

# High Frequency Radar Final Report

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PROJECT TITLE: “An Advanced Atmospheric/Ocean Assessment Program Designed to Reduce the Risk Associated with the Offshore Wind Energy Development Defined by the NJ Energy Master Plan”

PROGRAM SPONSOR: State of New Jersey, NJ Board of Public Utilities (NJBPUB) Bureau of Conservation & Renewable Energy & Office of Clean Energy



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April 22, 2013

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## Introduction

## High Frequency Radar Network

### Site Installation

Four SeaSonde High Frequency (HF) radars were purchased and installed as part of the Rutgers BPU project. Table 1 lists the spacing between the SeaSonde stations. This will be useful when configuring the bistatic operations between the sites.

**Table 1: Spacing between SeaSonde HF Radar sites in kilometers**

	BRNT	BRMR	RATH	WOOD
BRNT	0	27	61	87
BRMR		0	34	60
RATH			0	26
WOOD				0

The radial current data is collected from each of the sites once an hour and transferred back to the file server at Rutgers. The data is combined into total vector files using the HFRProgs MATLAB toolbox. The total vector files are plotted and made available on the Rutgers website (<http://marine.rutgers.edu/cool/maracoos/imagery/>) for viewing. The data is then made available to the National Oceanic and Atmospheric Administration (NOAA) High Frequency Radar Network.

### **Brant Beach Site BRNT**

The site at Brant Beach, NJ was installed on December 5, 2011. The climate controlled enclosure that houses the system electronics is shown in Figure 1. The antenna on the beach is shown in Figure 2. Table 2 provides information on the installation and the hardware installed to increase the reliability of the system. The antenna was lost at Brant Beach during Hurricane Sandy. A spare antenna had been purchased as part of the project and was used to replace the lost antenna. That antenna is shown in



**Figure 1: Picture of the electronics enclosure at the Brant Beach radar site.**



**Figure 2: Picture of the antenna on the beach in Brant Beach, NJ after installation December 2011.**

**Table 2: Brant Beach Site Information**

Antenna Coordinates:	39.615383, -74.198300
Transmit Frequency:	13.45 MHz
Power Output:	40 W
Bandwidth:	50kHz
AC Installed:	Yes
UPS Installed:	Yes
Data Transfers via:	Cable Internet
Power Control:	Remote
Backup Drive:	Yes
Lightning Protection:	Yes
Property Owner:	The Township of Long Beach Township, New Jersey
Local Contact:	Andrew Baran, Deputy Municipal Department Head



**Figure 3: Picture of the antenna on the beach in Brant Beach, NJ after Hurricane Sandy April 2013.**

### Brigantine Site BRMR

The site at Briagantine, NJ was installed on January 5, 2012. The climate controlled enclosure that houses the system electronics is shown in Figure 4. The antenna on the beach is shown in Figure 5. Table 3 provides information on the installation and the hardware installed to increase the reliability of the system. The antenna at BRMR was knocked down and was damaged slightly after Hurricane Sandy. The antenna was repaired and made operational again on December 20, 2012.



**Figure 4: Picture of the electronics enclosure at the Brigantine radar site.**





**Figure 5: Picture of the antenna on the beach in Brigantine, NJ.**

**Table 3: Brigantine Site Information**

Antenna Coordinates:	39.408183, -74.361217
Transmit Frequency:	13.45 MHz
Power Output:	40 W
Bandwidth:	50kHz
AC Installed:	Yes
UPS Installed:	Yes
Data Transfers via:	Cable Internet
Power Control:	Remote
Backup Drive:	Yes
Lightning Protection:	Yes
Property Owner:	The City of Brigantine Beach, New Jersey
Local Contact:	Ernie Purdy, Superintendent of Public Works

### Strathmere Site RATH

The site at Strathmere, NJ was installed on January 5, 2012. The climate controlled enclosure that houses the system electronics is shown in Figure 6. The antenna on the beach is shown in Figure 7. Table 4 provides information on the installation and the hardware installed to increase the reliability of the system. The site at Strathmere experienced no damage during Hurricane Sandy.



**Figure 6:** Picture of the electronics enclosure at the Strathmere radar site.



**Figure 7: Picture of the antenna on the beach in Strathmere, NJ.**

**Table 4: Strathmere Site Information**

Antenna Coordinates:	39.198683, -74.652517
Transmit Frequency:	13.45 MHz
Power Output:	40 W
Bandwidth:	50kHz
AC Installed:	Yes
UPS Installed:	Yes
Data Transfers via:	Cable Internet
Power Control:	Remote
Backup Drive:	Yes
Lightning Protection:	Yes
Property Owner:	The Township of Upper, New Jersey
Local Contact:	Paul Dietrich, Township Engineer

### North Wildwood Site WOOD

The site at North Wildwood, NJ was installed on January 27, 2012. The climate controlled enclosure that houses the system electronics is shown in Figure 8. The antenna on the beach is shown in Figure 9. Table 5 provides information on the installation and the hardware installed to increase the reliability of the system. The site at North Wildwood experienced no damage during Hurricane Sandy.



**Figure 8: Picture of the electronics enclosure at the North Wildwood radar site.**



**Figure 9: Picture of the antenna on the beach in North Wildwood, NJ.**



**Table 5: North Wildwood Site Information**

Antenna Coordinates:	38.990633, -74.799767
Transmit Frequency:	13.45 MHz
Power Output:	40 W
Bandwidth:	50kHz
AC Installed:	Yes
UPS Installed:	Yes
Data Transfers via:	Cellular Internet
Power Control:	Remote
Backup Drive:	Yes
Lightning Protection:	Yes
Property Owner:	The City of North Wildwood, New Jersey
Local Contact:	Christine Smyth, City Administrator
Radial Dat	

## Antenna Pattern Measurements

The antenna pattern can be considered the calibration of the equipment. The SeaSonde is a compact direction finding radar that receives radar echos from all directions. The receive antenna consists of two directionally dependent cross loops and an omni directional monopole. The SeaSonde determines the bearing of these radar echos based on the ratio of the signal in each of the three channels of the receive antenna. If there is any metal longer than a quarter of the transmitted wavelength, which is 6 meters for the 13 Mhz system, within a few wavelengths then the possibility of antenna distortion exists. This will affect the bearing measurements of the radial velocity estimates.

This distortion can be measured and corrected by conducting an antenna pattern measurement (APM). This should be conducted when the equipment is first installed, if there is a major change in the environment of the system, if new hardware (receivers, cables, antennas) are introduced to the system. Table 1 provides the dates and reason an antenna pattern measurement was performed at each of the four BPU sites.

Radial files generated using the antenna pattern measurement are called ideal radials. Radial files generated using a theoretical sine function for the antenna response are referred to as ideal radial files.

**Table 6: Dates for antenna pattern measurements at each radar station.**

BRNT		
Number	APM Date	Reason
1	12/2/2011	New Antenna
2	1/30/2012	measured radials poor coverage
3	2/2/2012	swapped antenna board
4	2/6/2012	moved antenna
5	4/10/2012	before bottom half of antenna swap
6	4/11/2012	bottom half antenna swapped
7	5/2/2012	repaired dome mast
8	5/29/2012	360* APM
9	6/5/2012	new antenna
10	6/5/2012	rotated antenna
11	6/8/2012	360* APM with new antenna
12	6/8/2012	180 APM
13	6/8/2012	360 w SPRK antenna
14	6/13/2012	360* APM w/SPRK antenna
15	6/13/2012	360* APM w/SPRK antenna take 2
16	8/8/2012	replaced cables
17	2/5/2013	measured radials poor coverage

BRMR		
Number	APM Date	Reason
1	12/12/2011	New Antenna
2	3/13/2012	measured radials poor coverage
3	8/21/2012	measured radials poor coverage
4	1/3/2013	replaced cables
5	2/6/2013	measured radials poor coverage
6	2/12/2013	measured radials poor coverage

RATH		
Number	APM Date	Reason
1	1/31/2012	New Antenna
2	2/22/2012	measured radials poor coverage

WOOD		
Number	APM Date	Reason
1	1/26/2012	New Antenna
2	2/14/2012	measured radials poor coverage
3	8/9/2012	measured radials poor coverage

The antenna bearing is a critical measurement and setting of the radar system. The antenna is positioned so that it is pointing normal to the coast line and the two directional loops are evenly spaced over the ocean. Then a technician measures the magnetic bearing of this shore normal vector. The bearing is entered into the SeaSonde software. The software then corrects for the local magnetic declination to determine the true bearing of the receive antenna. Any error in this process will result in a bearing bias of the measurements, so great care was taken to make sure this measurement at each site was accurate. Table 7 lists the antenna bearing and the start date and time. For instance the SEAB site had an antenna bearing of 122 degrees true on January 1, 2012 at 00:00 GMT. The antenna remained at this bearing for the duration of the experiment. The antenna bearing of BRMR was set to 173 degrees true during its installation and changed to 170 on November 15, 2012 after the antenna was repaired due to Hurricane Sandy.

**Table 7: Dates that the bearing of the receive antenna changed and the value.**

<b>Station</b>	<b>Date</b>	<b>Bearing</b>
SEAB	1/1/12 0:00	122
BELM	1/1/12 0:00	139
SPRK	1/5/12 19:00	122
SPRK	6/14/12 21:00	157
SPRK	6/20/12 17:00	132
SPRK	9/26/12 16:00	142
BRNT	1/1/12 0:00	172
BRNT	1/30/12 20:00	144
BRNT	2/2/12 22:00	127
BRNT	2/6/12 17:00	147
BRNT	6/5/12 15:00	162
BRNT	6/8/12 15:00	144
BRNT	6/11/12 22:00	142
BRNT	11/14/12 18:00	137
BRMR	1/1/12 0:00	173
BRMR	11/15/12 16:00	170
RATH	1/5/12 19:00	198
WOOD	1/27/12	150

## Data Collection

There are several layers of data within the surface current measurements of the HF radar. Table 8 shows the different layers with their description. The spectra data was collected and archived on an external hard disk drive. The real-time radial data (Level 1a) was transferred back to Rutgers once an hour and combined into totals (Level 2a). The real time radial and total data was analyzed in the report and appendix. After seeing some anomalies in the data, the radial data was reprocessed with refined processing parameters to improve data quality. This reprocessed radial data (Level 1b) was used to produce reprocessed totals (Level 2b). Two sets of reprocessed totals were generated, one using the ideal radial files and the other using the measured radial files. The Level 1a, 1b, 2a and 2b data were stored on the IMCS file server that has tape redundancy. The analysis shown in this report and appendix is with the real-time data (Level 1a and 2a). The analysis in the “HF Radar Surface Current Summary” was performed using the reprocessed Level 2b data.

The inventory of spectra data from each site is given in Table 9. The missing data from RATH and WOOD was due to a failed hard drive that contained the data.

**Table 8: Levels of data associated with HF radar surface current measurements**

Data Level	Description
<b>Level 0</b>	Spectra Files
<b>Level 1a</b>	Real-time Radials
<b>Level 1b</b>	Reprocessed Radials
<b>Level 2a</b>	Real-time Totals
<b>Level 2b</b>	Reprocessed Totals
<b>Level 3</b>	Gap Filled Globally Gridded Products

**Table 9: Table showing the existence (X) of archived spectra files from each of the BPU radar stations.**

### *Cross Spectra Short (CSS) Data Files*

	BRMR	BRNT	RATH	WOOD
<b>Jan</b>	X	X		
<b>Feb</b>	X	X		
<b>Mar</b>	X	X	X	X
<b>Apr</b>	X	X	X	X
<b>May</b>	X	X	X	X
<b>June</b>	X	X	X	X
<b>July</b>	X	X	X	X
<b>Aug</b>	X	X	X	X
<b>Sep</b>	X	X	X	X
<b>Oct</b>	X	X	X	X
<b>Nov</b>	X	X	X	X
<b>Dec</b>	X	X	X	X

The monthly radial data availability is given in Table 10. The radial availability for all sites for 2012 was 78%. Some issues that prevented 100% data availability were hardware failures, software errors and Hurricane Sandy. Rutgers worked with the manufacturer CODAR Ocean Sensors to repair the failed hardware and fix software errors. Hurricane Sandy was the largest impact on the network destroying three of the sites (SEAB, BELM and SPRK) and causing outages at the other sites.

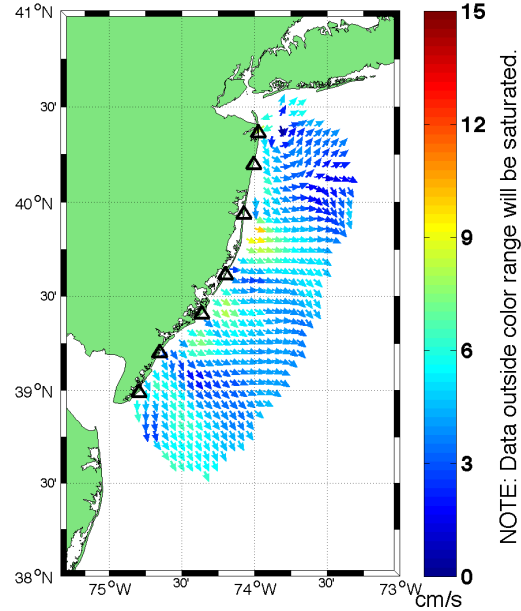
**Table 10: Monthly radial data availability percentages. The boxes in yellow indicate sites and months impacted by Hurricane Sandy.**

	SEAB	BELM	SPRK	BRNT	BRMR	RATH	WOOD
<b>Jan-12</b>	100%	100%	100%	100%	100%	58%	13%
<b>Feb-12</b>	100%	97%	100%	100%	100%	83%	85%
<b>Mar-12</b>	97%	87%	100%	100%	100%	92%	68%
<b>Apr-12</b>	98%	97%	100%	57%	99%	91%	86%
<b>May-12</b>	92%	100%	100%	100%	100%	98%	99%
<b>Jun-12</b>	100%	71%	58%	99%	98%	100%	100%
<b>Jul-12</b>	100%	92%	0%	100%	91%	100%	100%
<b>Aug-12</b>	100%	100%	0%	100%	100%	100%	100%
<b>Sep-12</b>	100%	65%	12%	100%	100%	100%	100%
<b>Oct-12</b>	91%	0%	93%	93%	93%	100%	100%
<b>Nov-12</b>	0%	0%	0%	0%	20%	100%	54%
<b>Dec-12</b>	0%	0%	0%	36%	14%	99%	100%

## Results

The annual mean of the surface currents off New Jersey for 2012 is shown in Figure 10. The mean current is on the order of 6-9 cm/s to the southeast. The currents near the NY Bight Apex shift direction towards the northeast. Only the grid points where there was at least 50% data coverage were plotted. This follows similar procedures from other researchers in the field.

BPU Mean for: Jan 01, 2012 to Dec 31, 2012

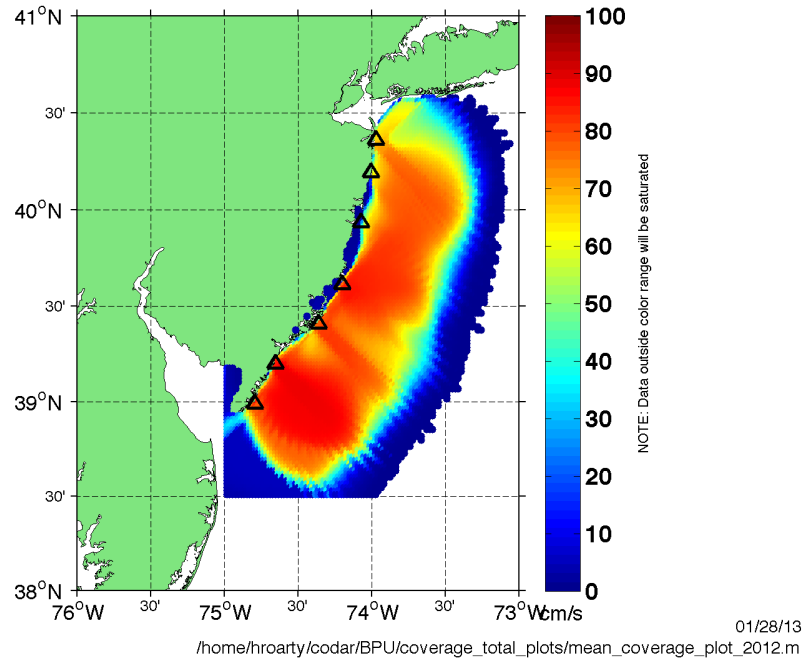


02/04/13  
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**Figure 10: Annual mean of the surface currents from January 1, 2012 to December 31, 2012 as measured by the HF radar system. The colorbar on the right shows the current scale in cm/s.**

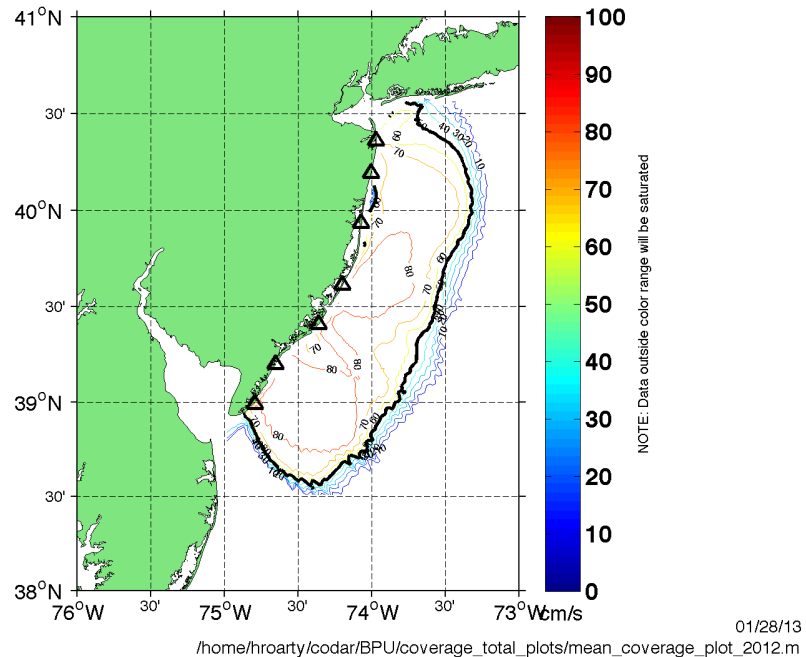
The temporal and spatial coverage for the network is shown in Figure 11. The temporal coverage over most of the New Jersey shelf reaches 70%. The coverage over the wind area development reached 80%. Figure 12 is also a plot of temporal and spatial coverage for the year. This figure delineates the 10% contour lines while Figure 11 uses the colormap to display coverage.

BPU OI Coverage, 8784 possible hourly maps  
From 2012-01-01 00:00 to 2012-12-31 23:00



**Figure 11: HF radar coverage for 2012. The colorbar on the right shows the temporal coverage red 100% and blue 0%.**

BPU OI Coverage, 8784 possible hourly maps  
From 2012-01-01 00:00 to 2012-12-31 23:00



**Figure 12: Contours of HF radar temporal coverage for 2012. Every 10 percent is shown with the 50% coverage area shown as the thick black line.**

## Appendix

The appendix assembles all plots and analysis related to the quality control and assurance of the radial and total vector files. All figures use the Level 1a real-time radial data and Level 2a real-time total data.

Section	Name
<b>01</b>	HF Radar Antenna Pattern Measurements
<b>02</b>	HF Radar Hardware Diagnostic Data
<b>03</b>	Ideal Radial Inventory
<b>04</b>	Measured Radial Inventory
<b>05</b>	Radial Contribution to Totals
<b>06</b>	Monthly Radial Coverage Maps
<b>07</b>	Average Radial Velocity
<b>08</b>	Ideal and Measured Radial Correlation Plots Time Series Plots
<b>09</b>	Ideal Radials Filtered by Land Mask
<b>10</b>	Site Locations with Bathymetry Maps
<b>11</b>	13 MHz First Order Line Setting Inspection
<b>12</b>	HF Radar Vector Coverage
<b>13</b>	13 MHz Monthly Average Surface Current Maps
<b>14</b>	M2 Tidal Ellipses



Section 01:

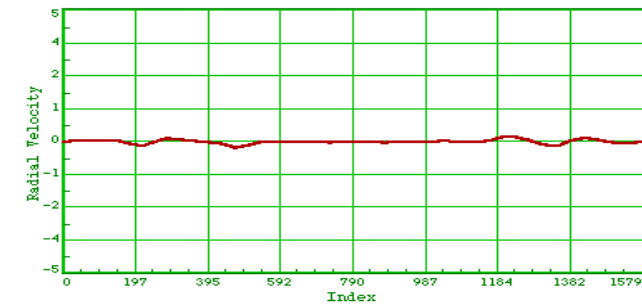
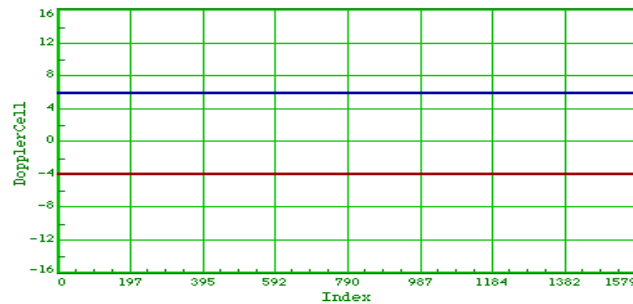
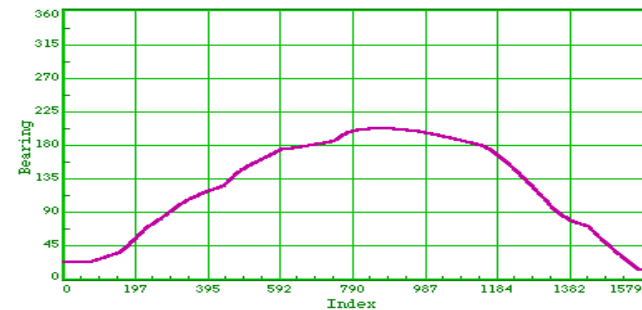
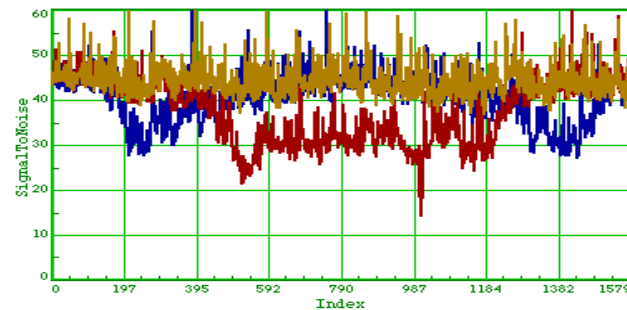
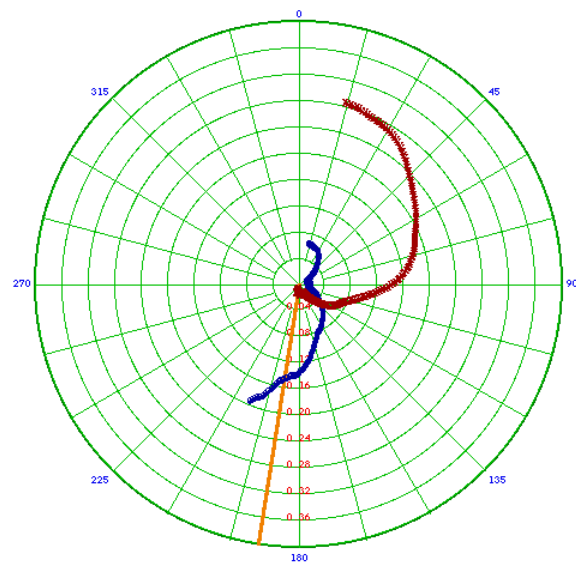
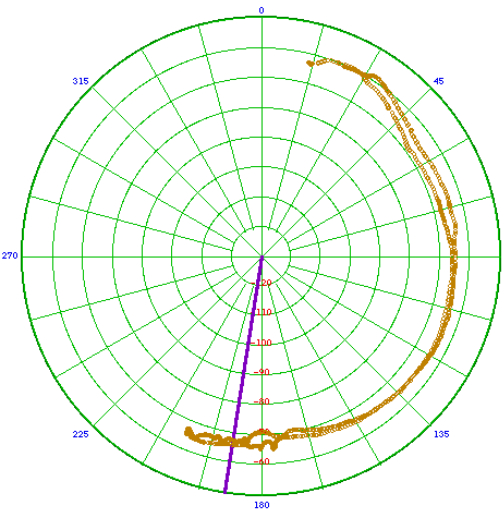
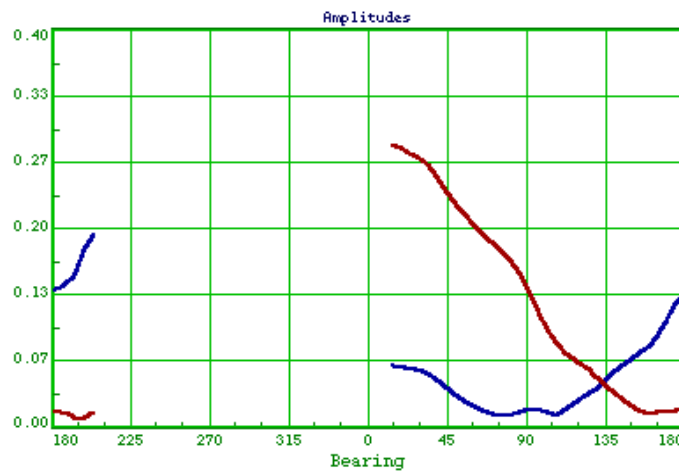
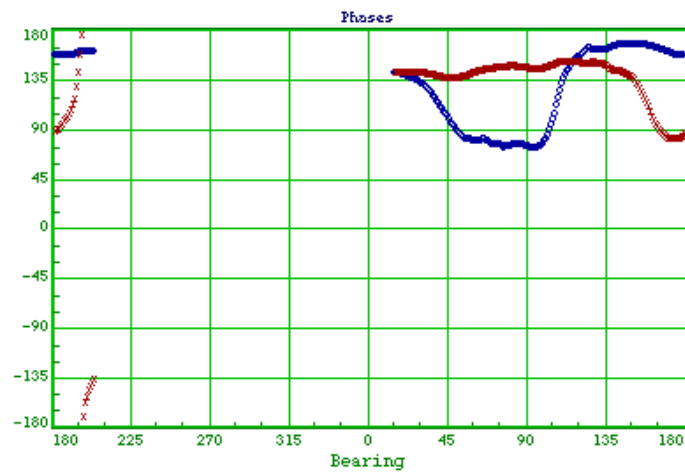
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# **HF Radar Antenna Pattern Measurements**

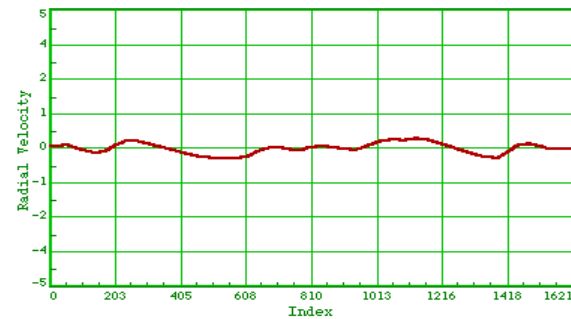
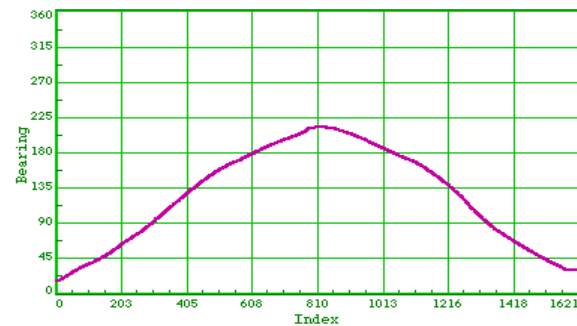
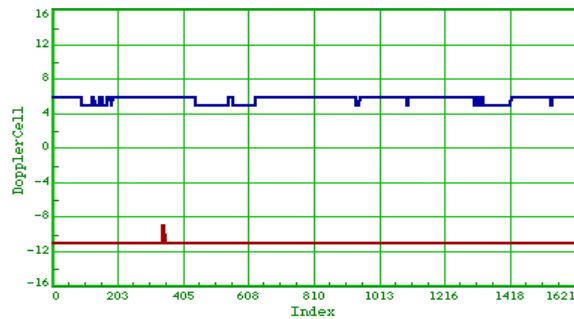
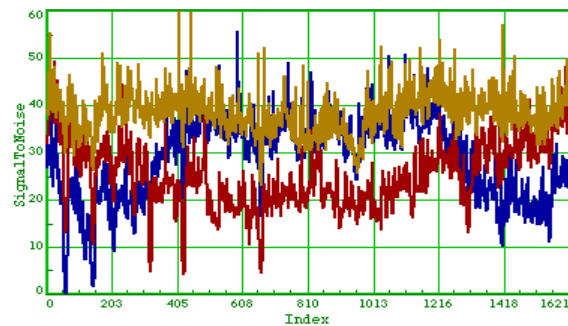
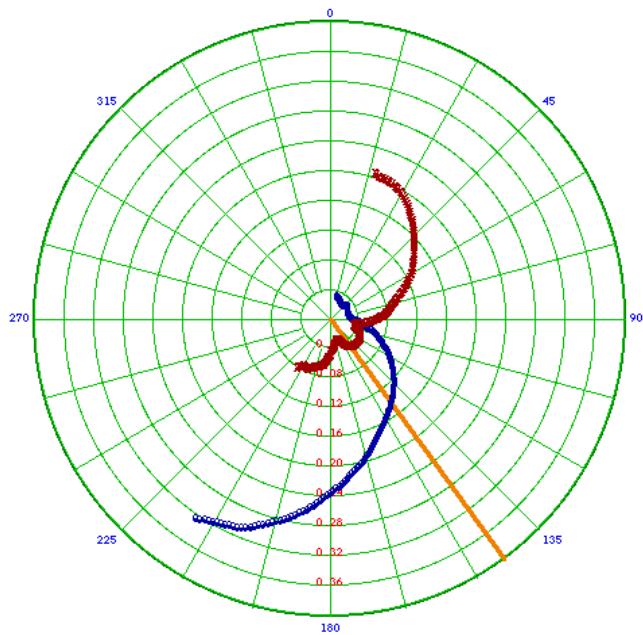
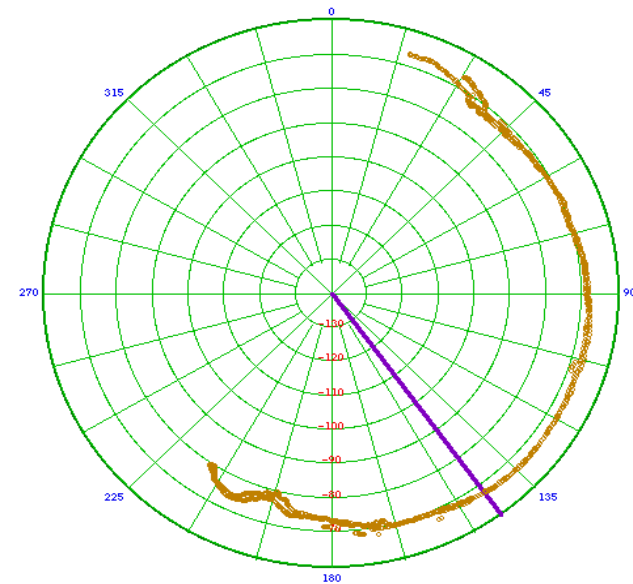
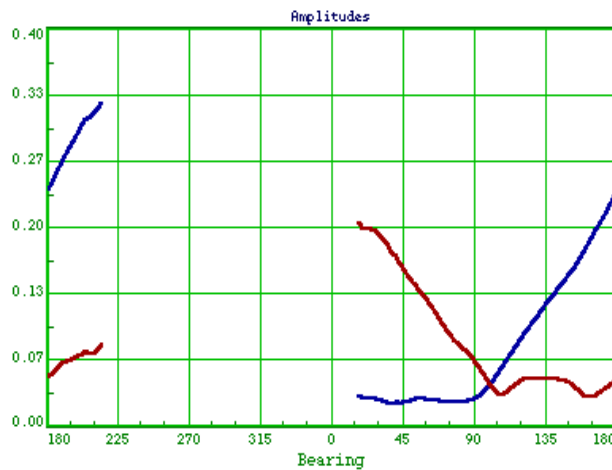
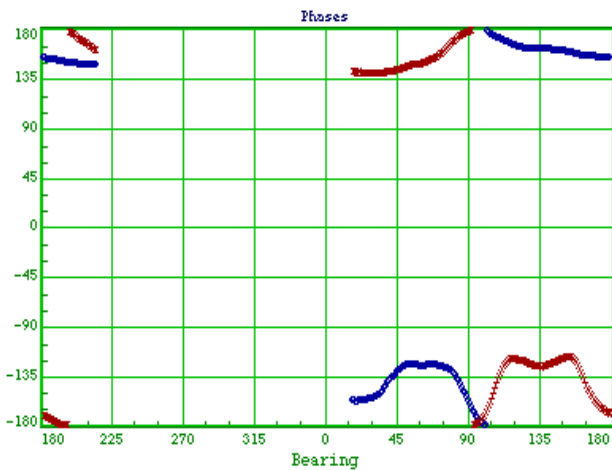
January 1, 2012 – February 22, 2013

# **BRANT BEACH**

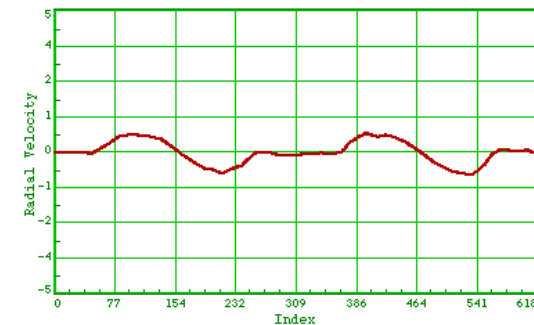
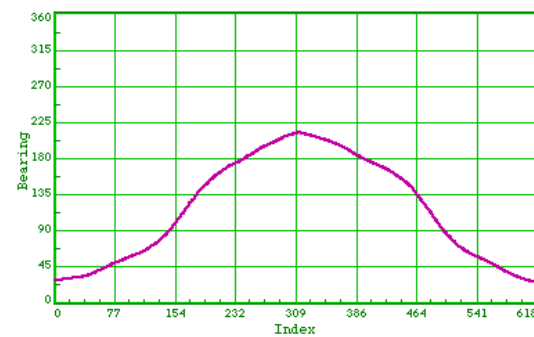
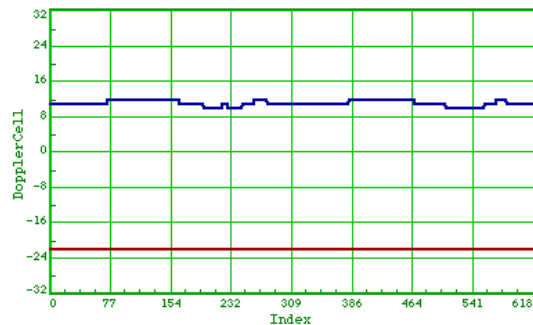
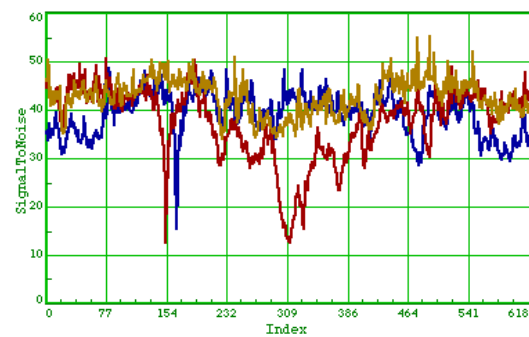
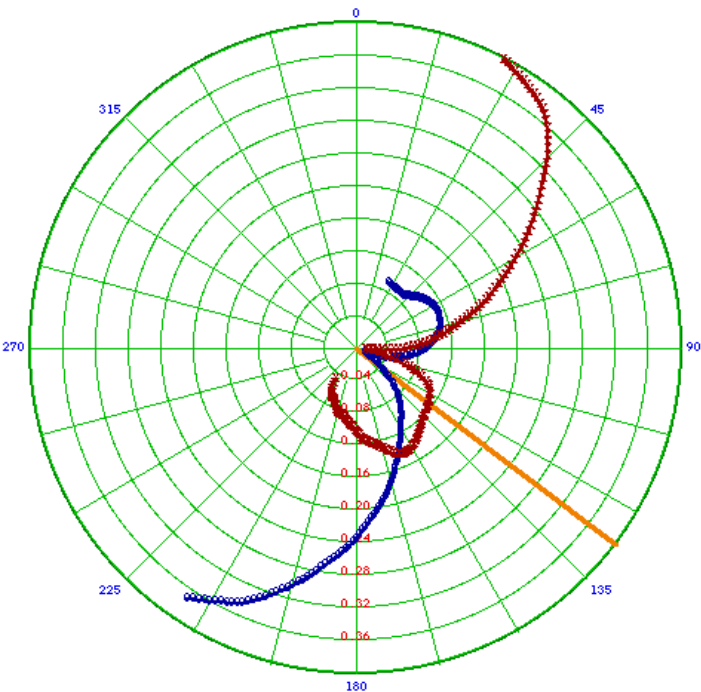
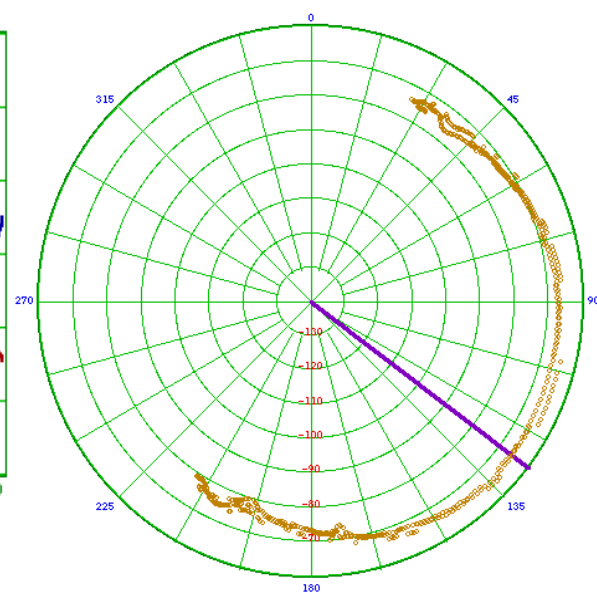
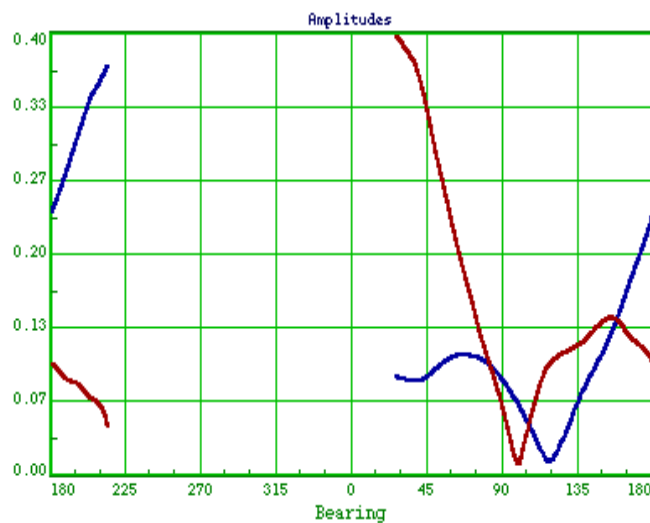
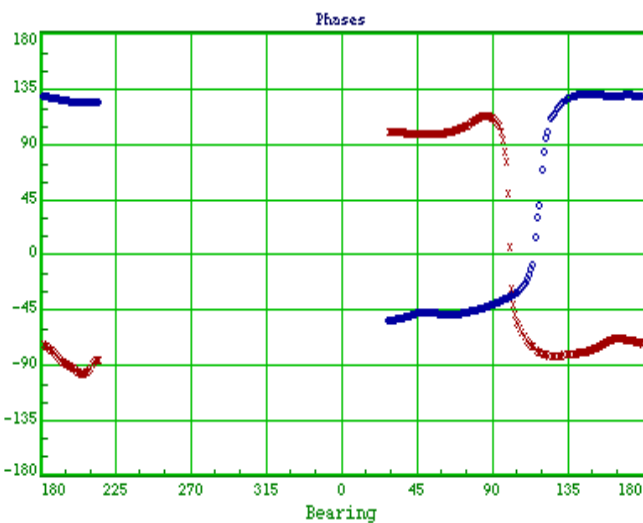
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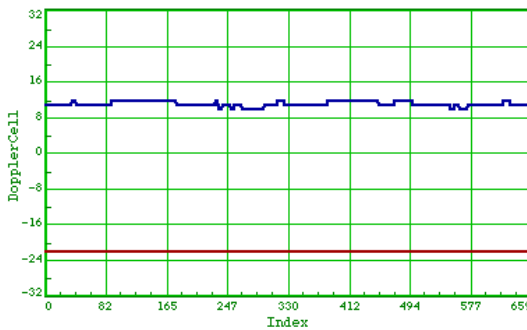
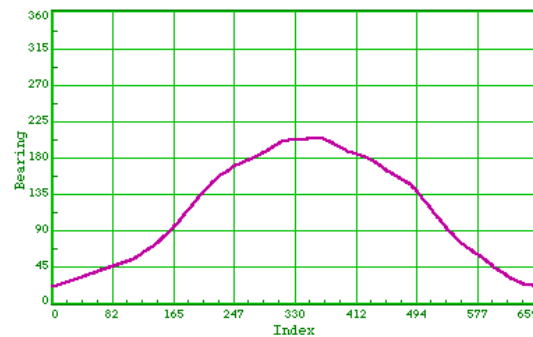
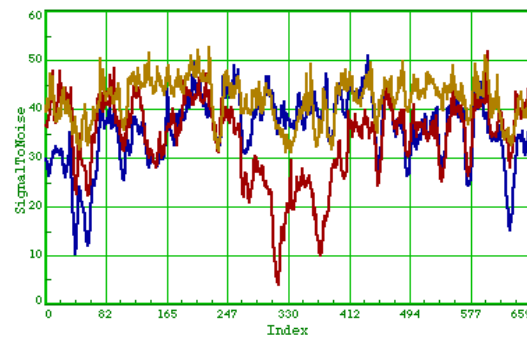
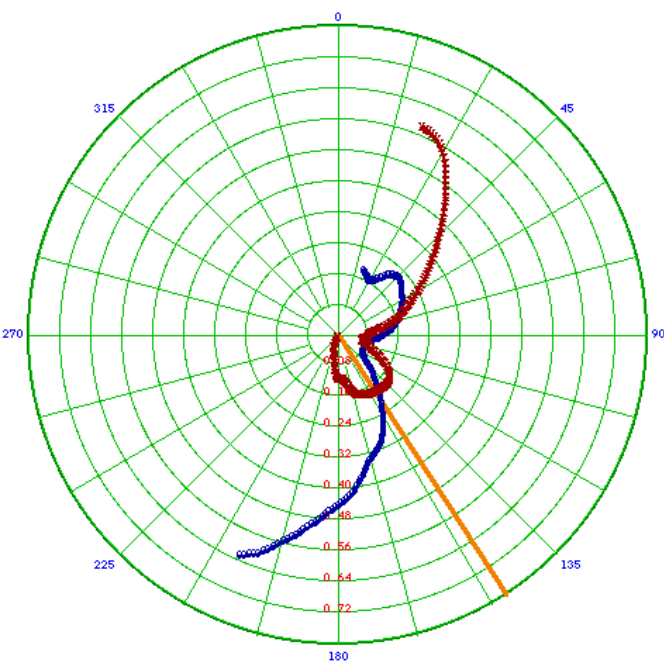
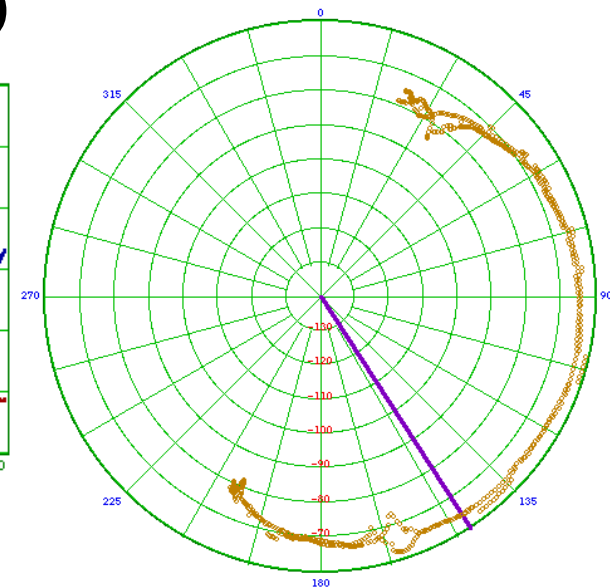
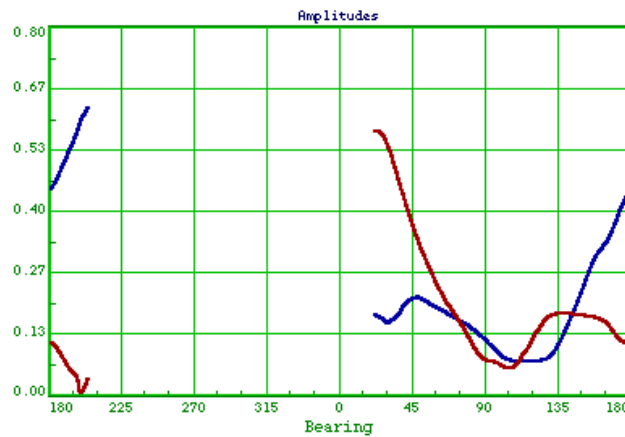
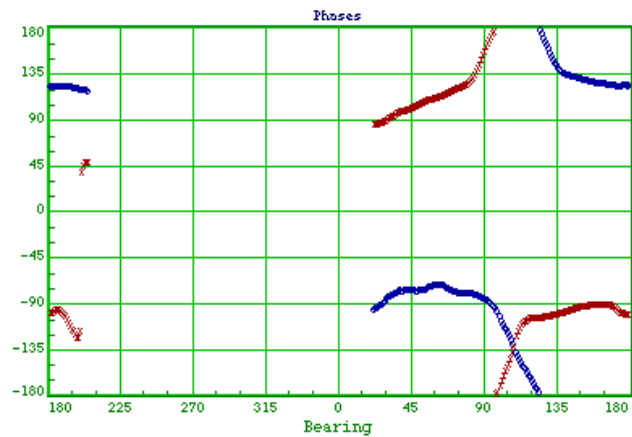
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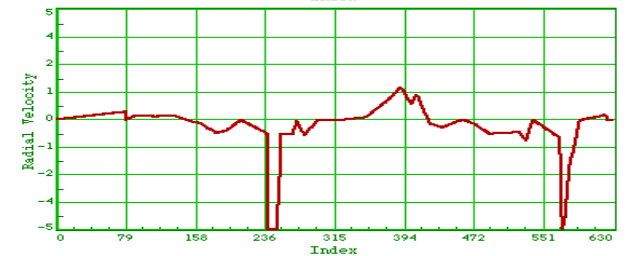
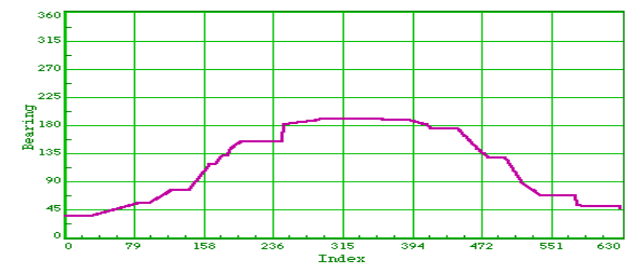
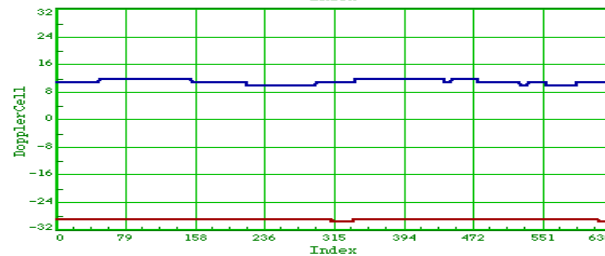
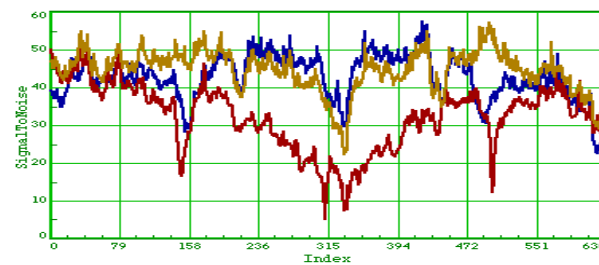
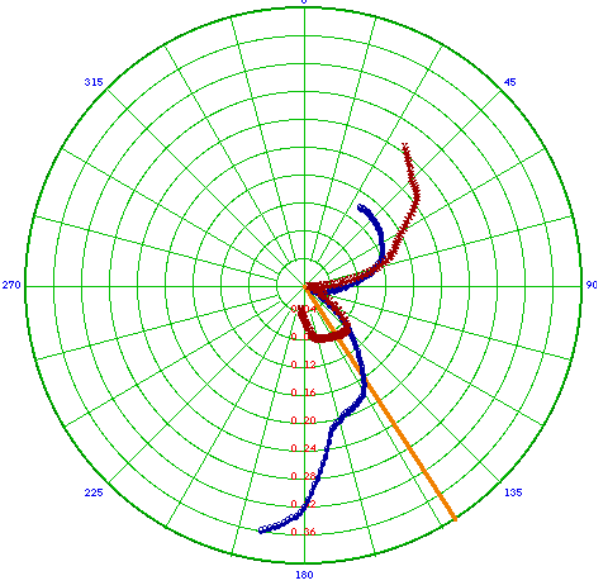
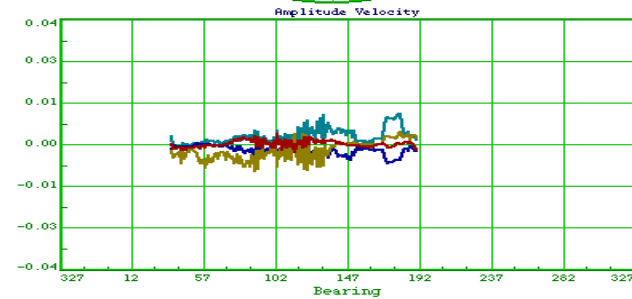
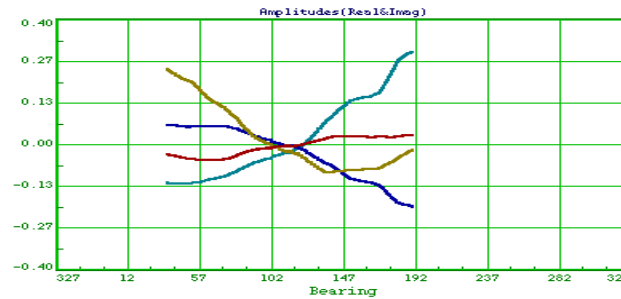
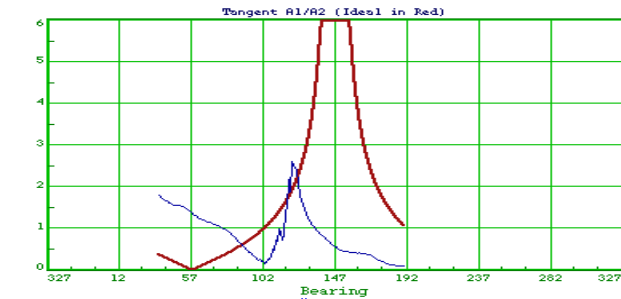
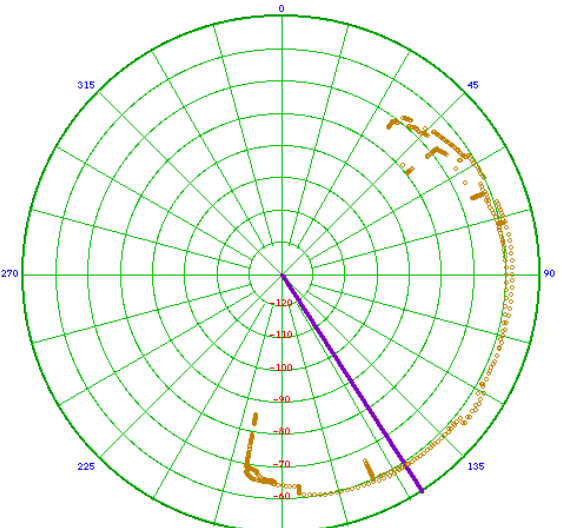
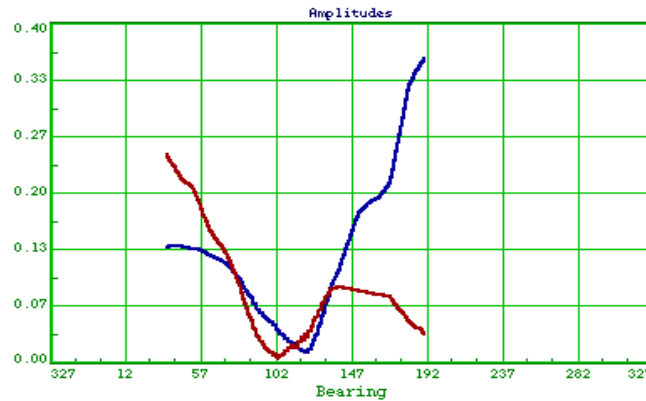
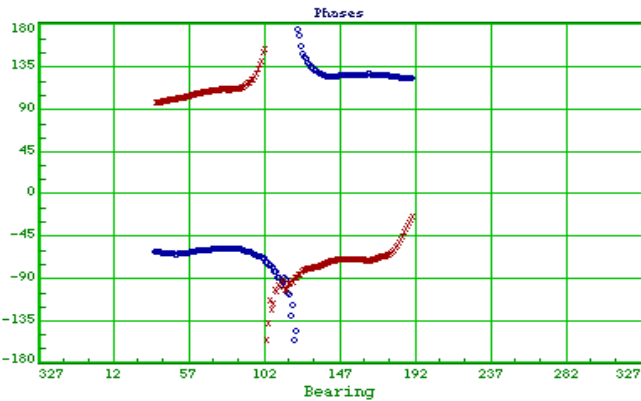
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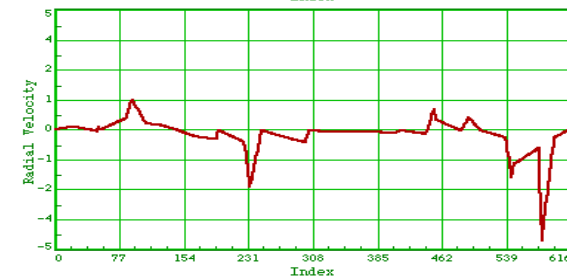
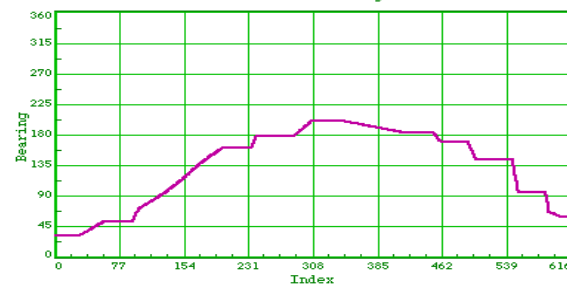
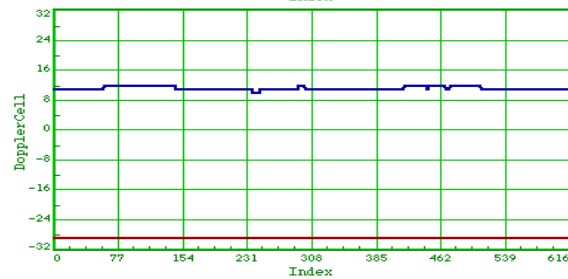
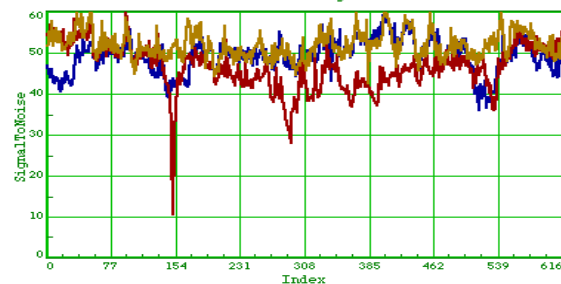
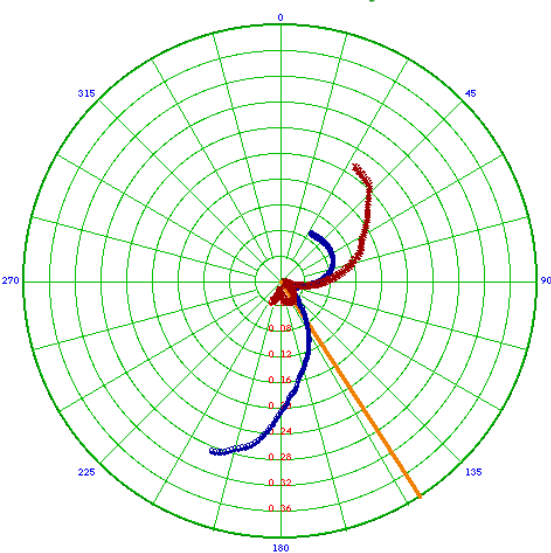
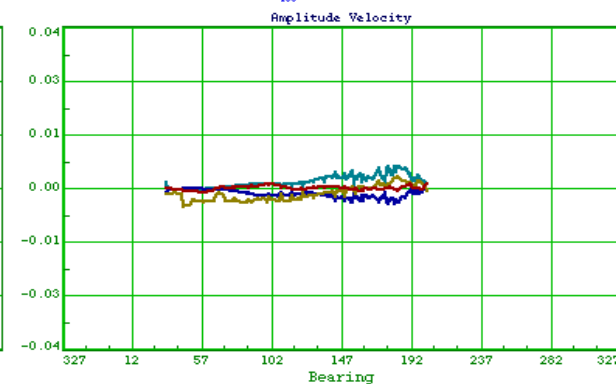
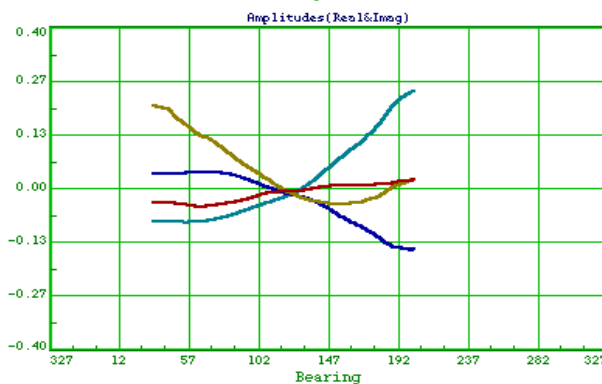
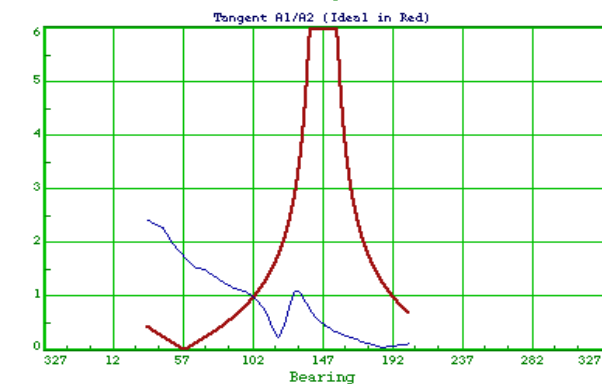
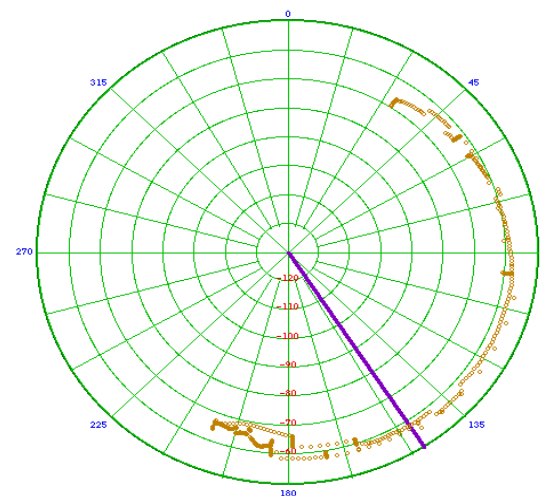
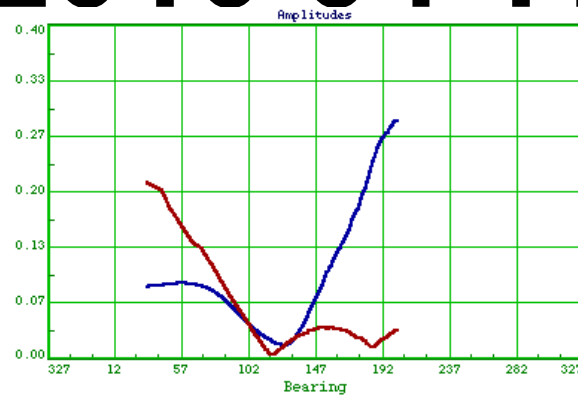
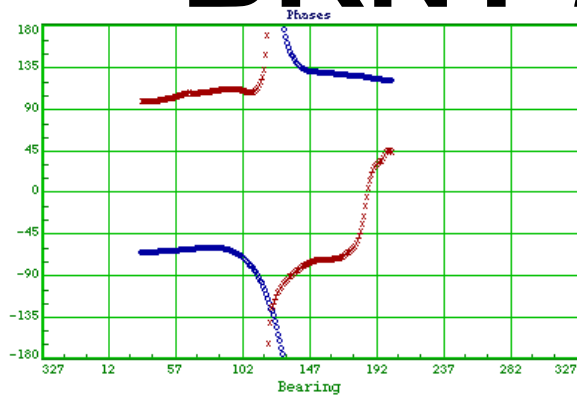
# 2012 02 06



# BRNT 2012 04 10

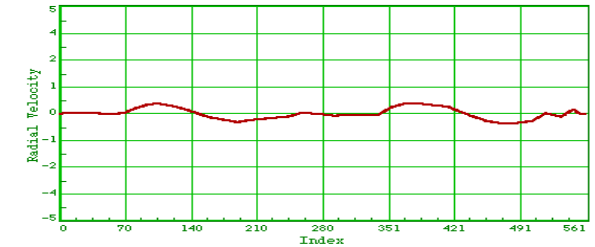
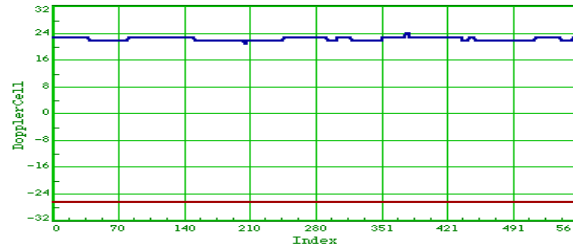
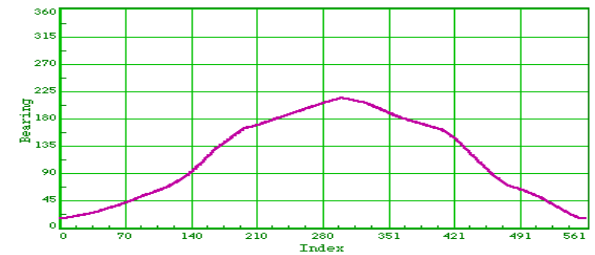
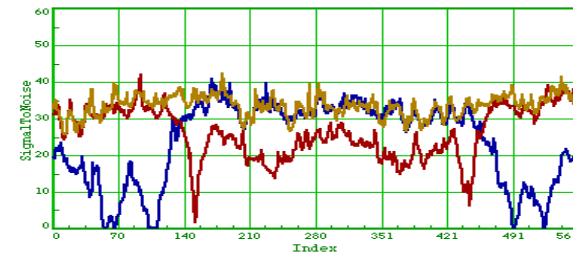
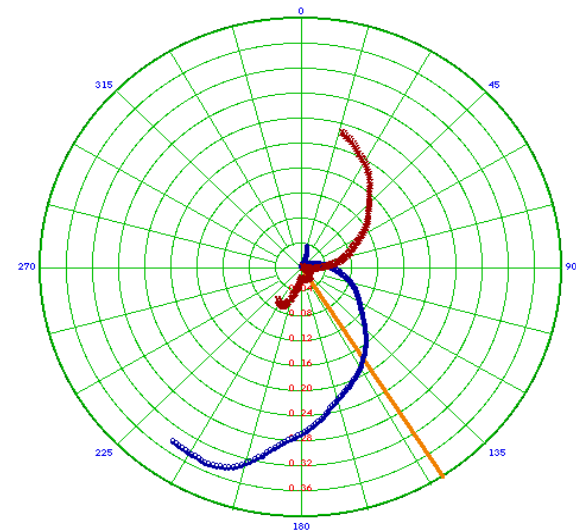
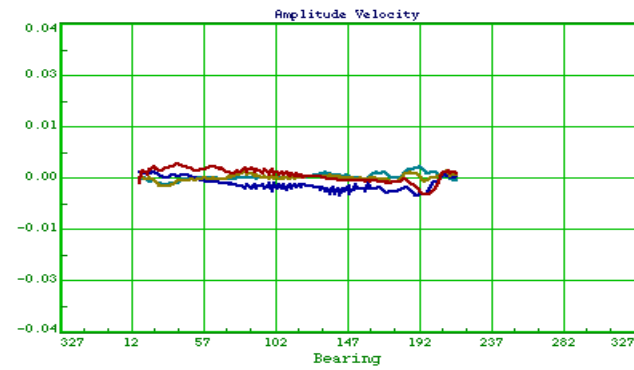
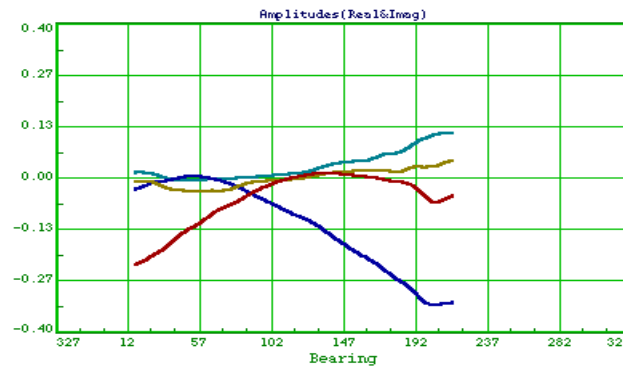
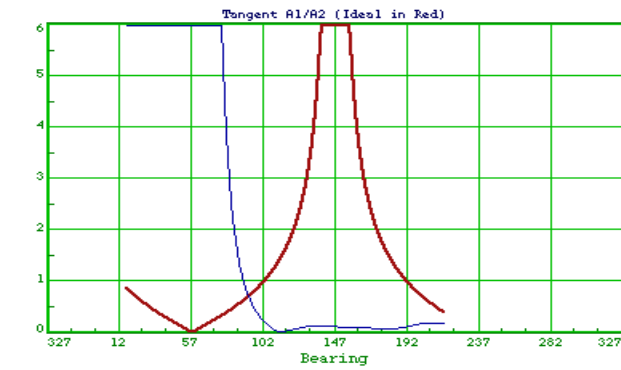
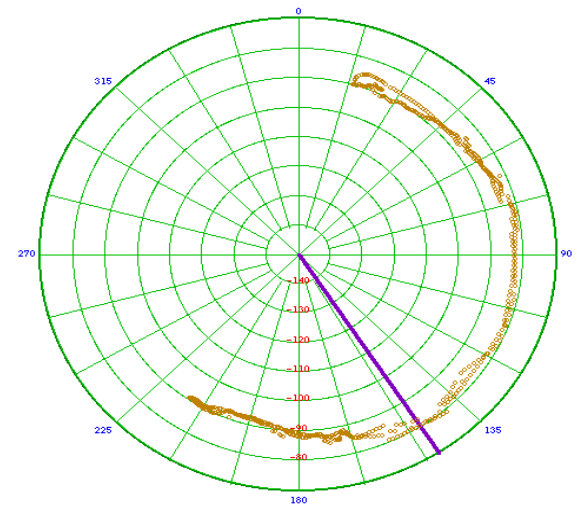
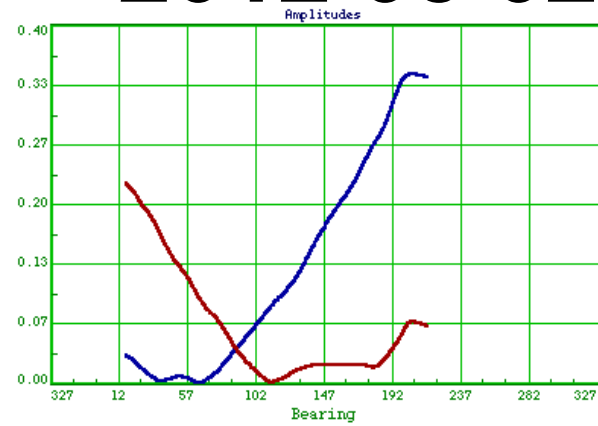
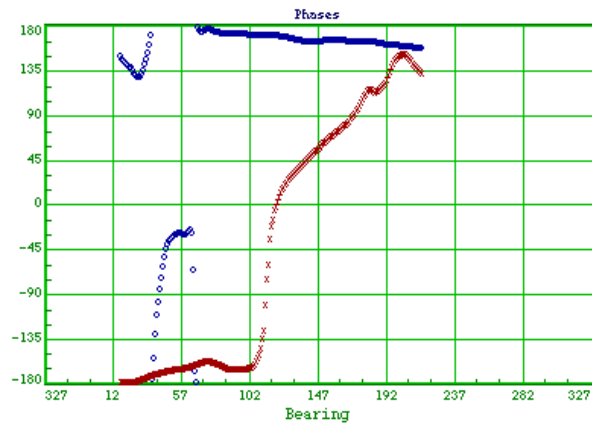


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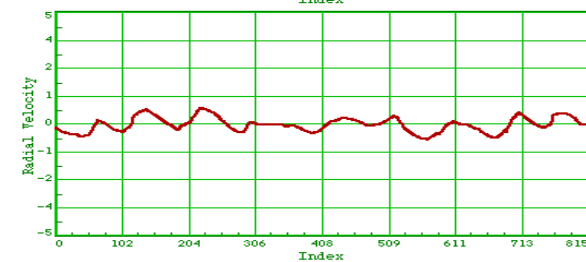
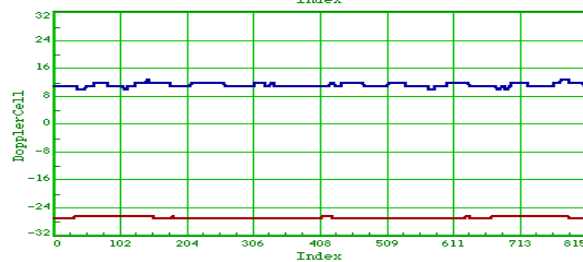
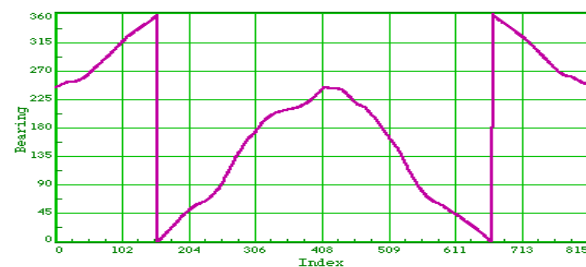
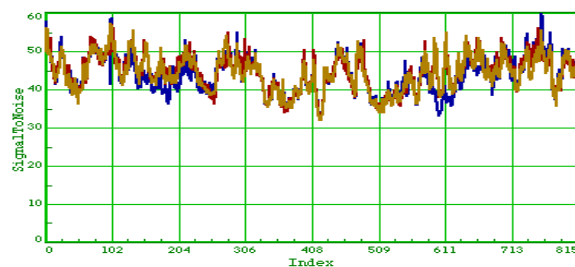
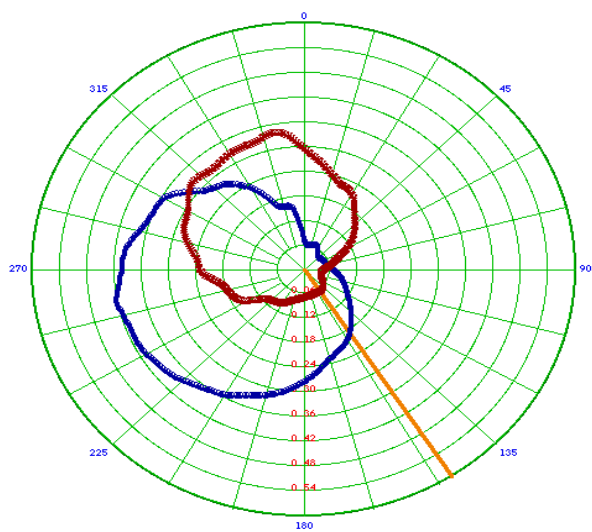
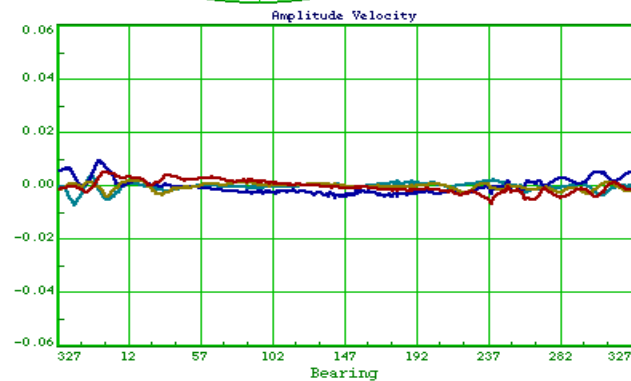
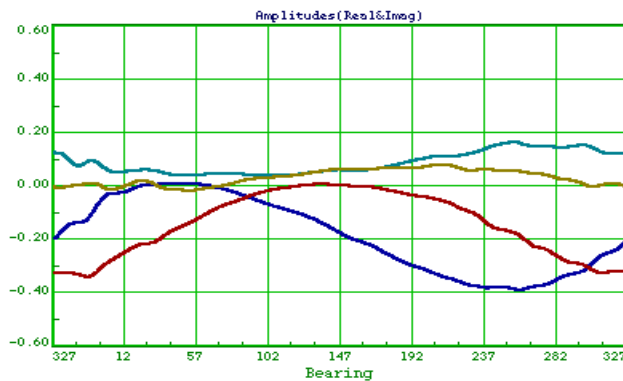
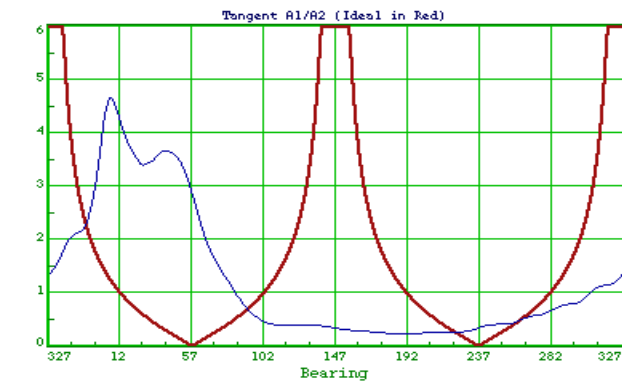
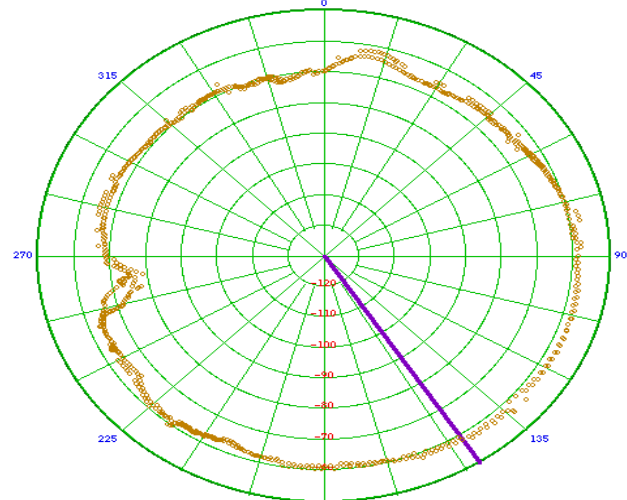
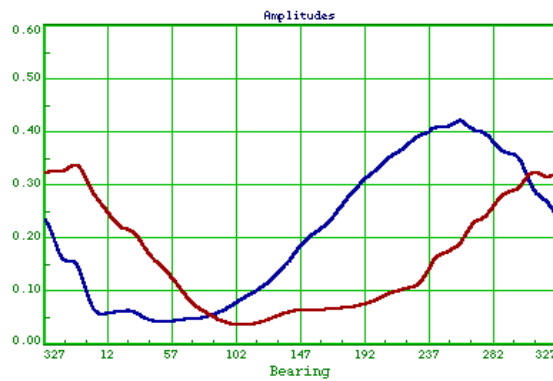
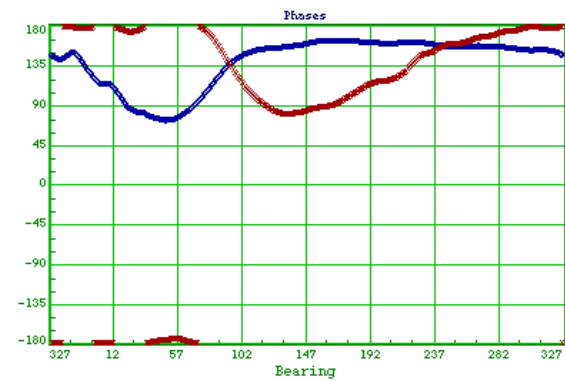




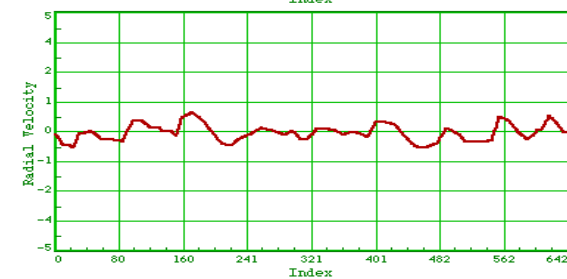
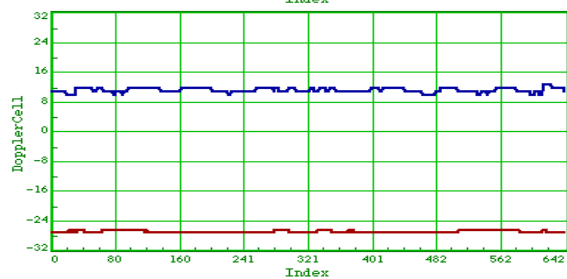
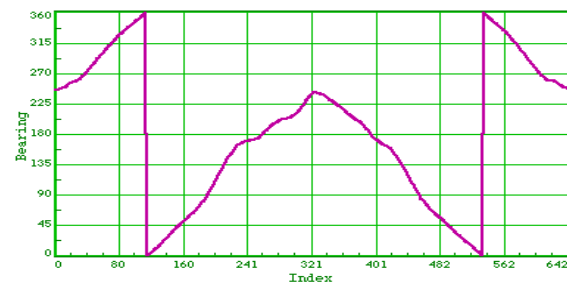
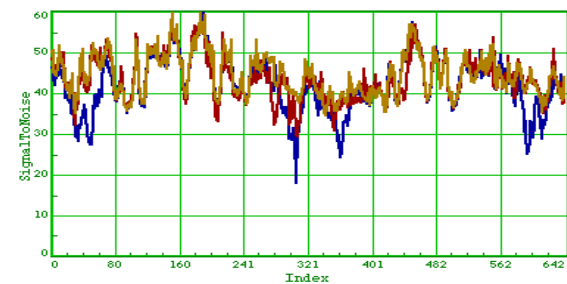
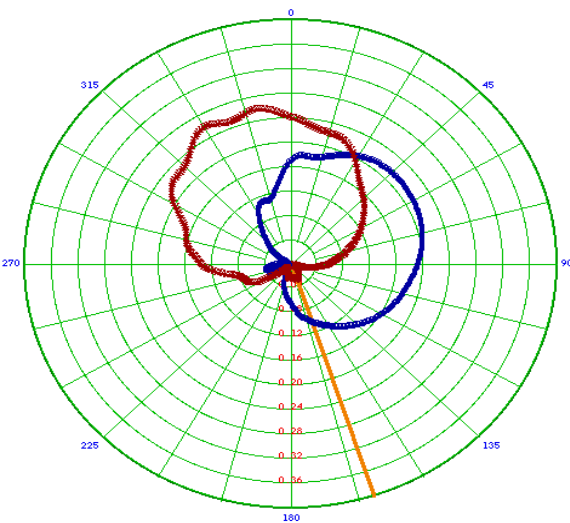
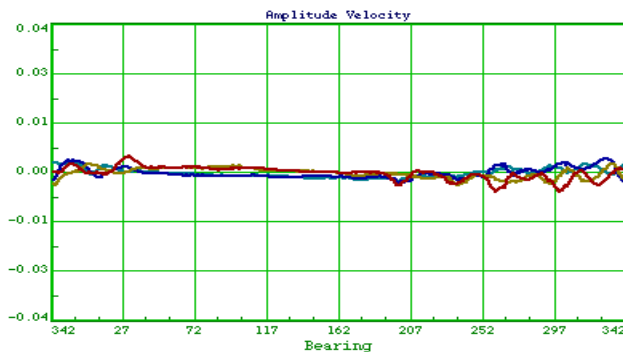
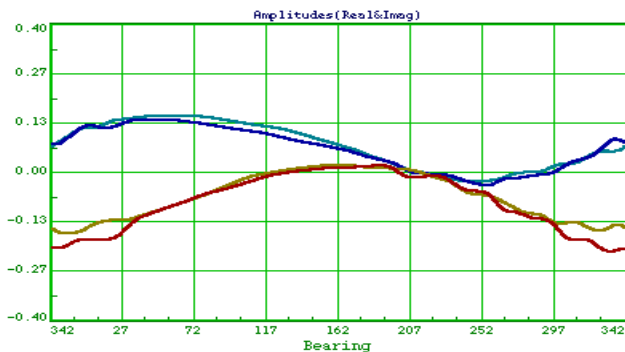
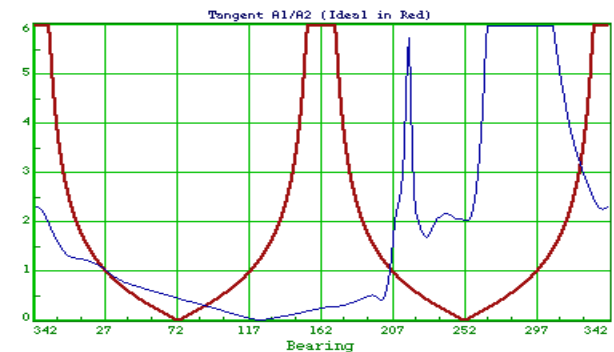
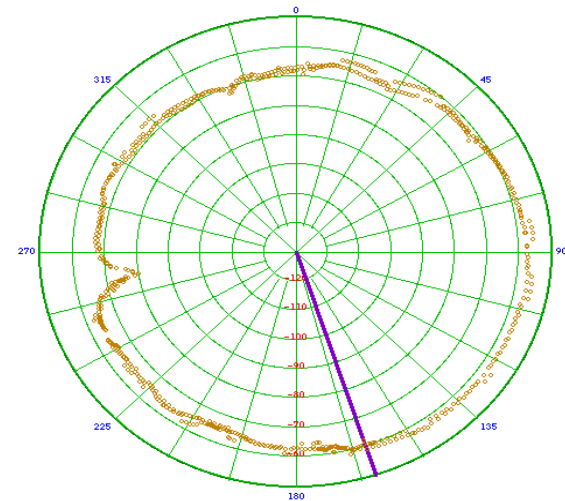
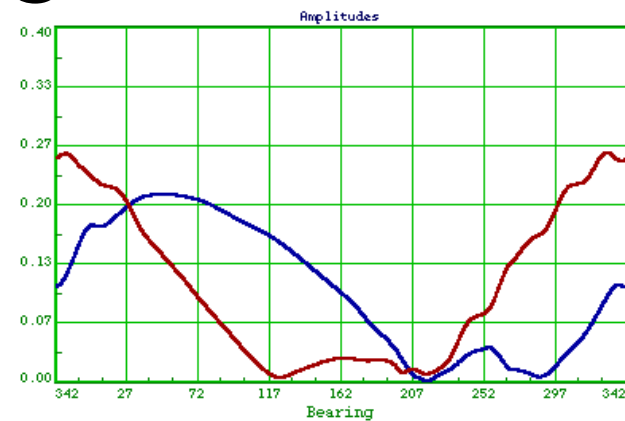
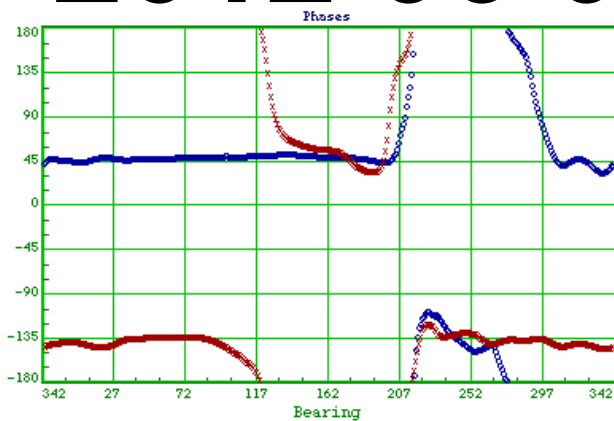
# 2012 05 02



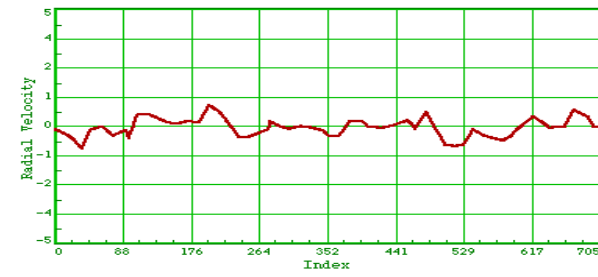
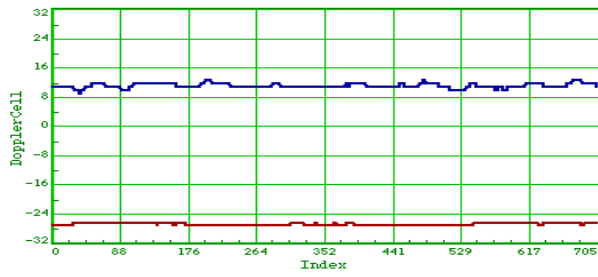
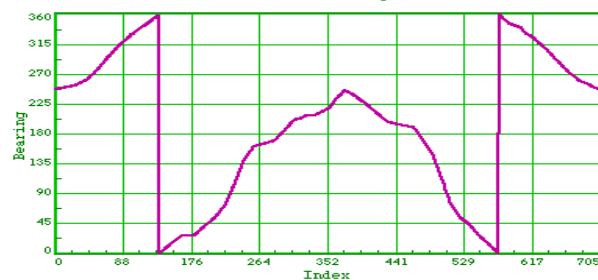
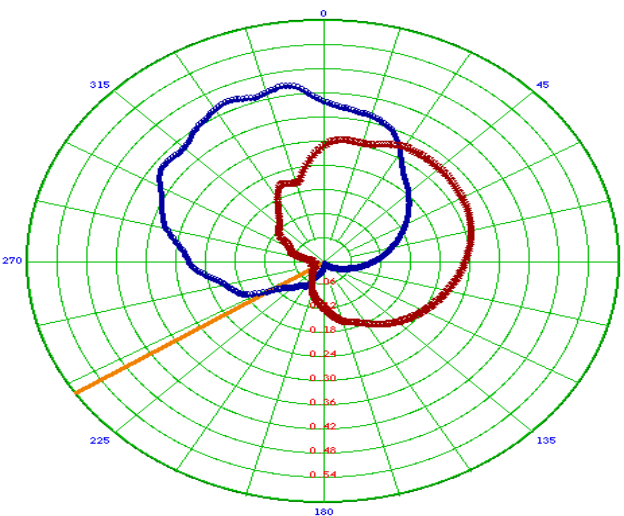
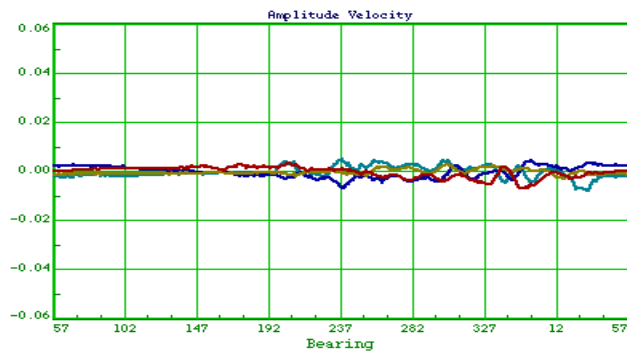
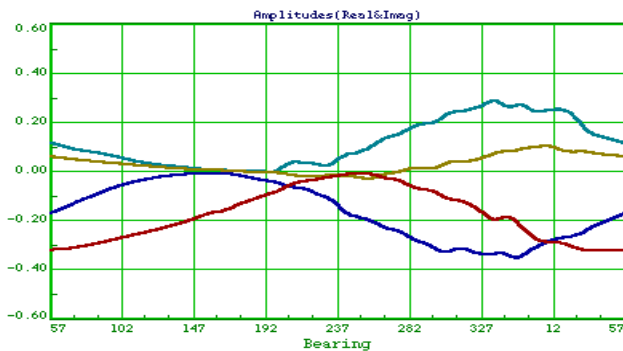
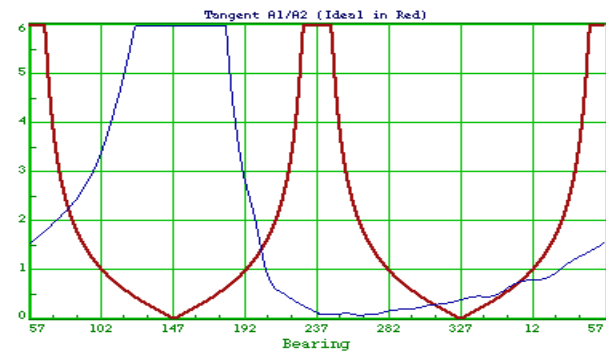
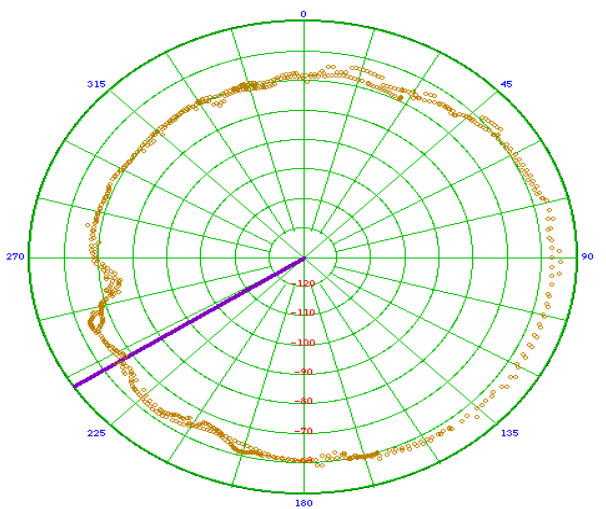
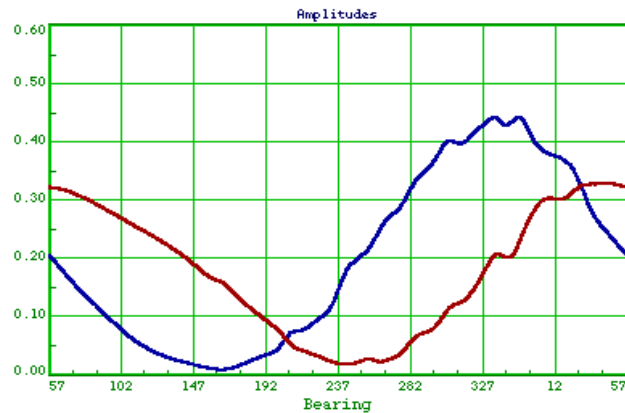
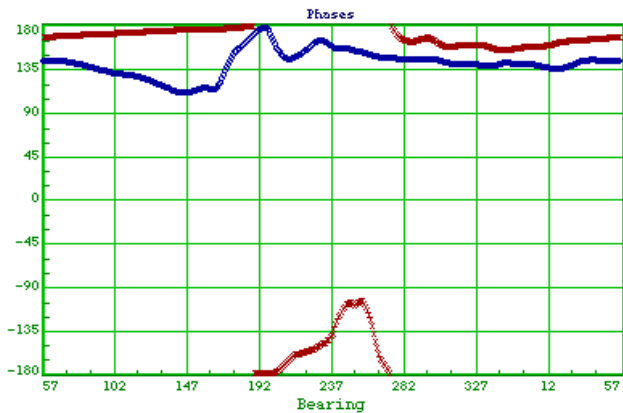
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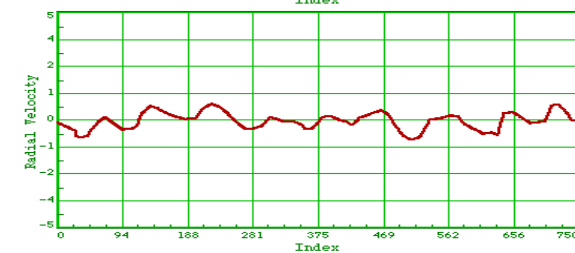
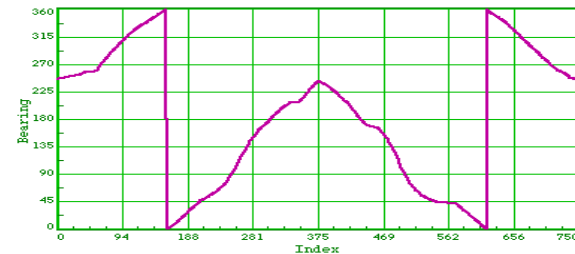
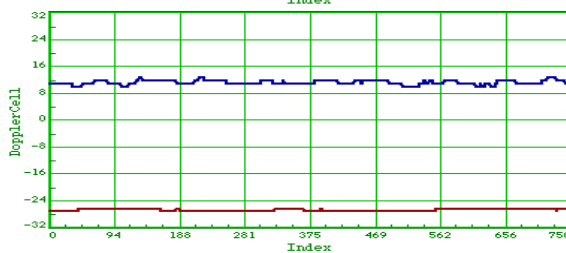
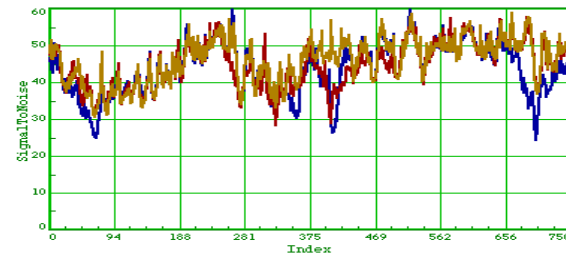
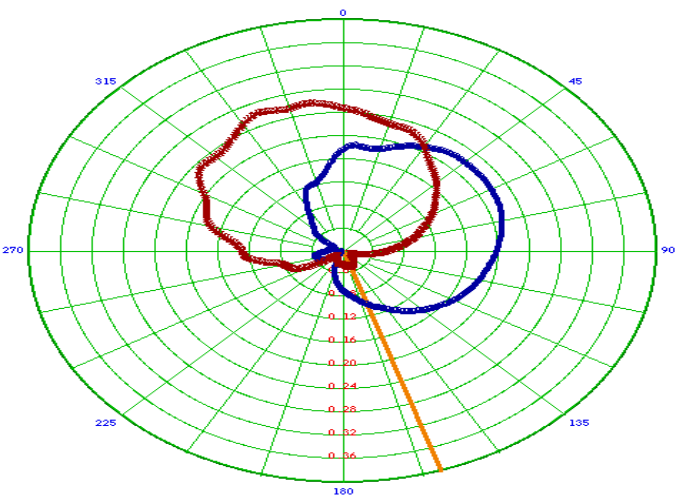
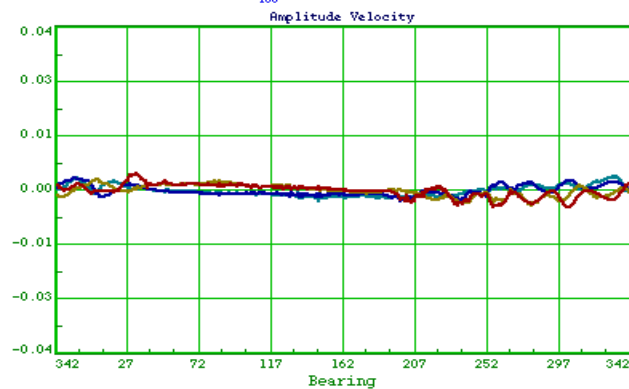
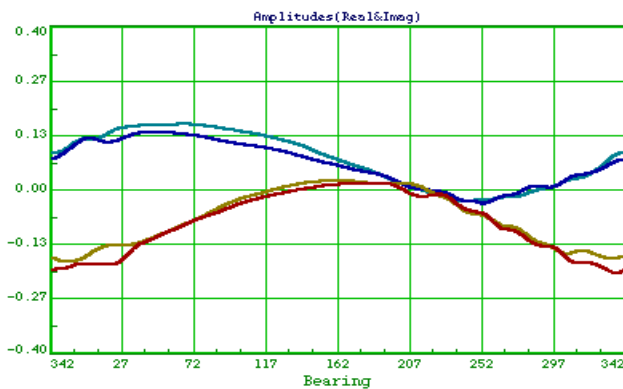
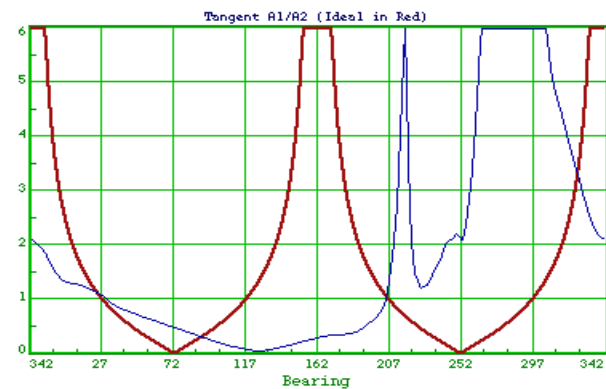
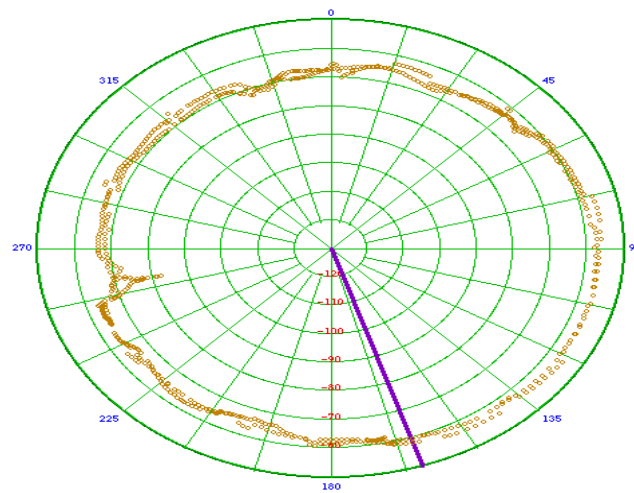
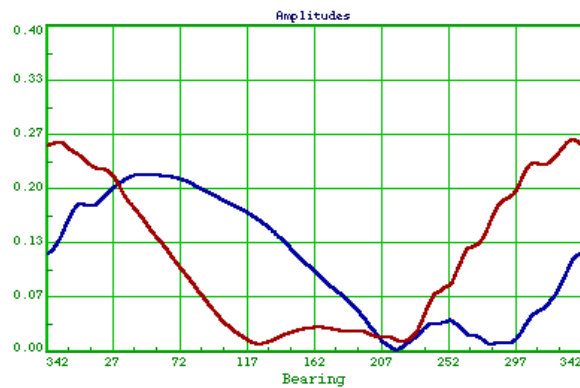
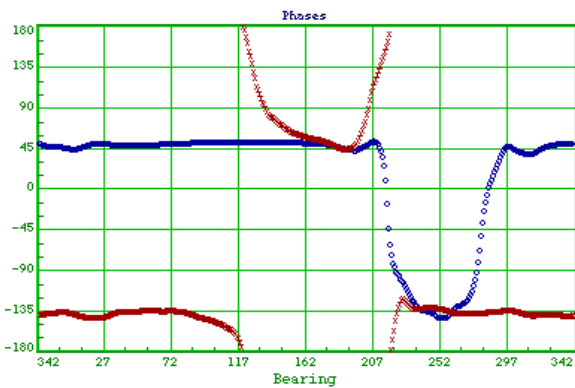
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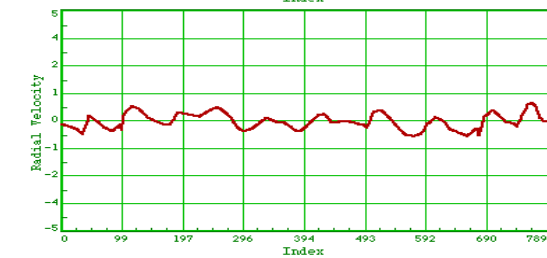
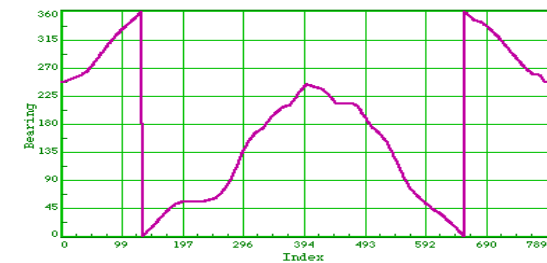
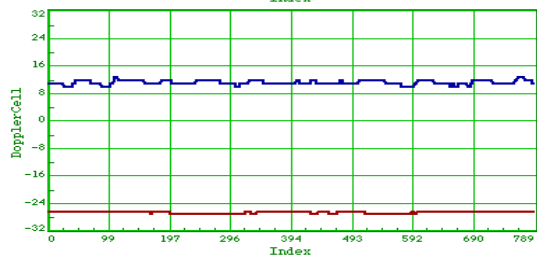
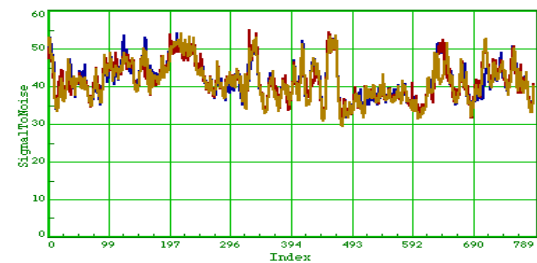
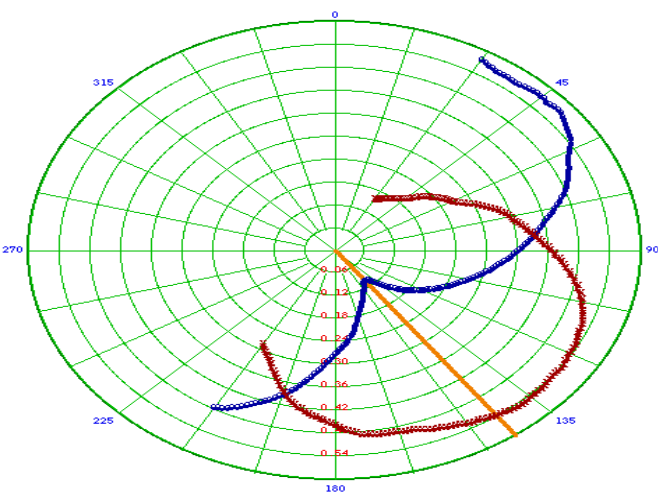
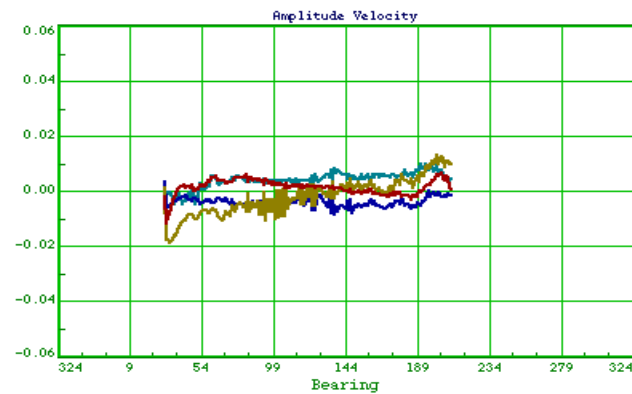
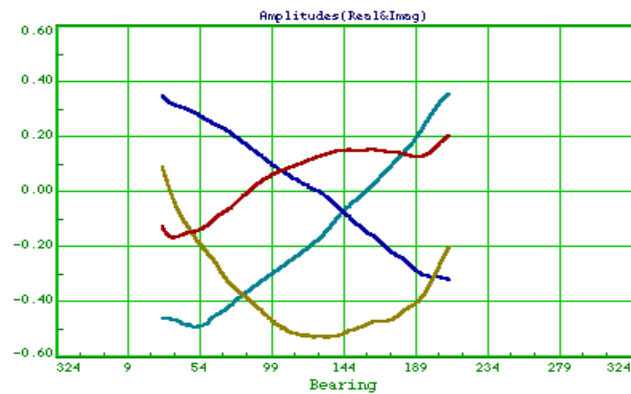
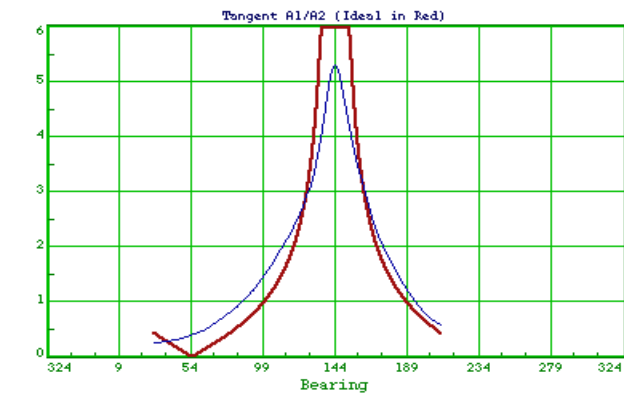
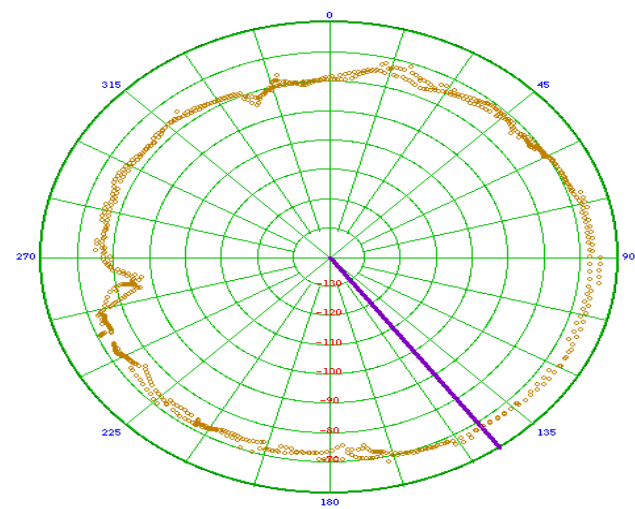
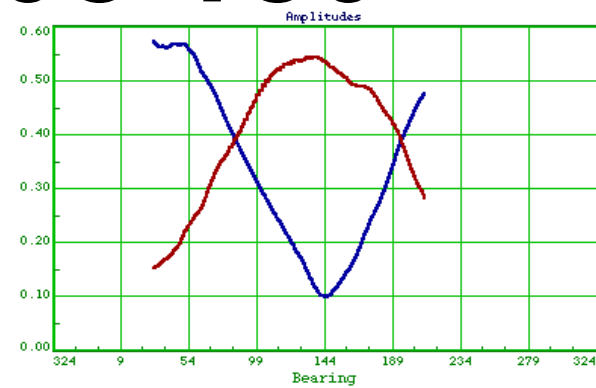
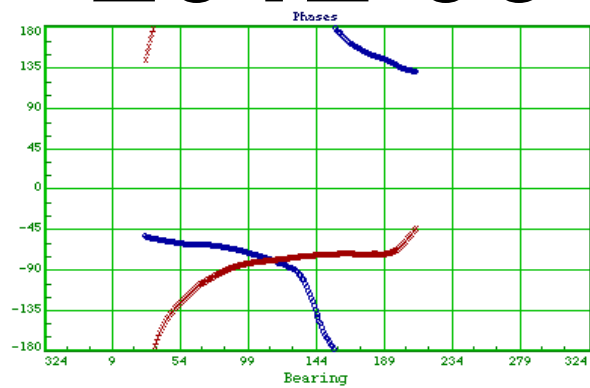
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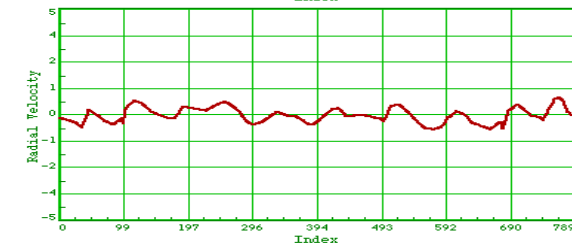
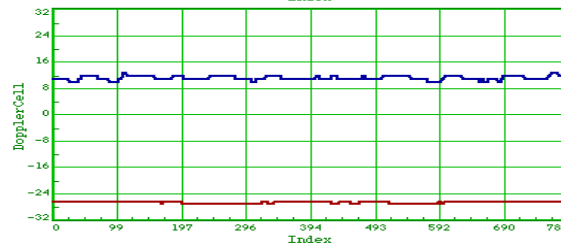
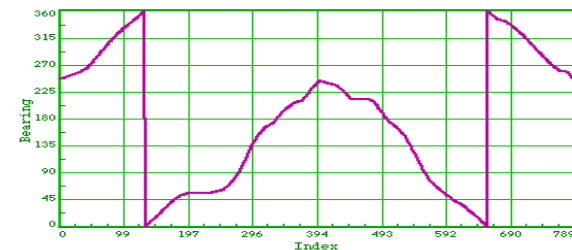
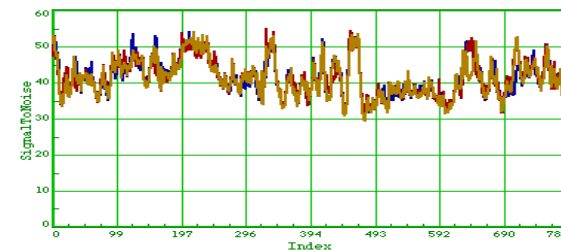
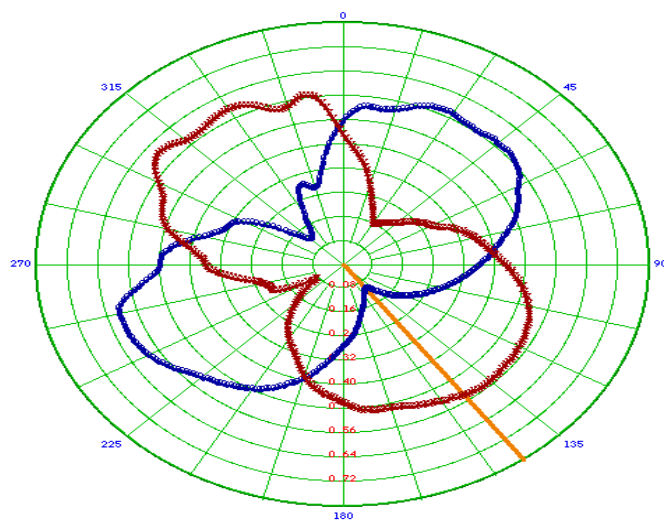
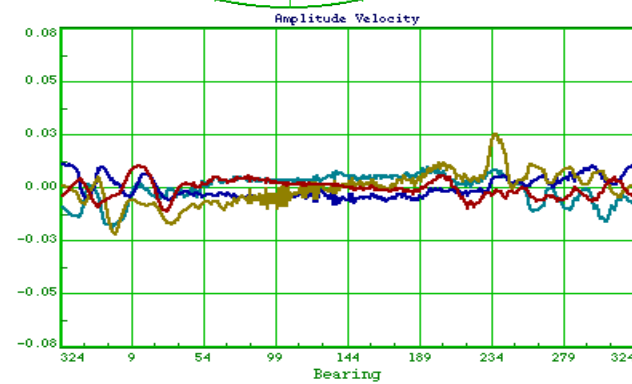
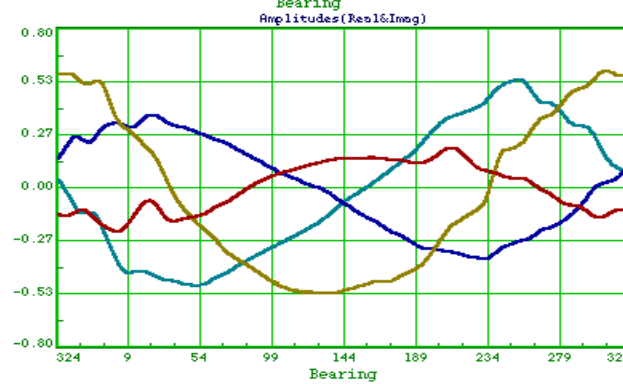
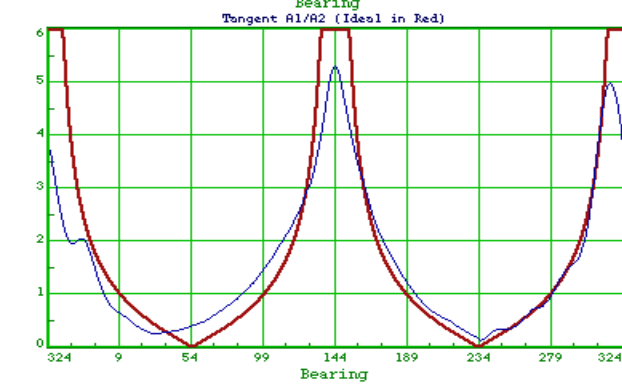
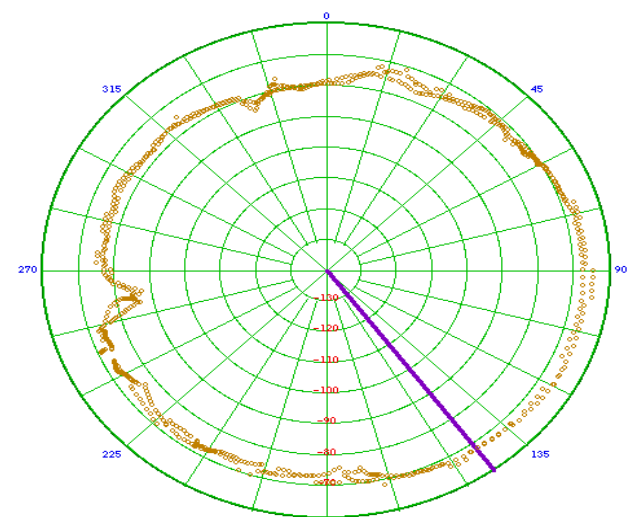
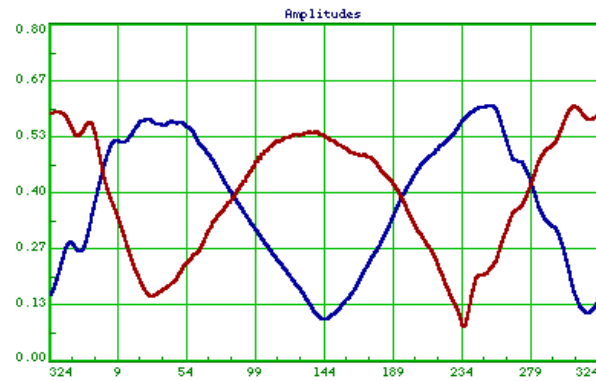
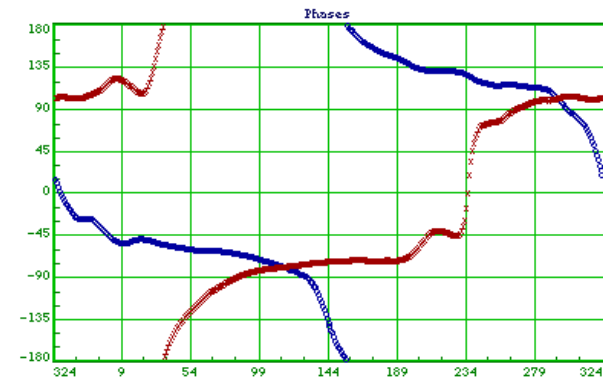
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# 2012 06 08 180

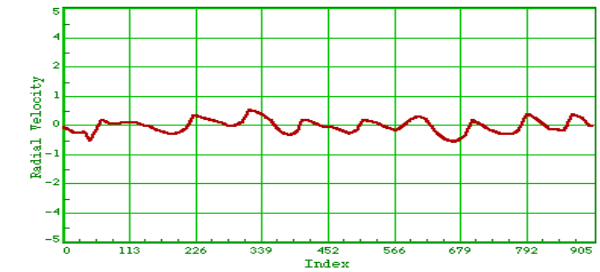
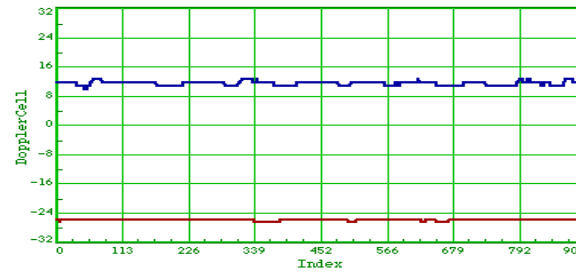
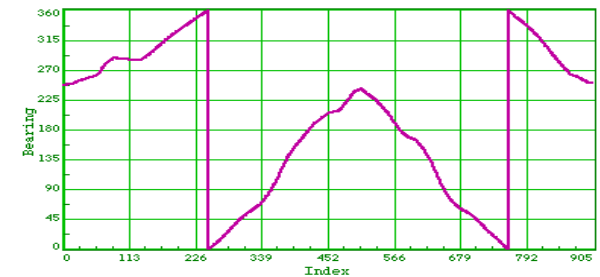
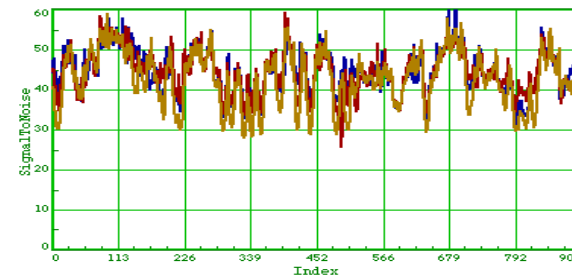
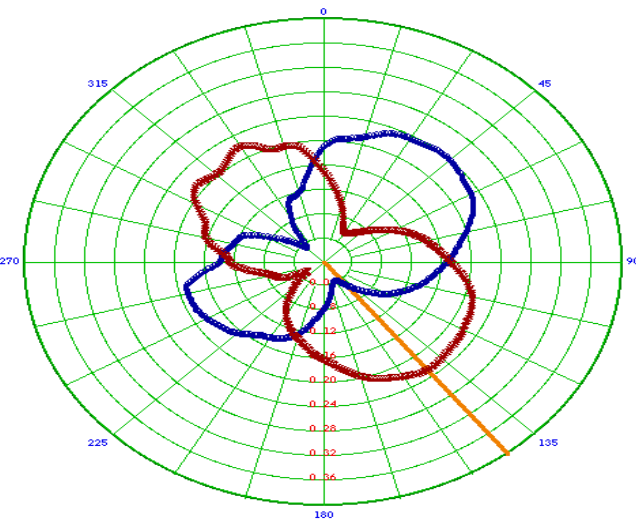
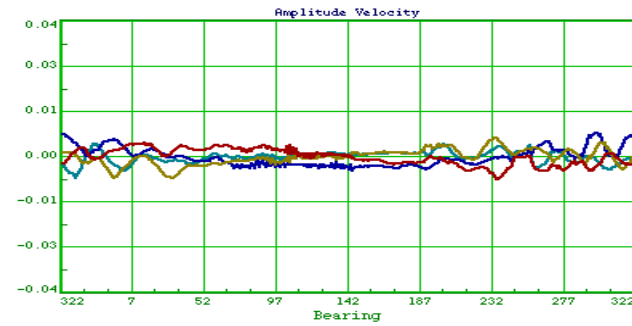
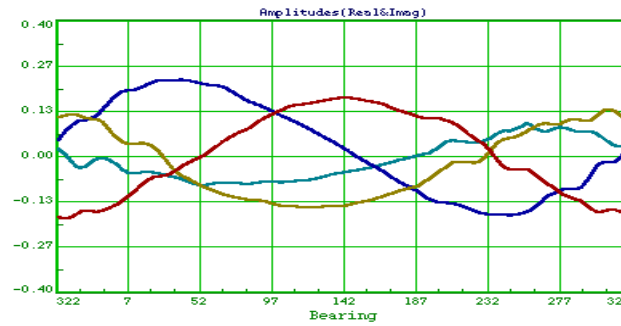
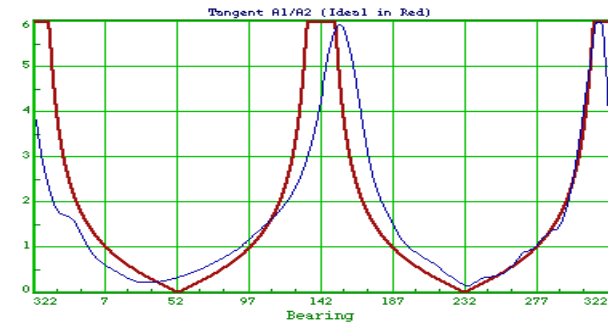
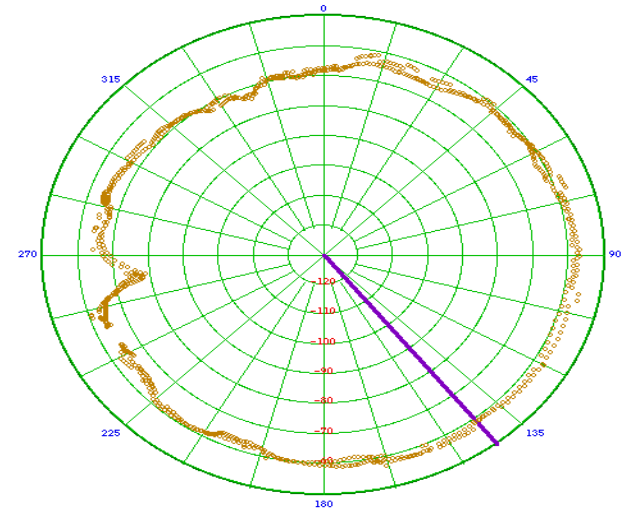
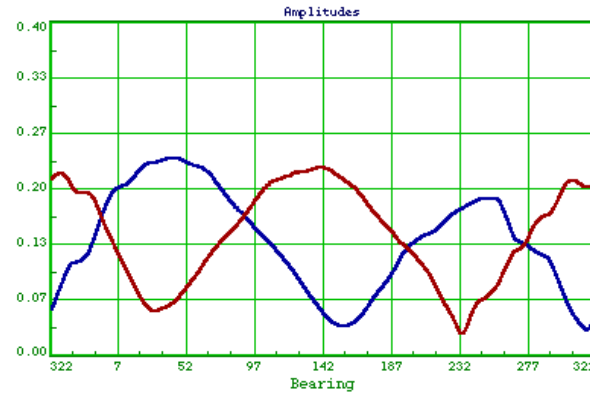
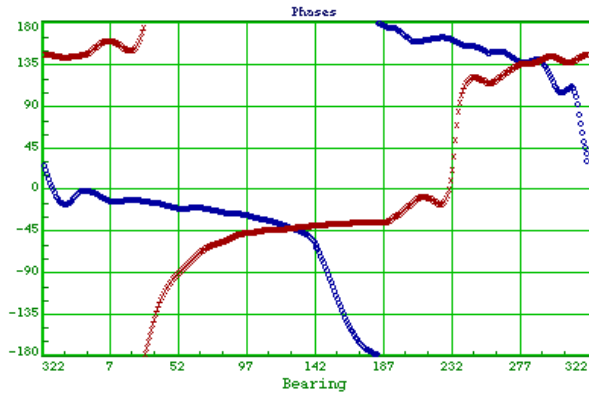


# 2012 06 08 360



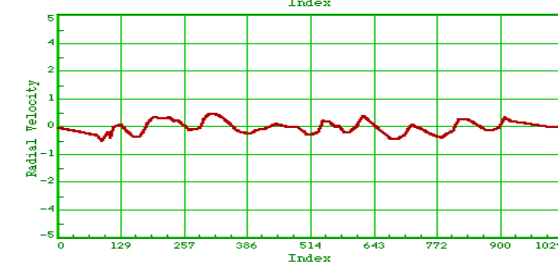
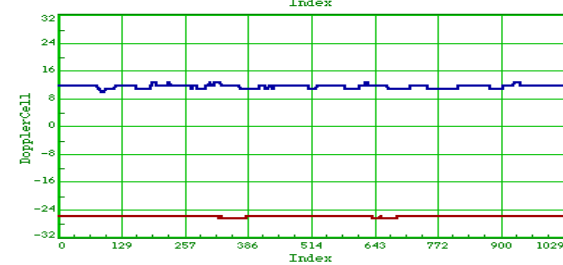
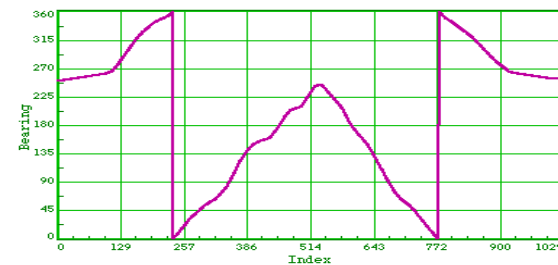
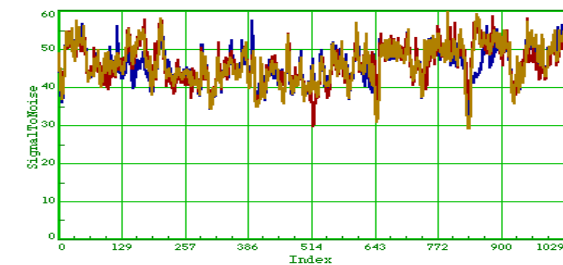
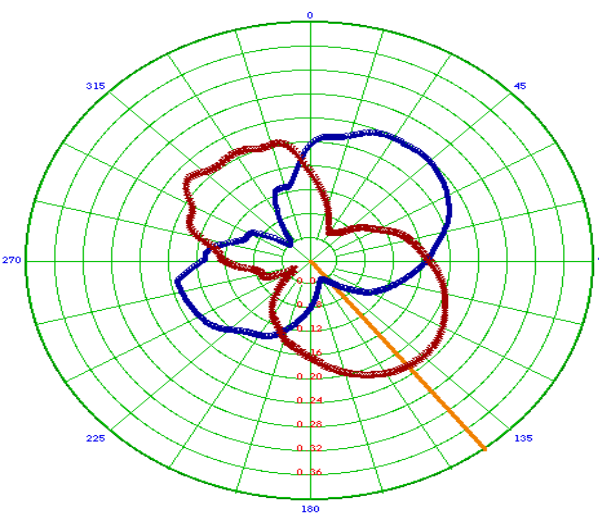
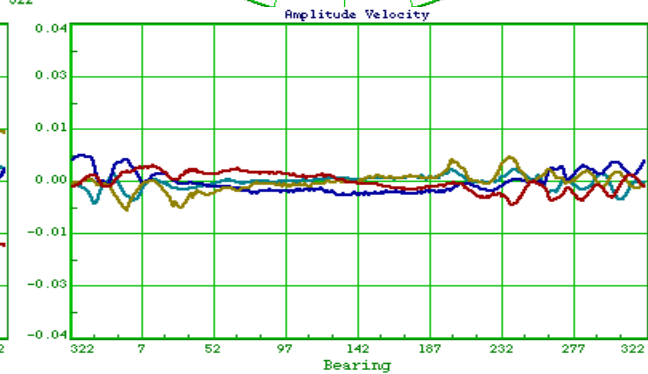
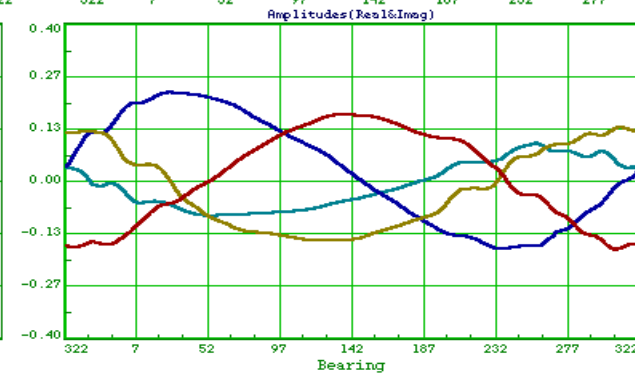
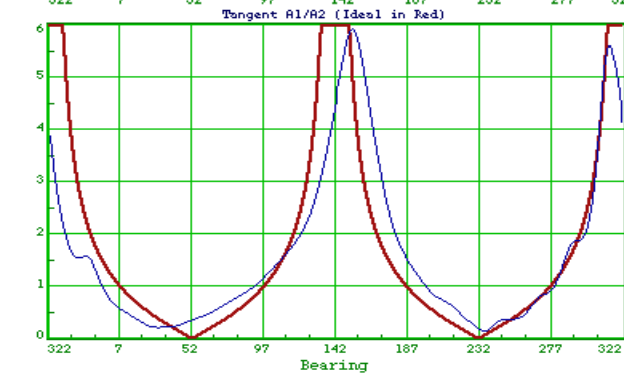
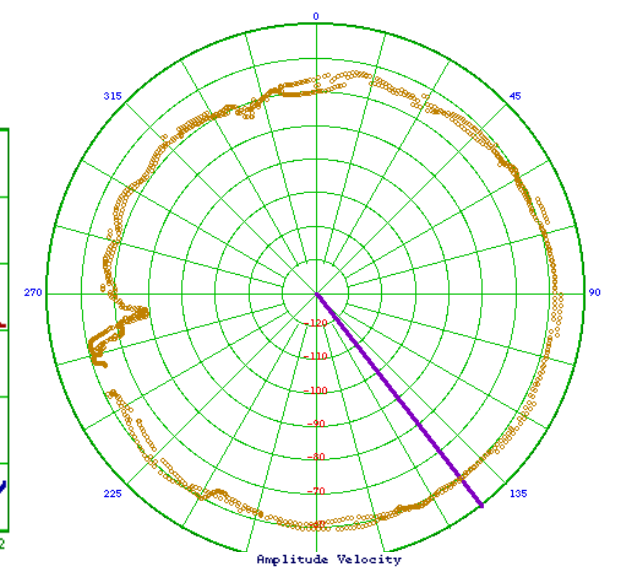
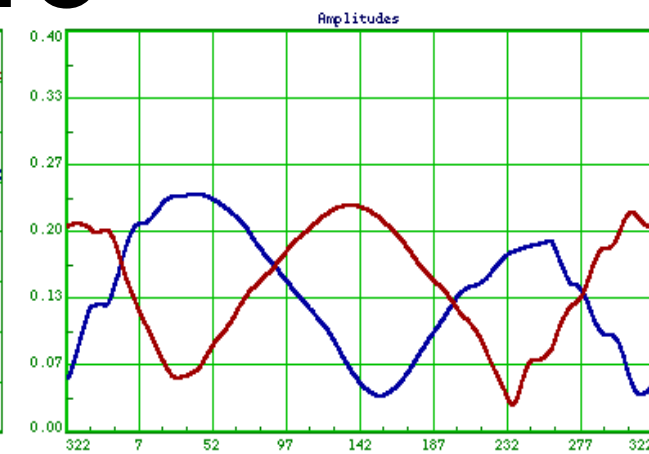
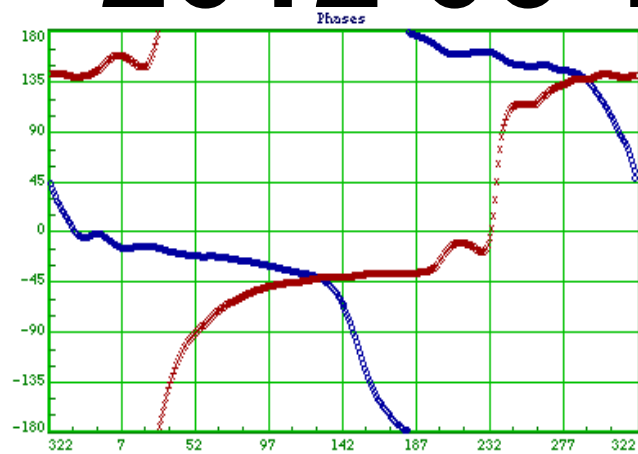


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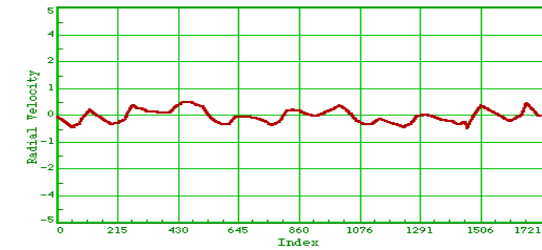
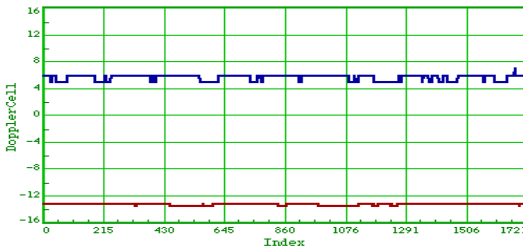
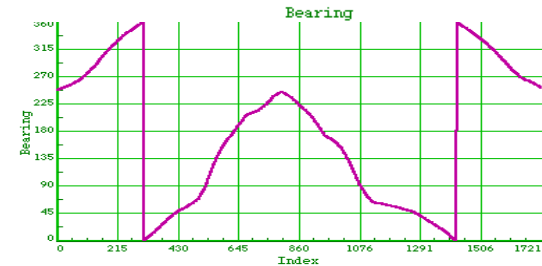
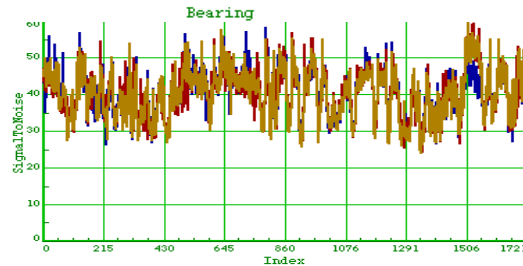
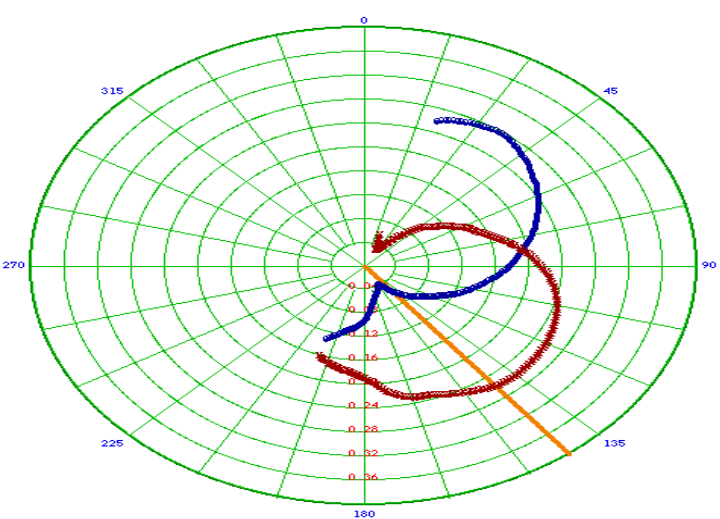
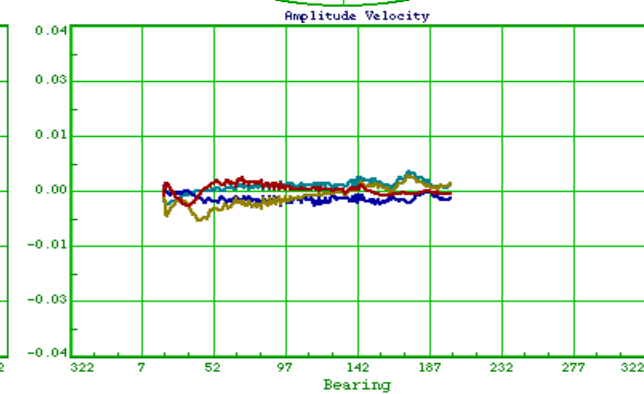
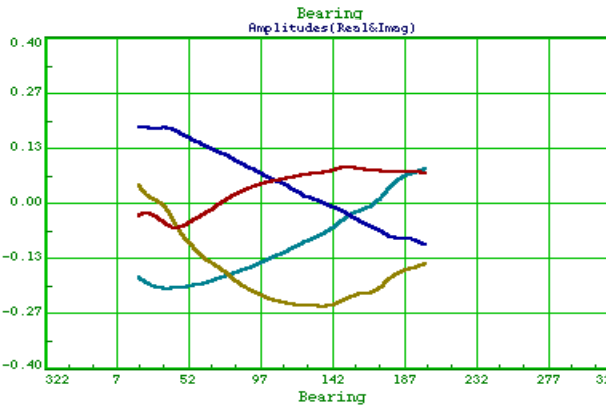
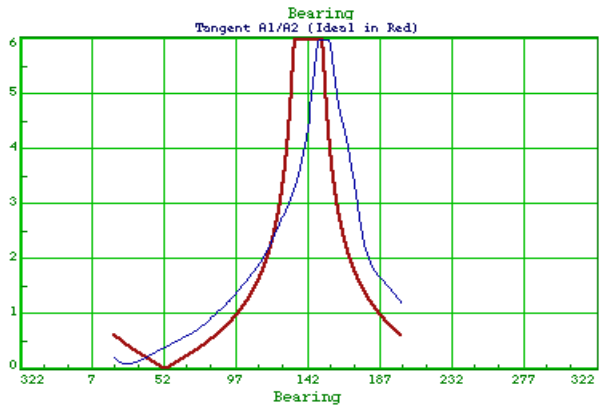
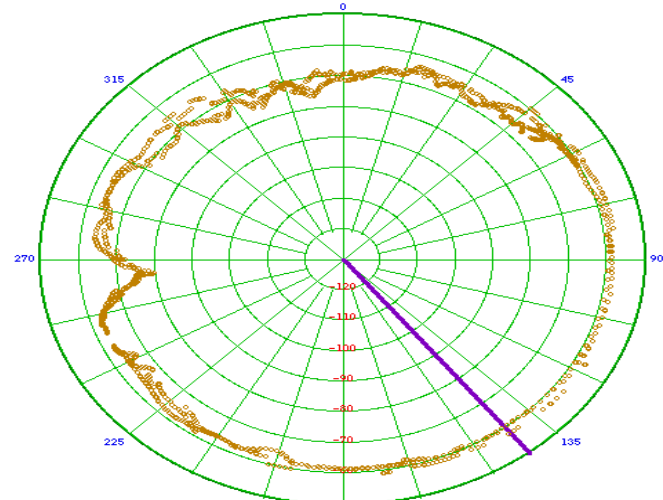
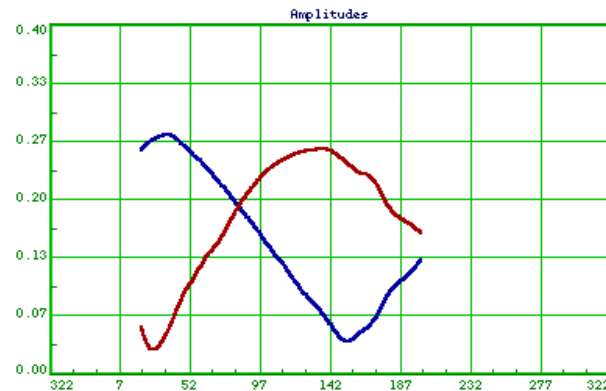
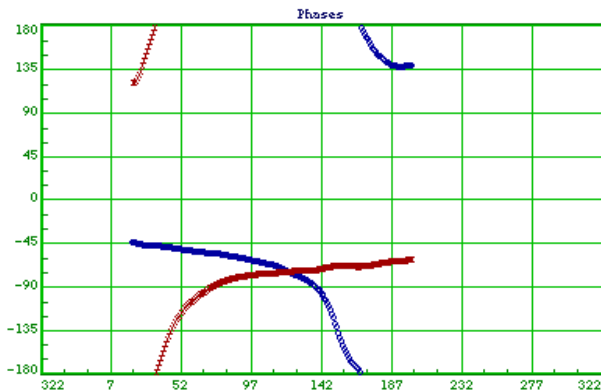




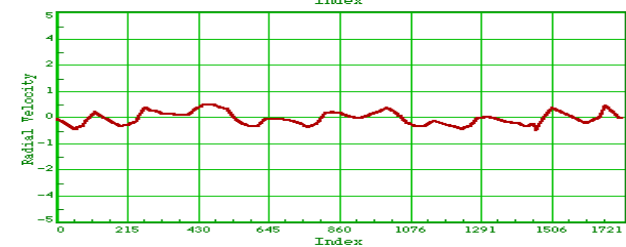
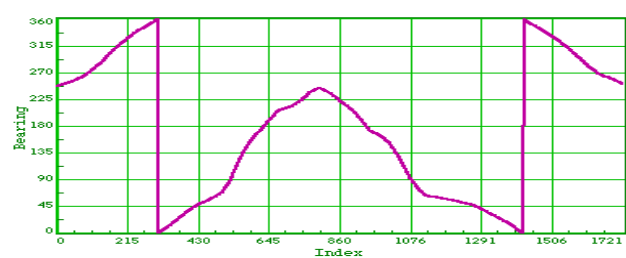
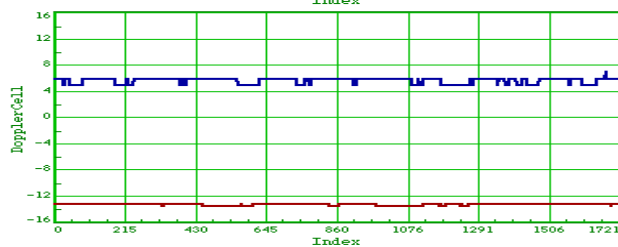
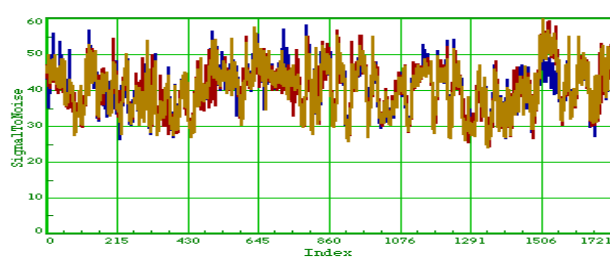
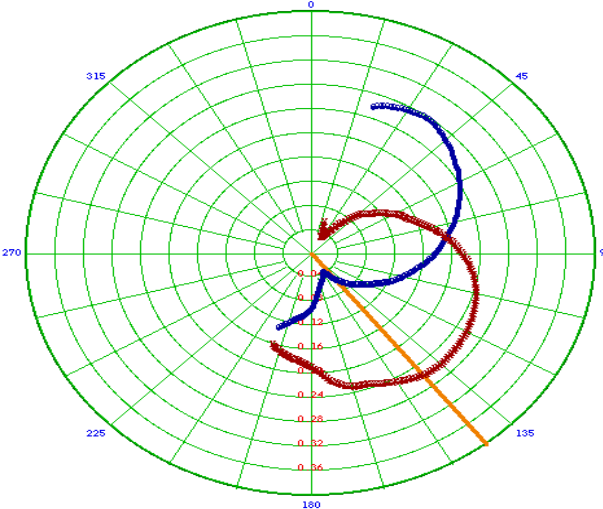
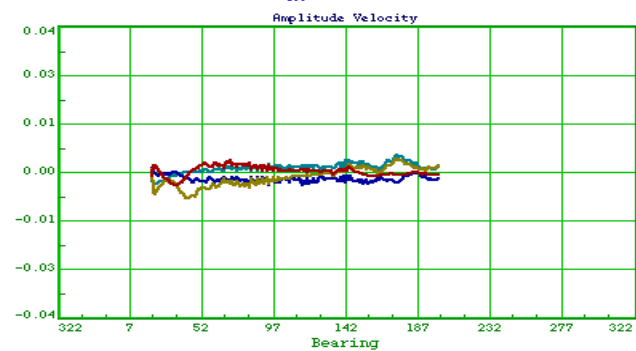
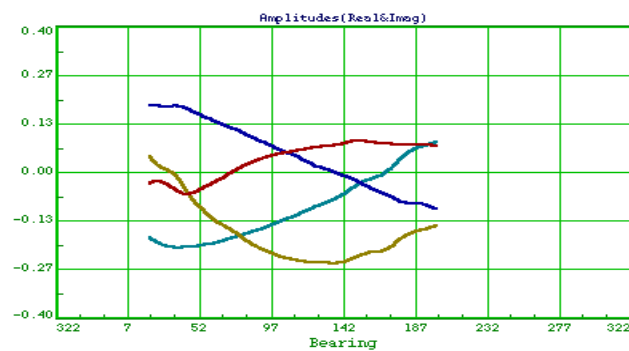
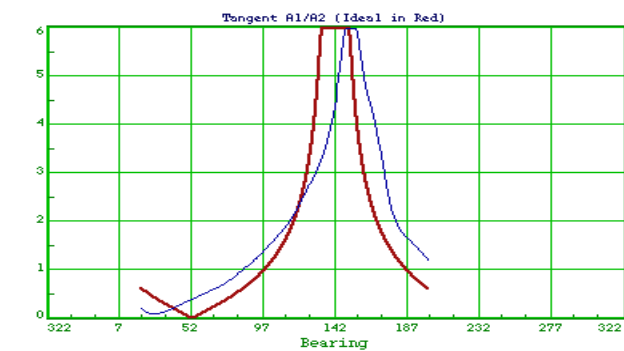
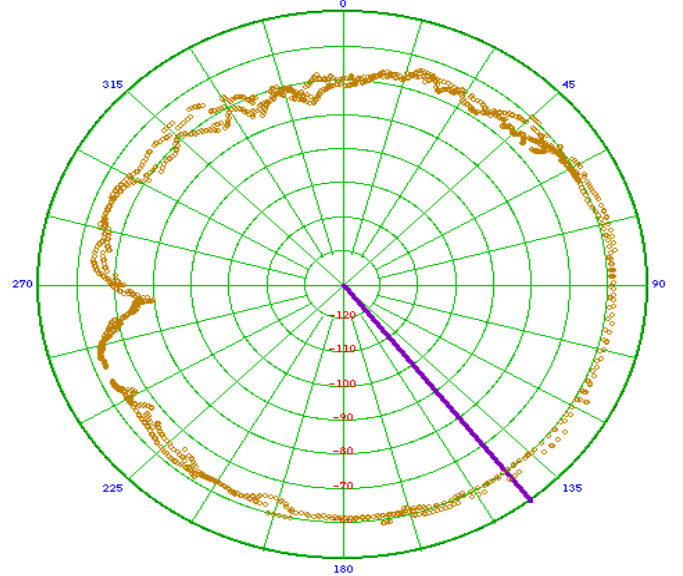
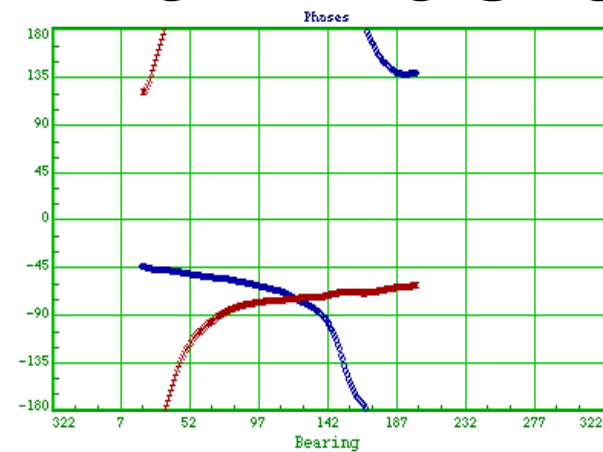
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# 2012 08 08 180

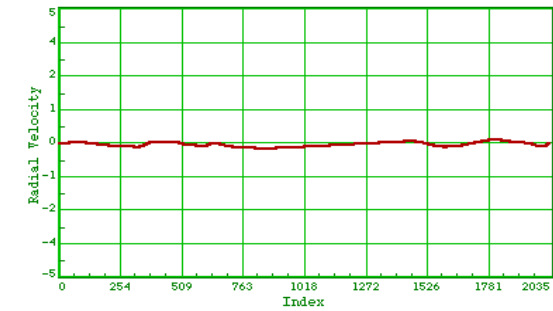
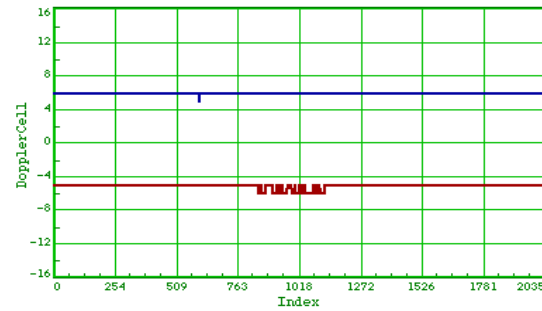
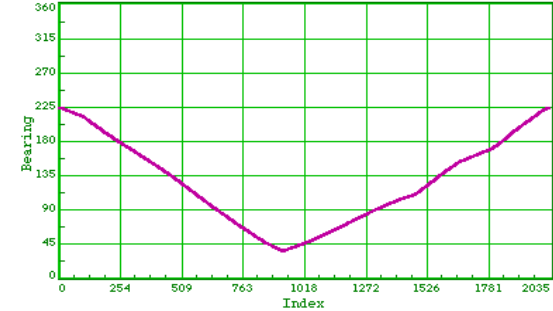
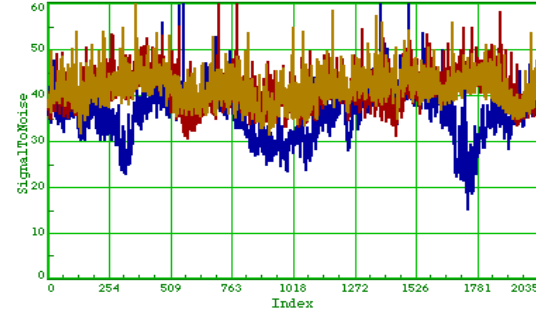
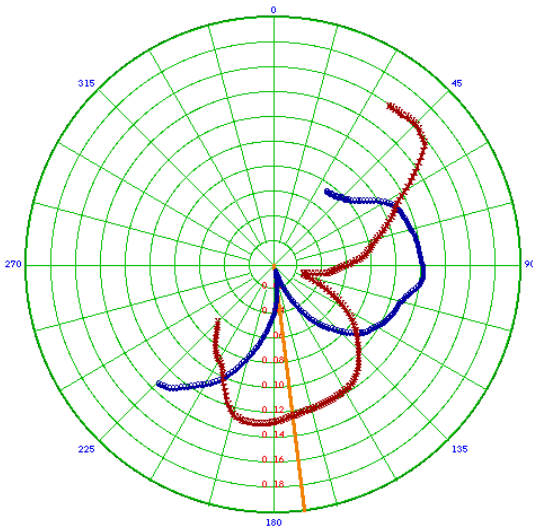
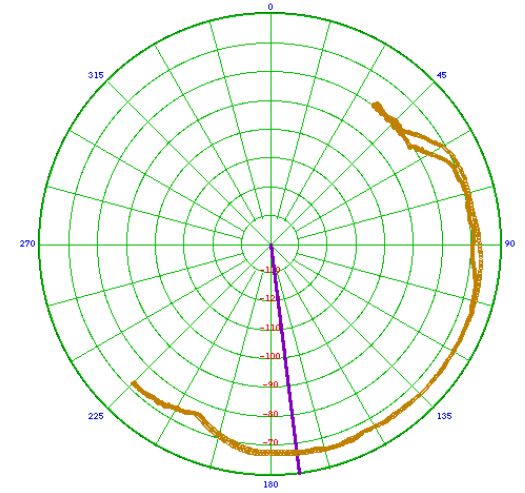
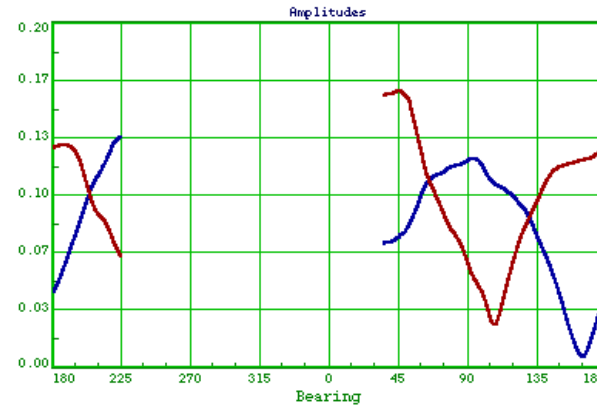
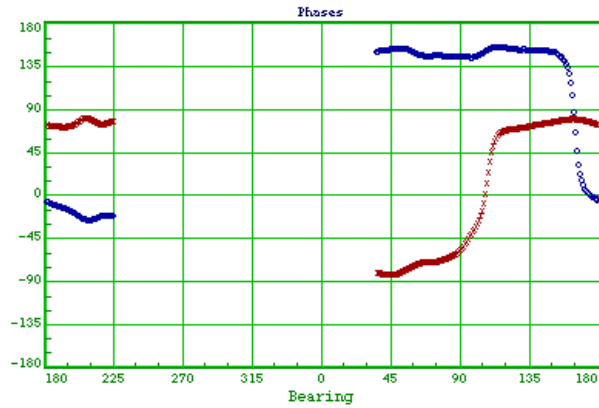


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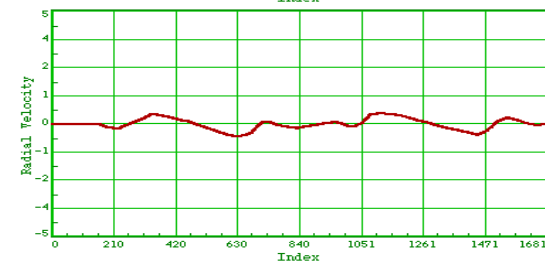
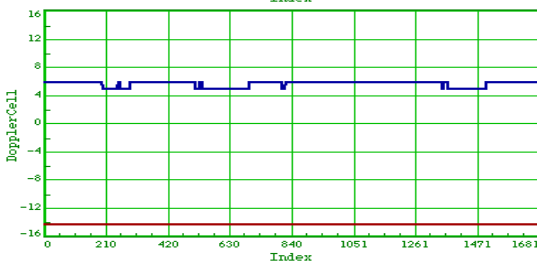
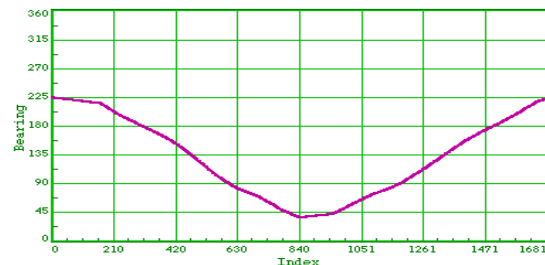
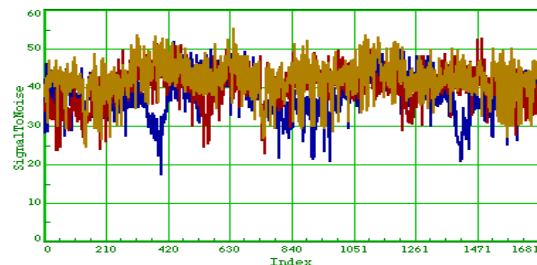
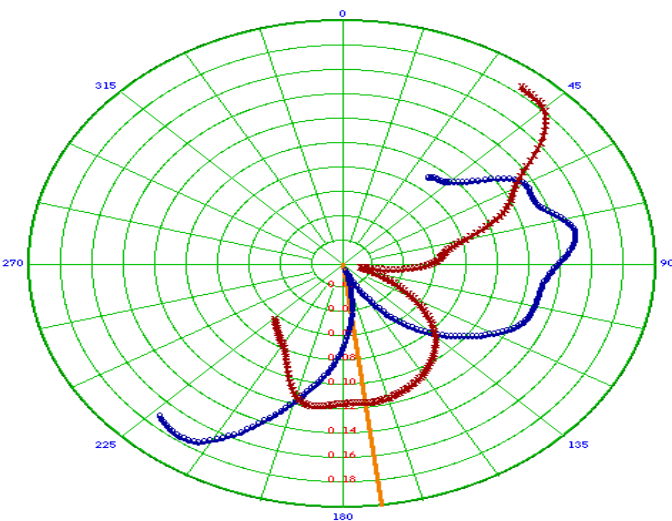
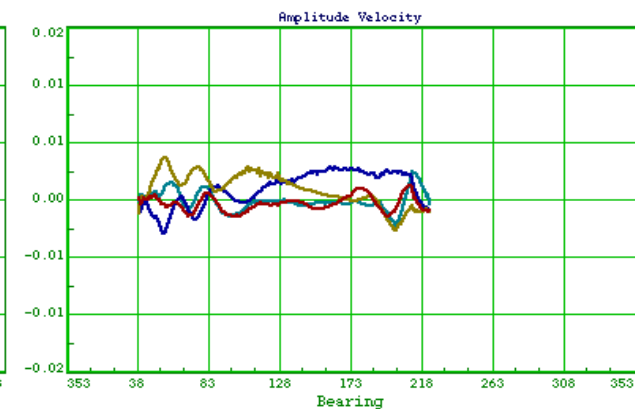
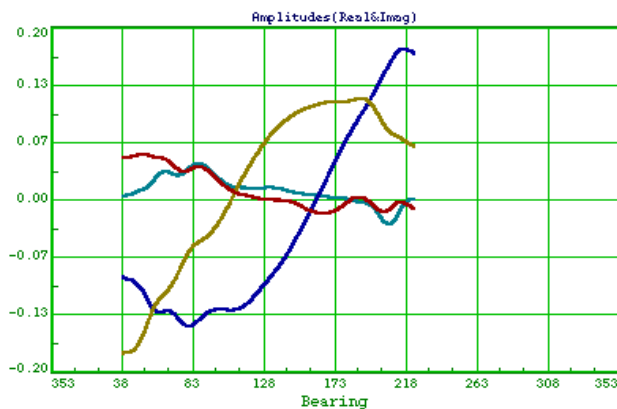
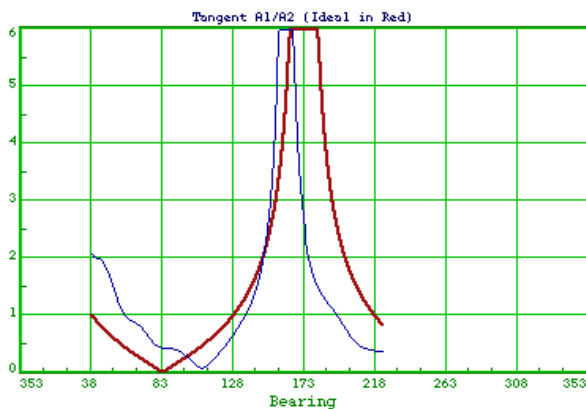
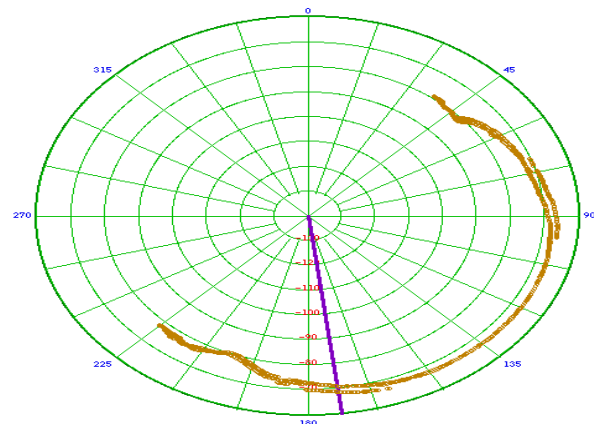
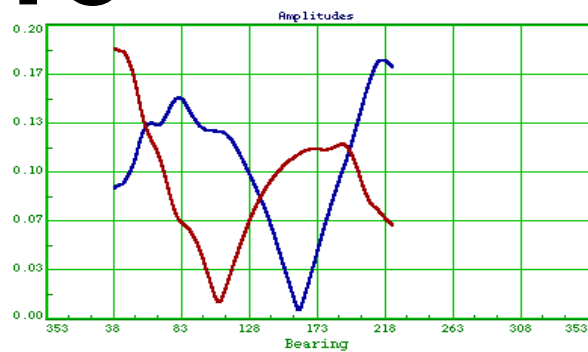
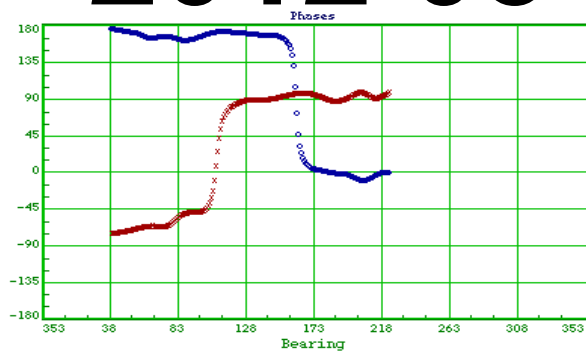


**BRIGANTINE**

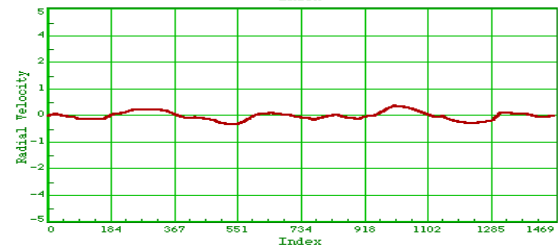
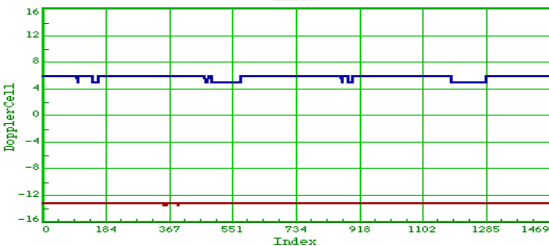
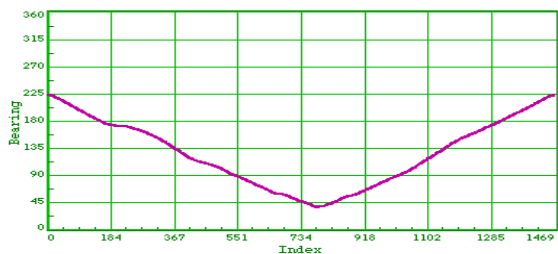
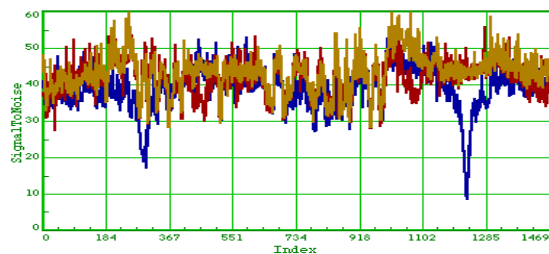
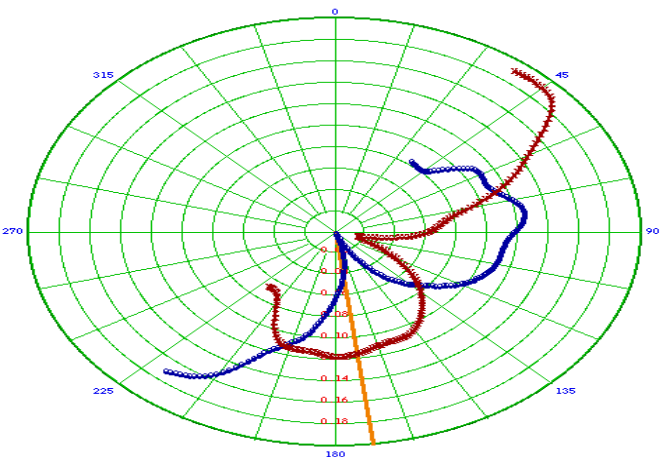
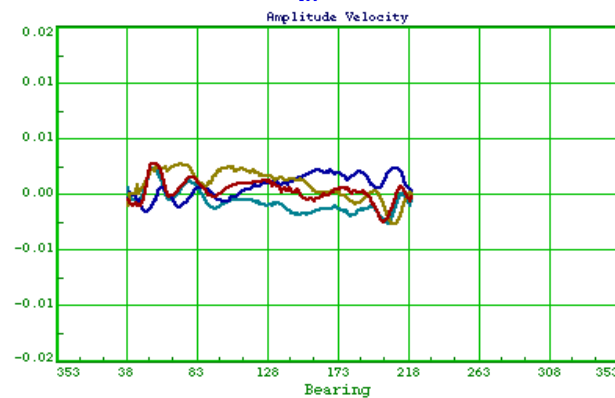
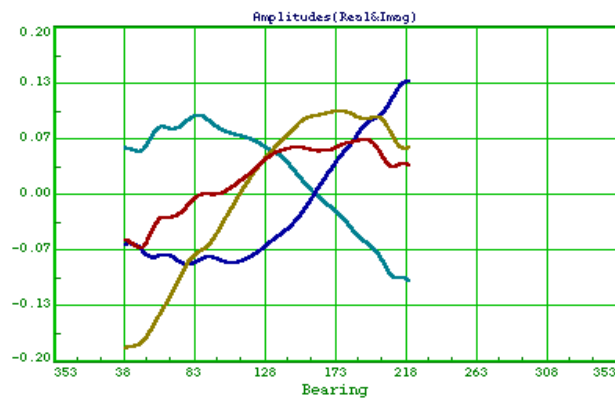
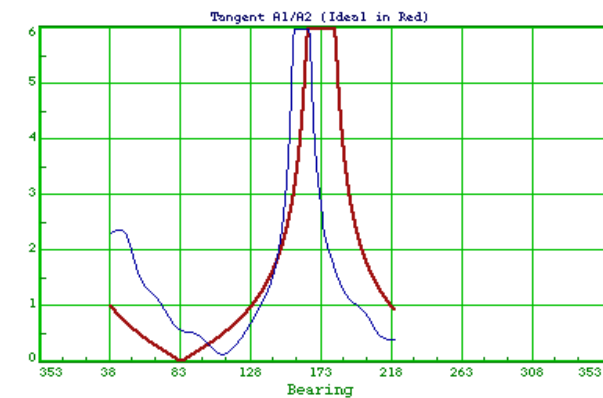
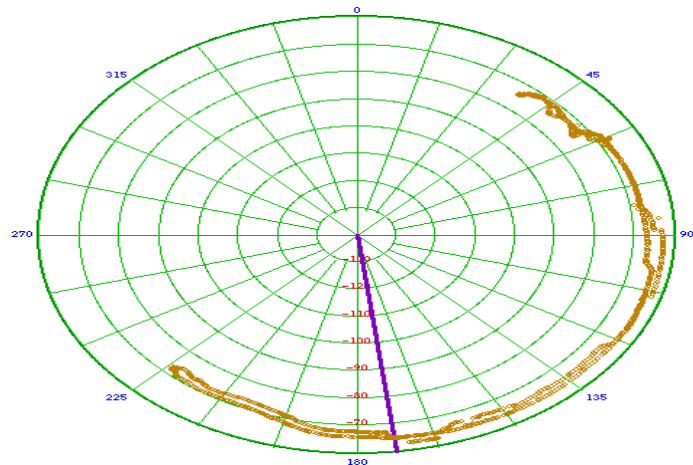
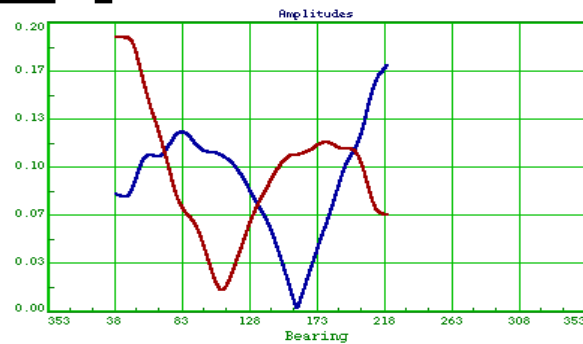
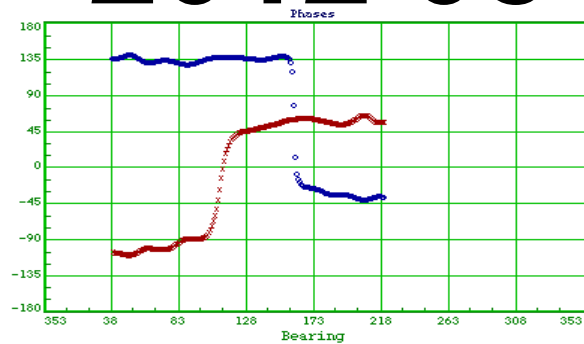
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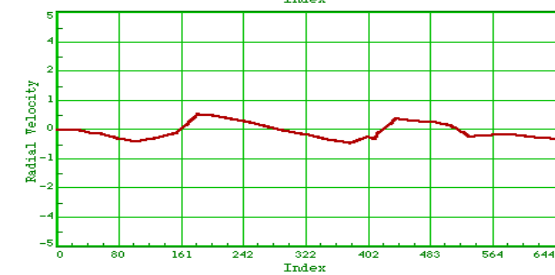
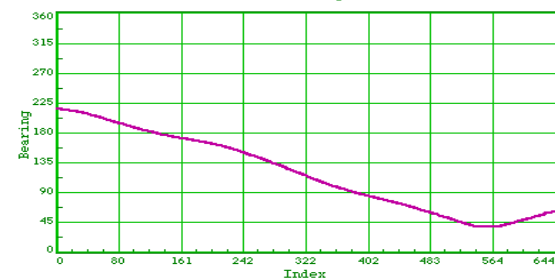
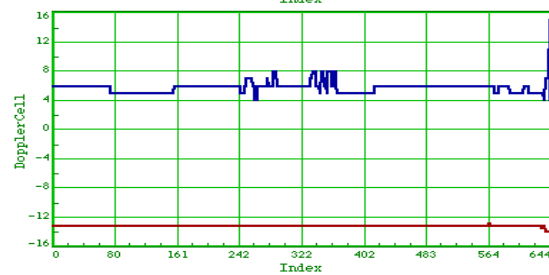
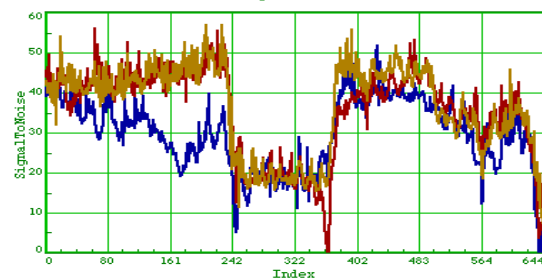
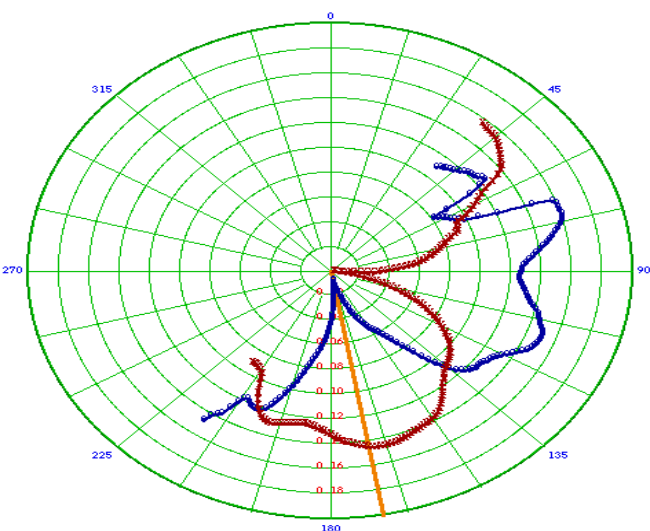
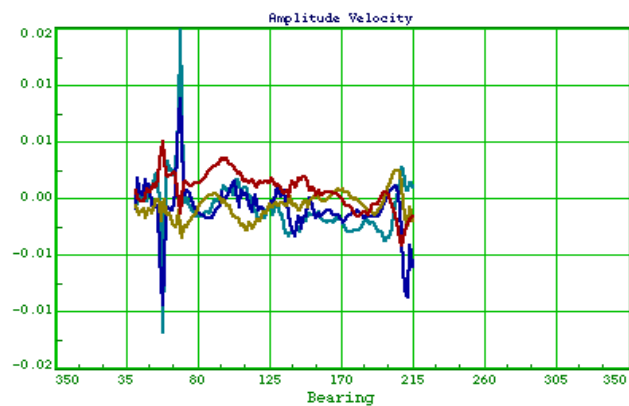
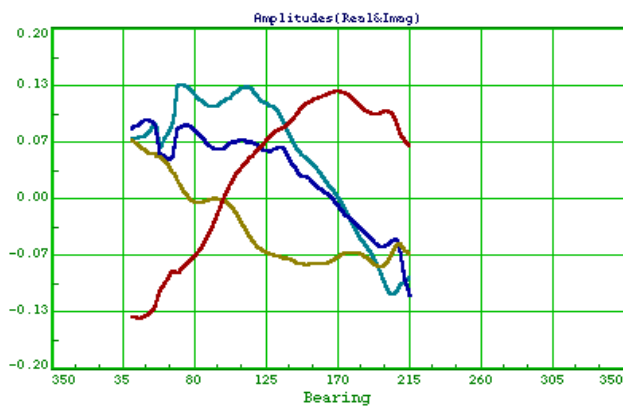
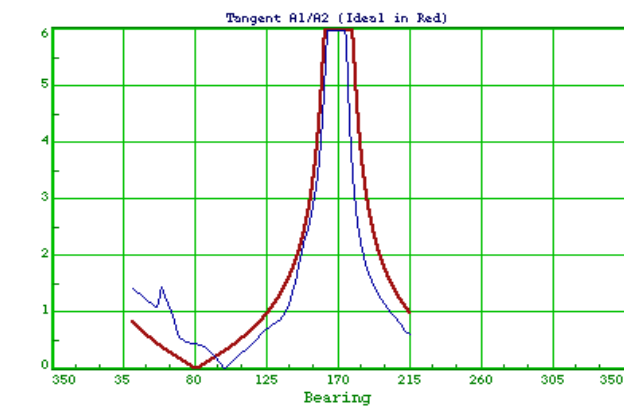
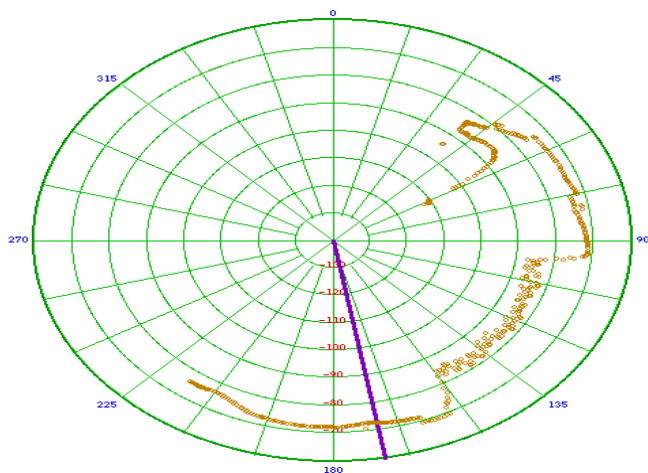
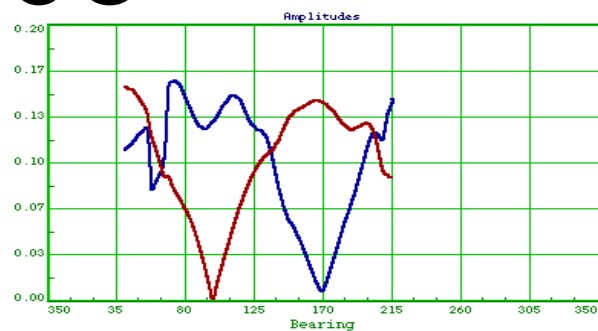
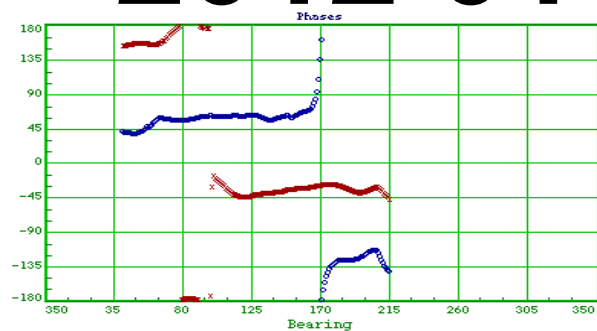
# 2012 03 13



# 2012 08 21

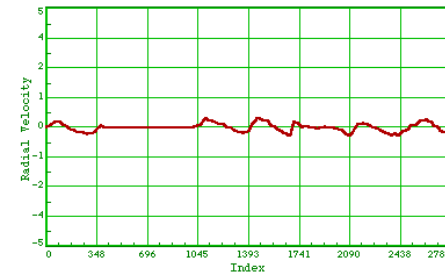
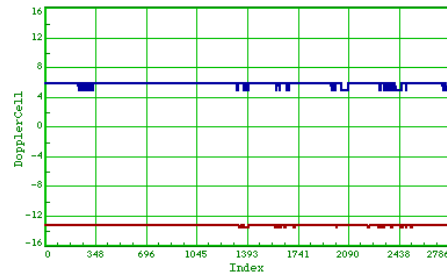
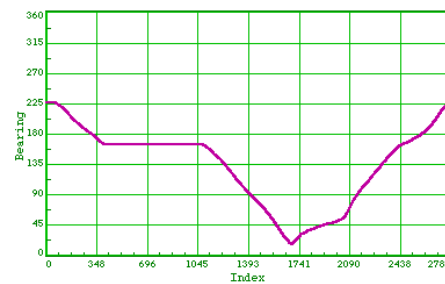
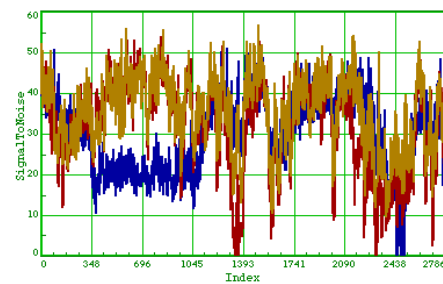
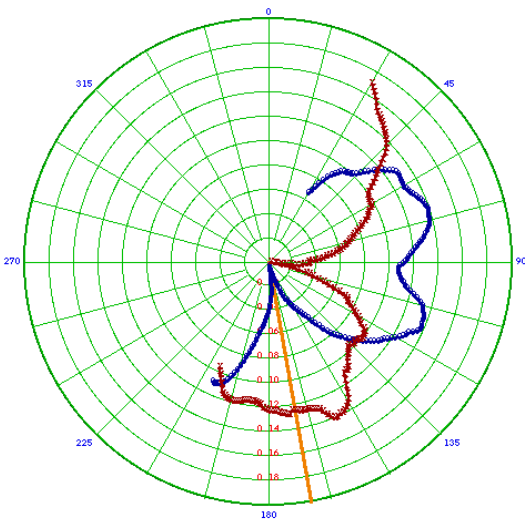
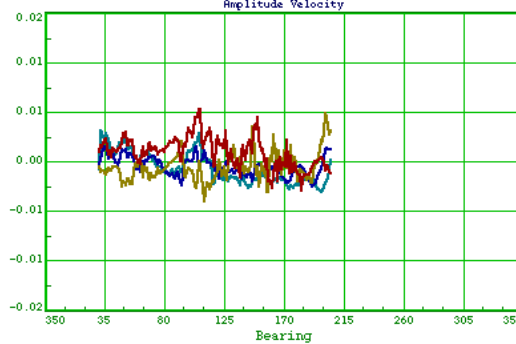
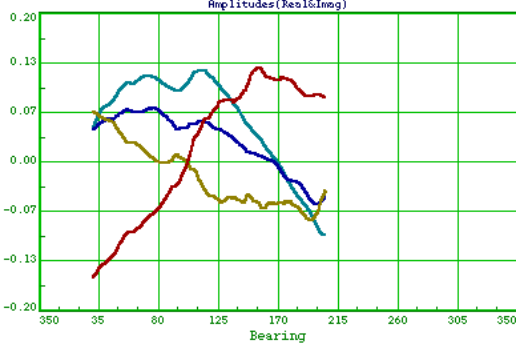
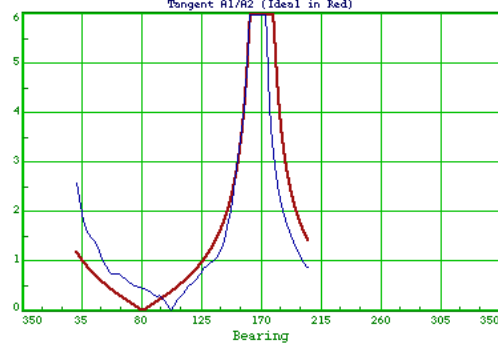
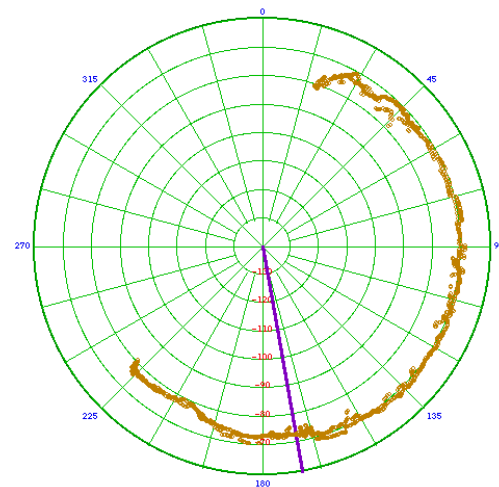
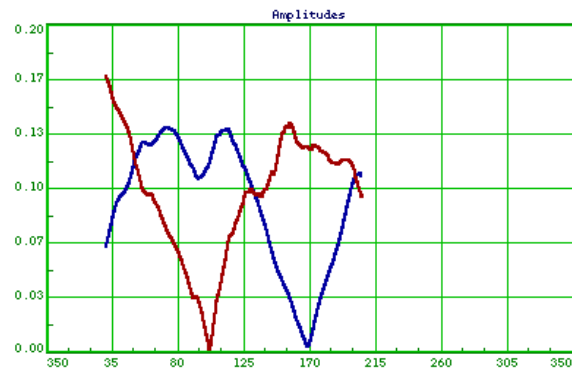
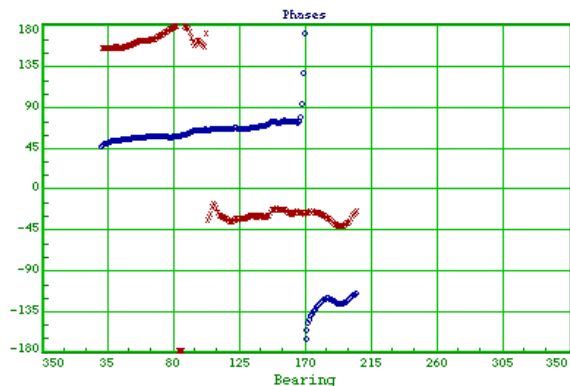


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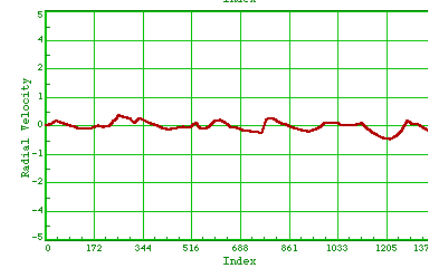
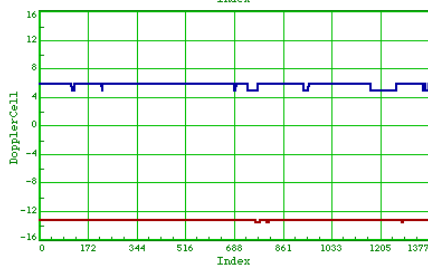
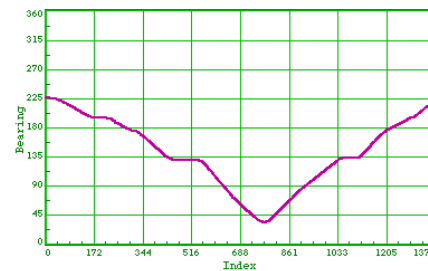
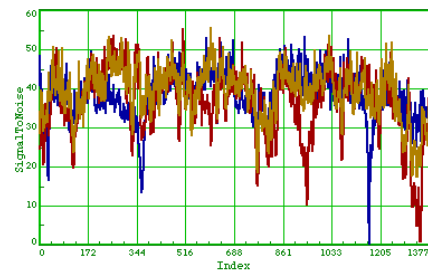
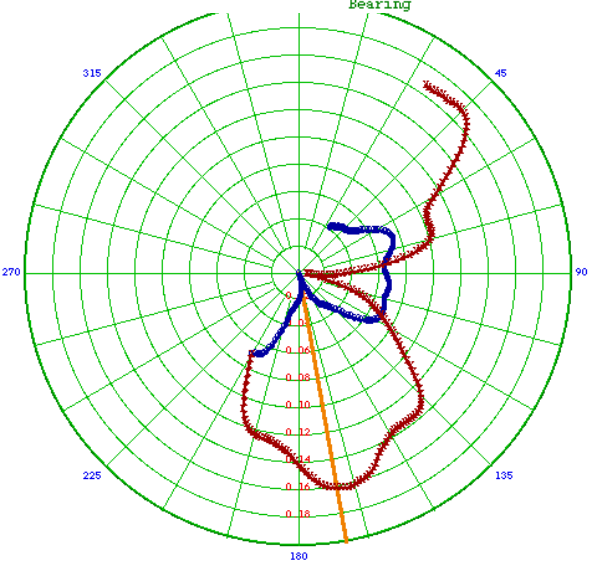
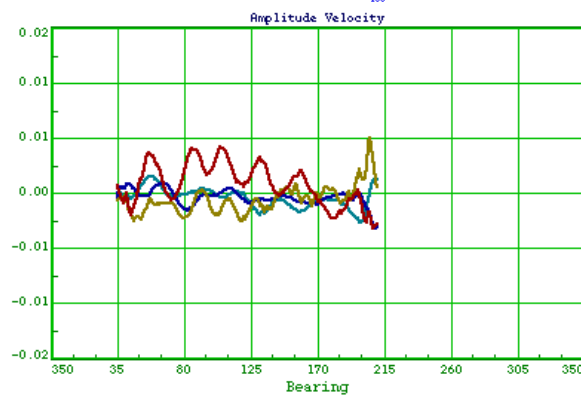
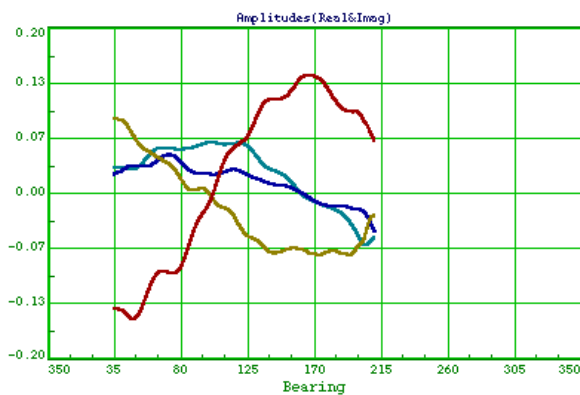
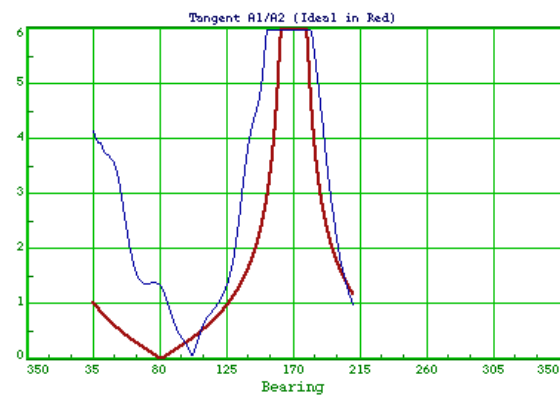
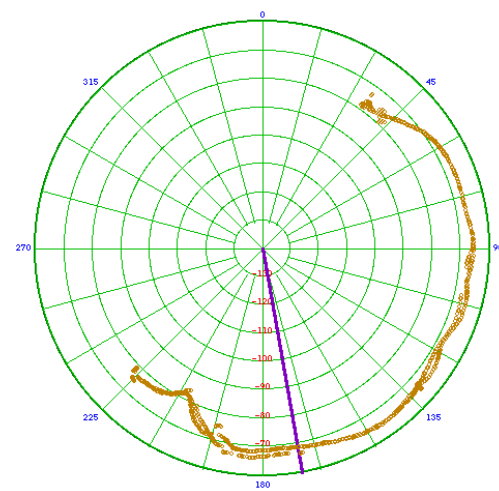
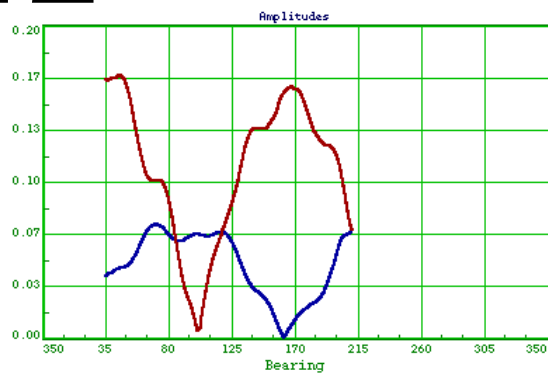
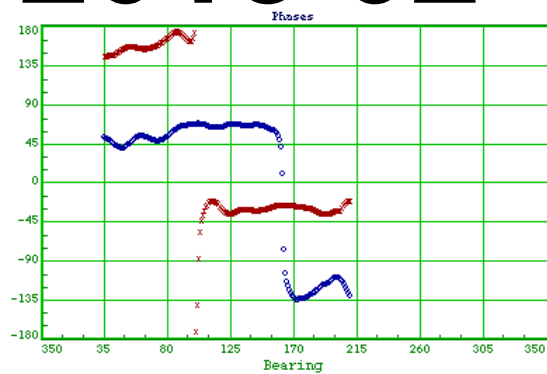




# 2013 02 06

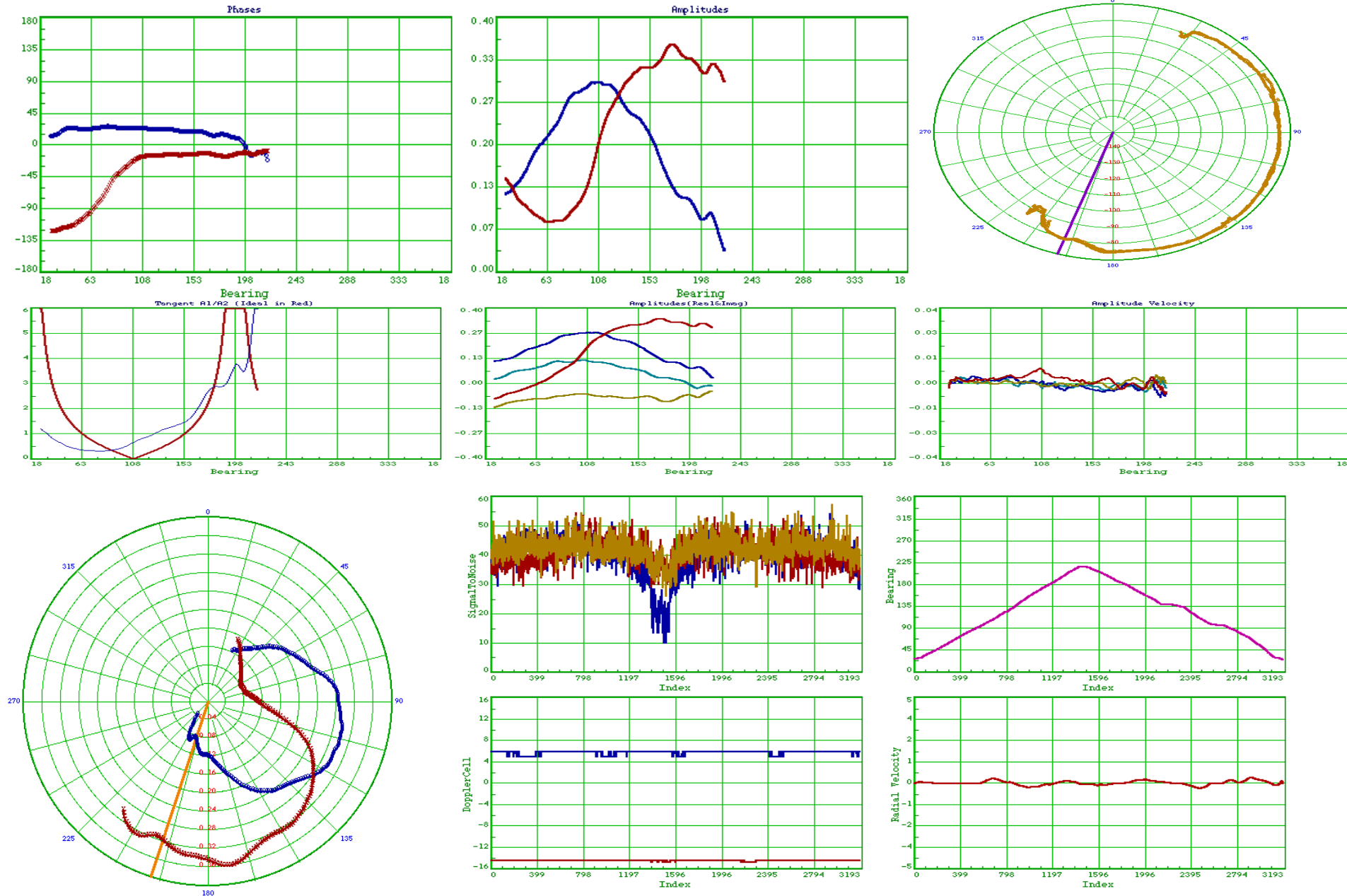


# 2013 02 12

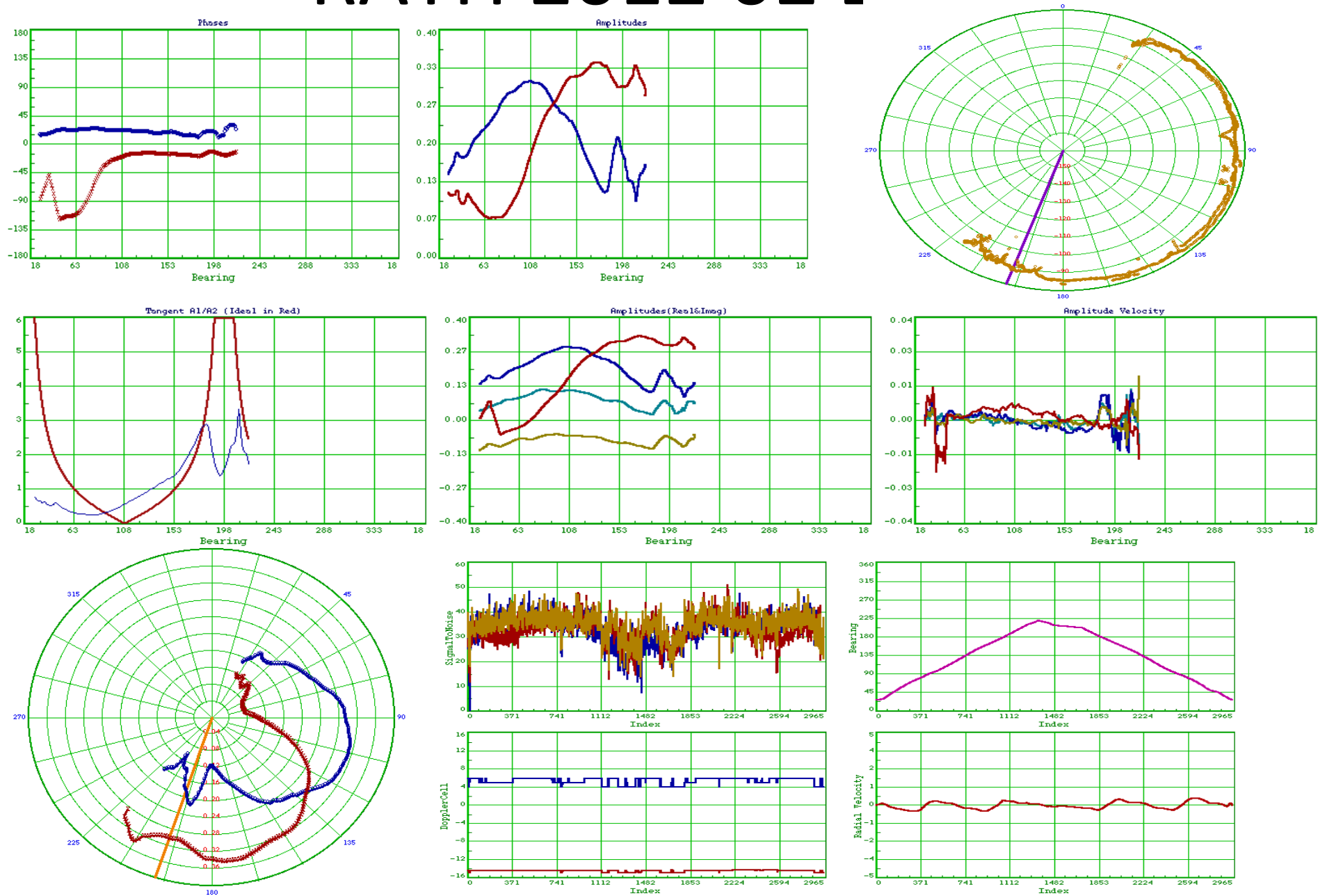


**STRATHMERE**

# RATH 2012 01 31

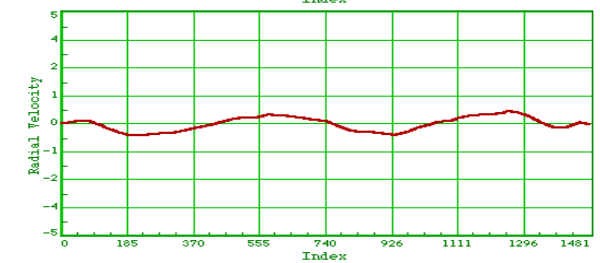
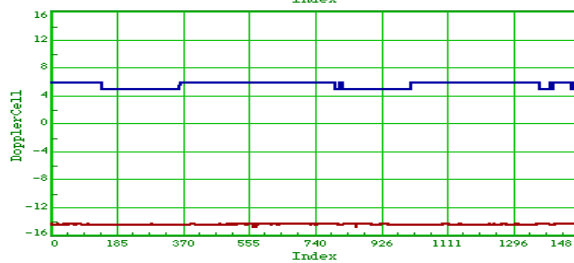
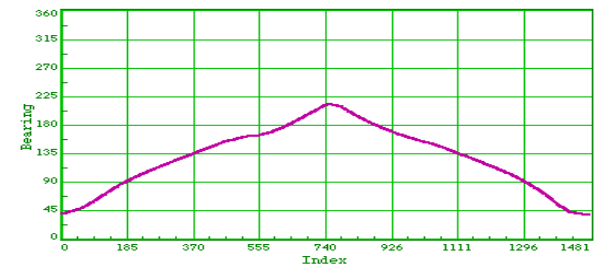
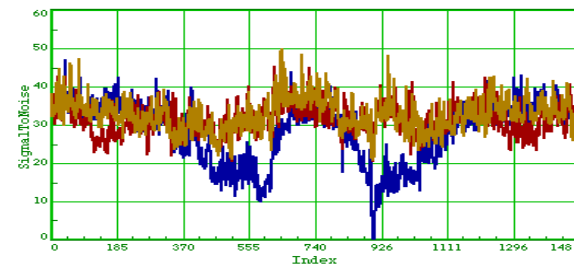
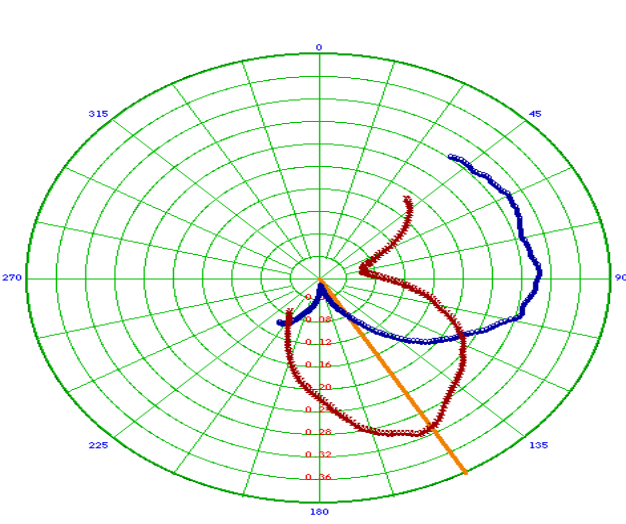
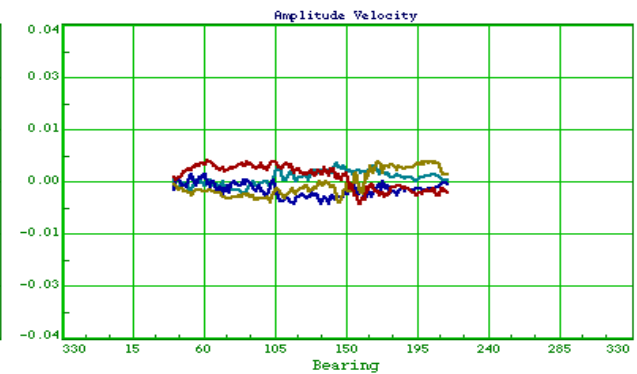
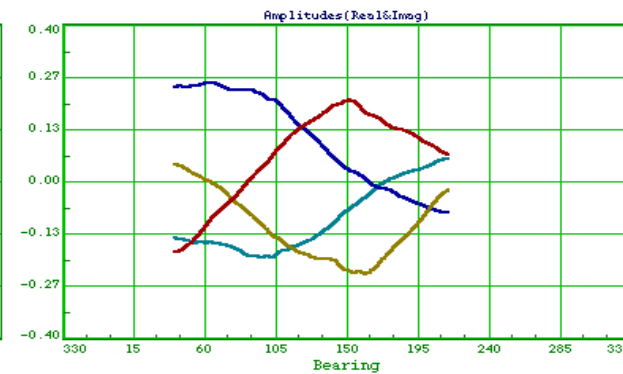
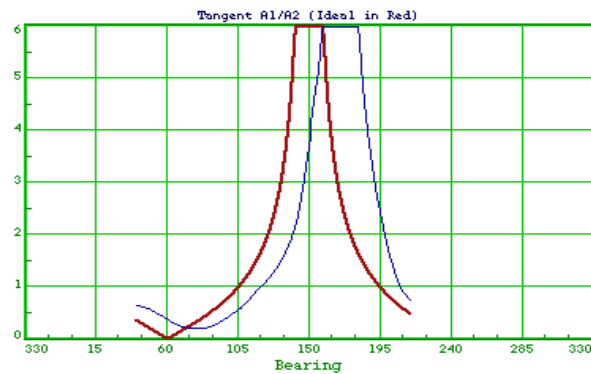
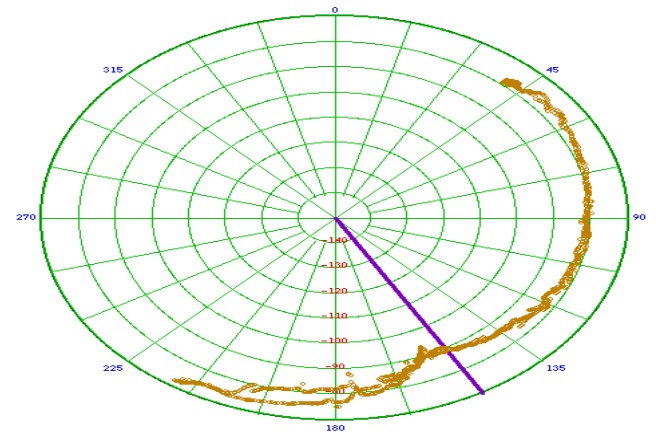
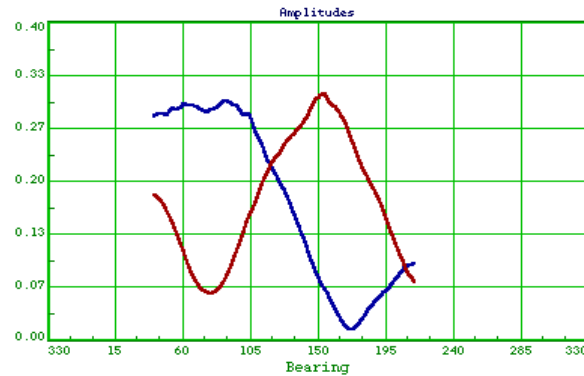
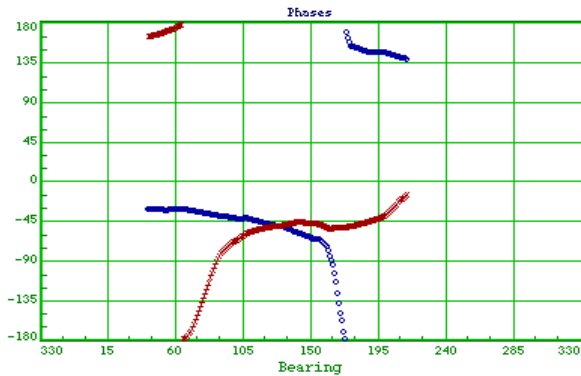


# RATH 2012 02 22



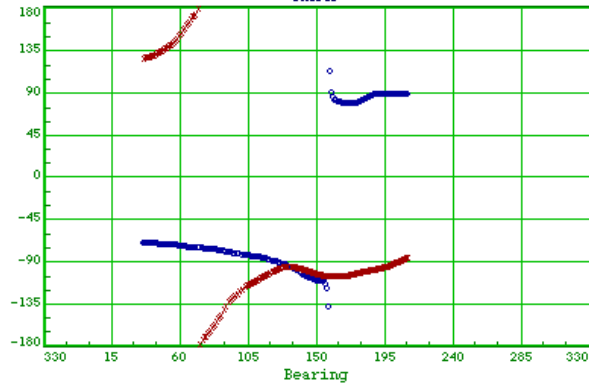
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# WOOD 2012 01 26

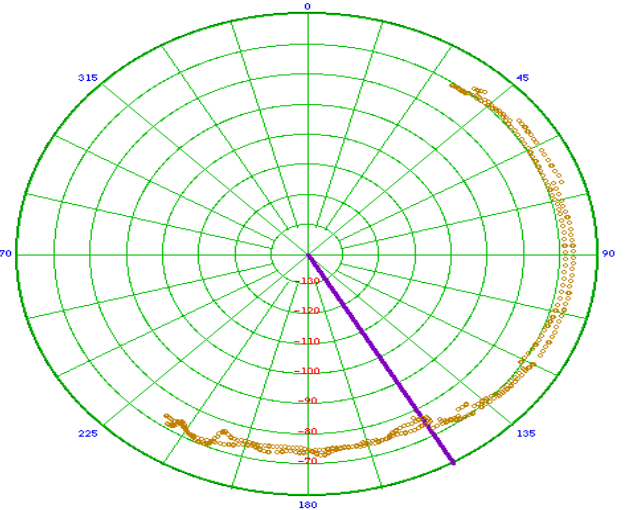
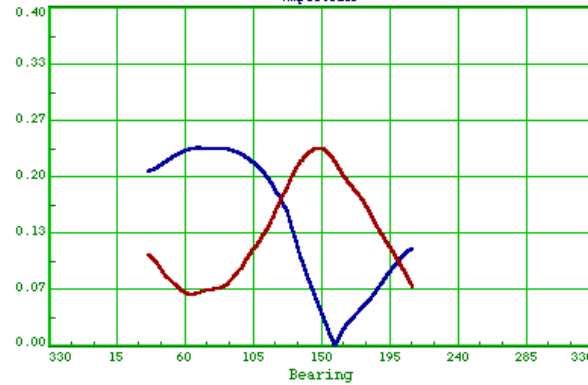


# 2012 02 14

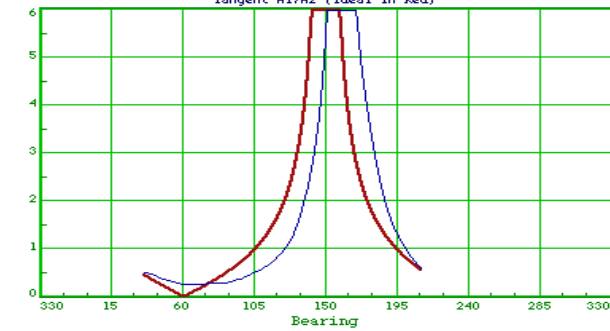
Phases



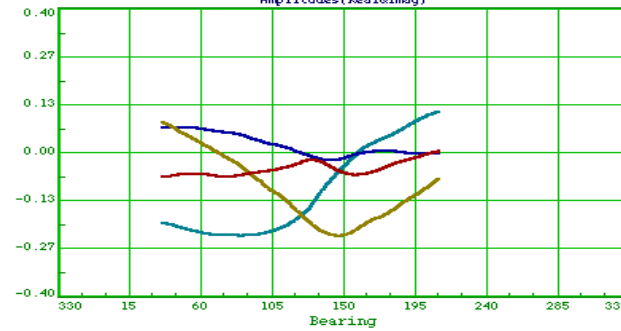
Amplitudes



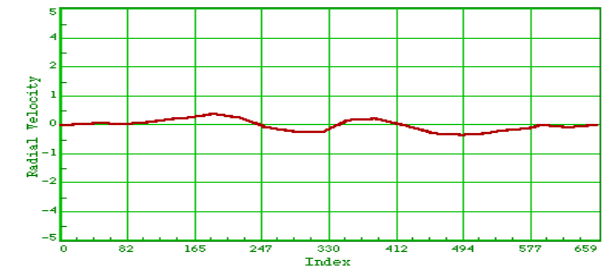
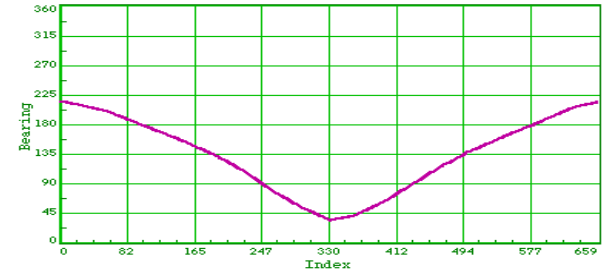
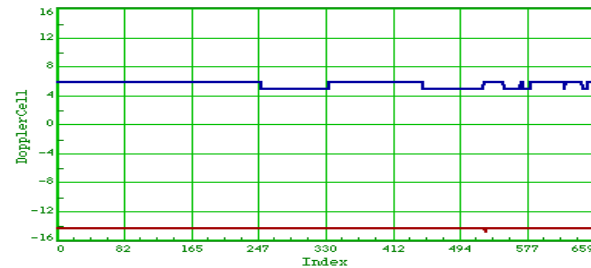
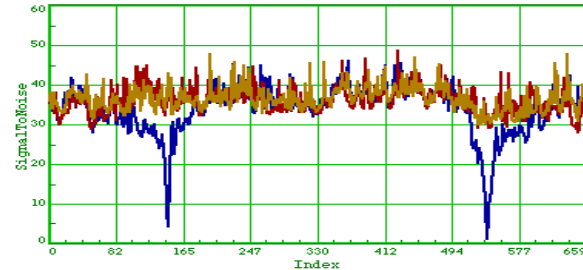
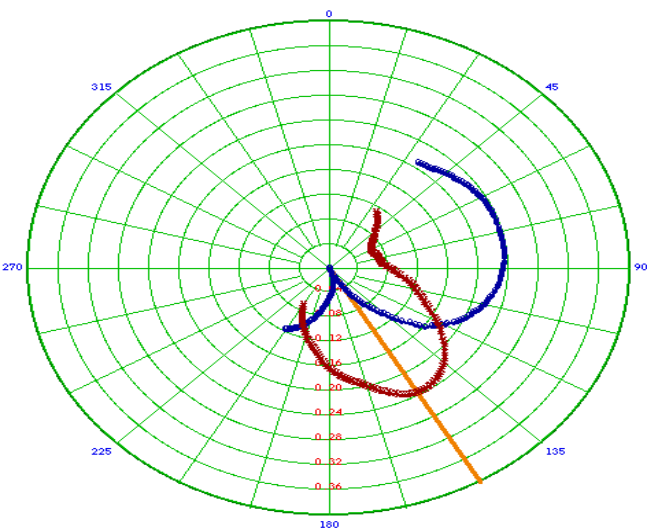
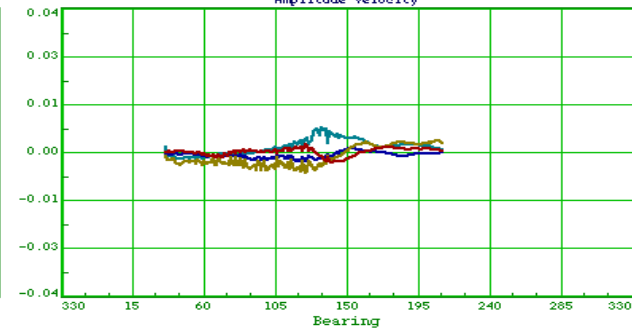
Tangent A1/A2 (Ideal in Red)



Amplitudes (Real & Imag)

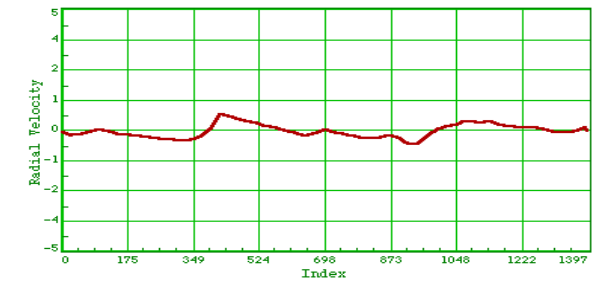
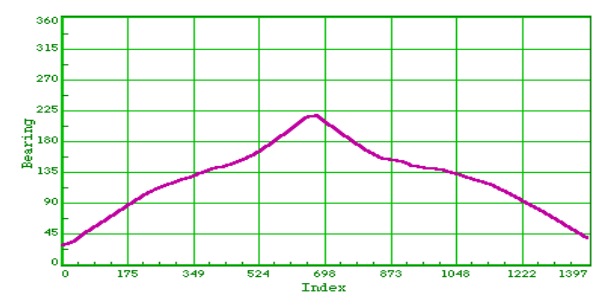
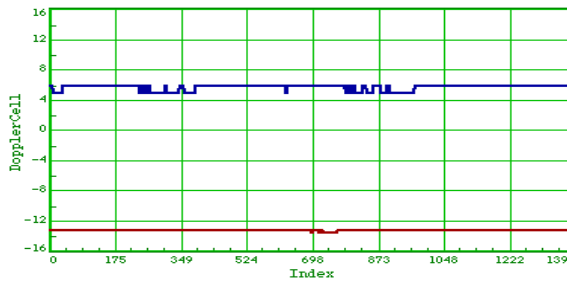
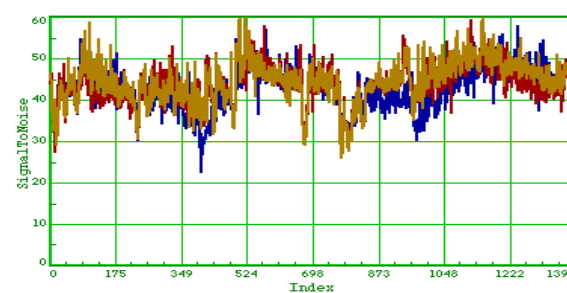
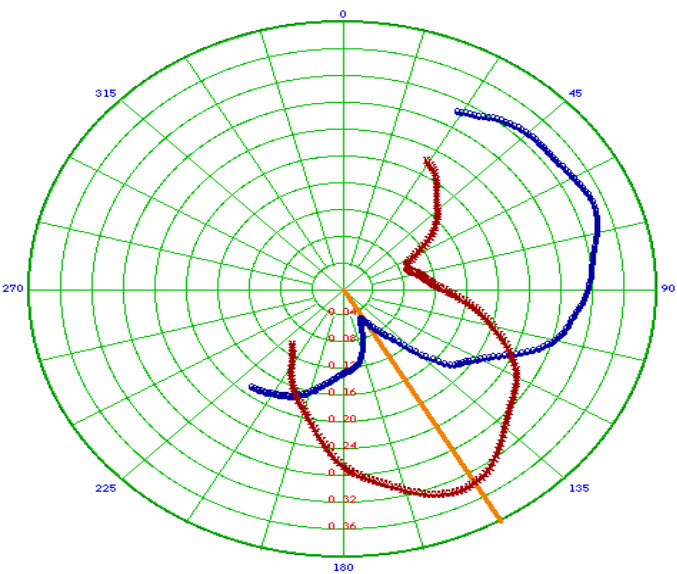
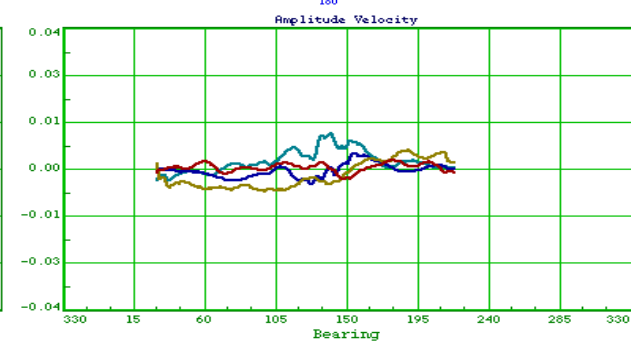
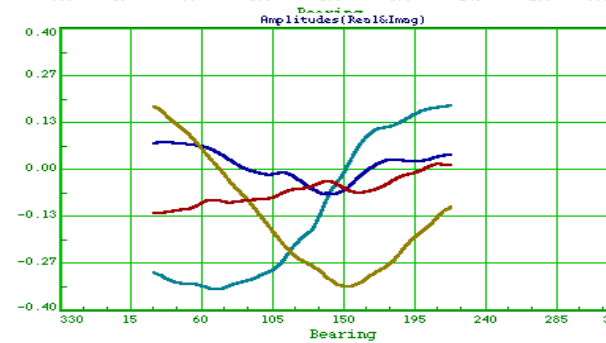
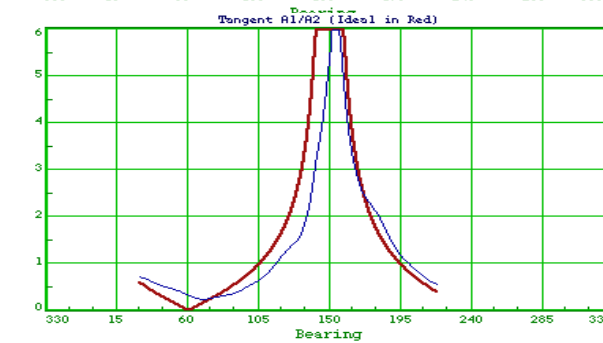
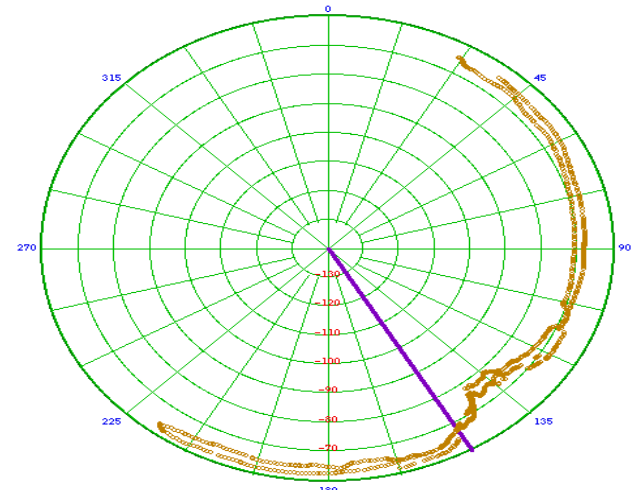
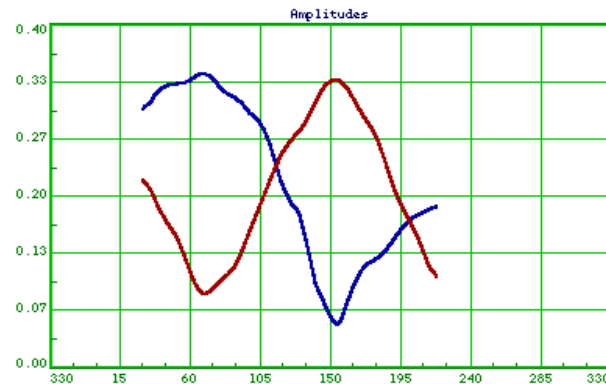
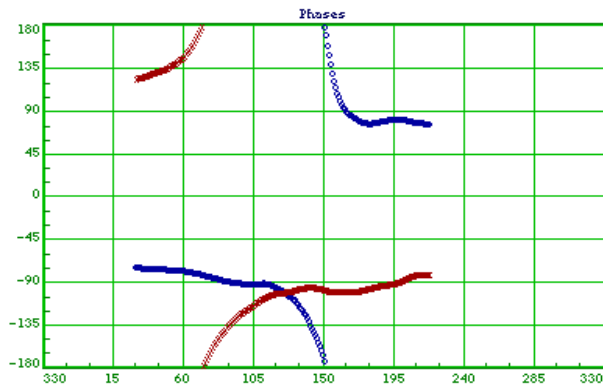


Amplitude Velocity





# 2012 08 09



Section 02:

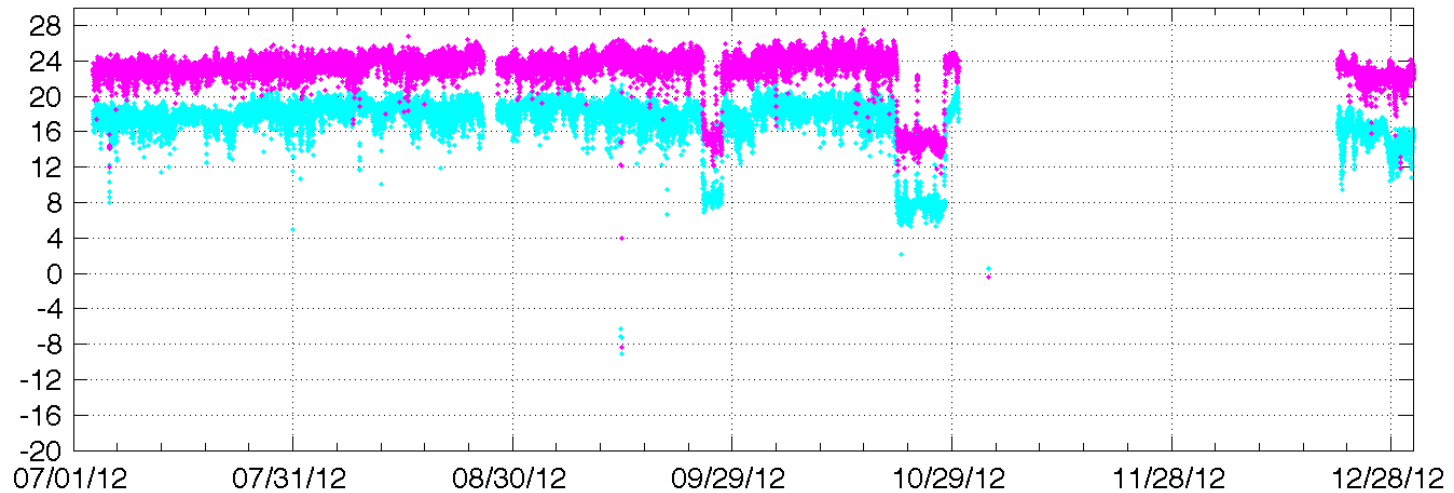
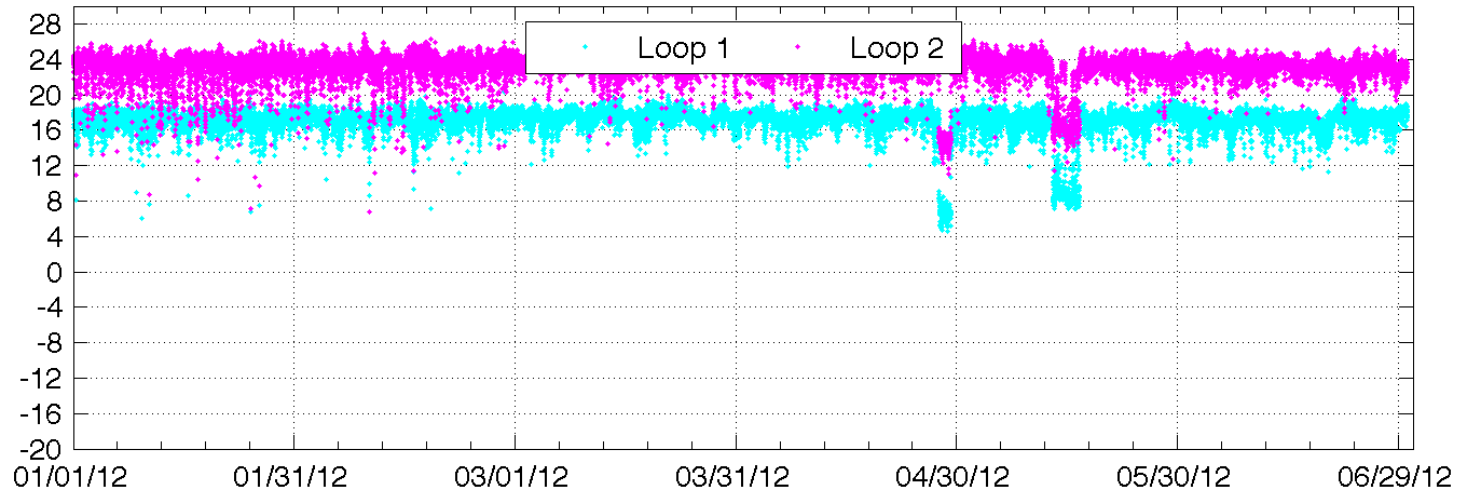
**BPU**

# **HF Radar Hardware Diagnostic Data**

January 1, 2012 – December 31, 2012

# **AMPLITUDES**

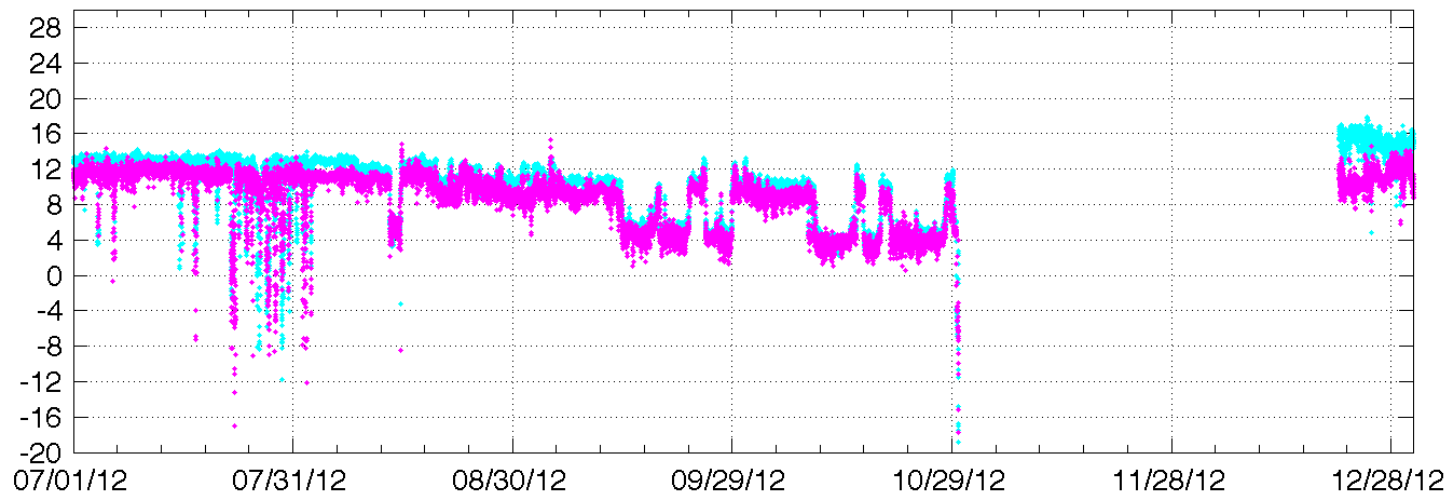
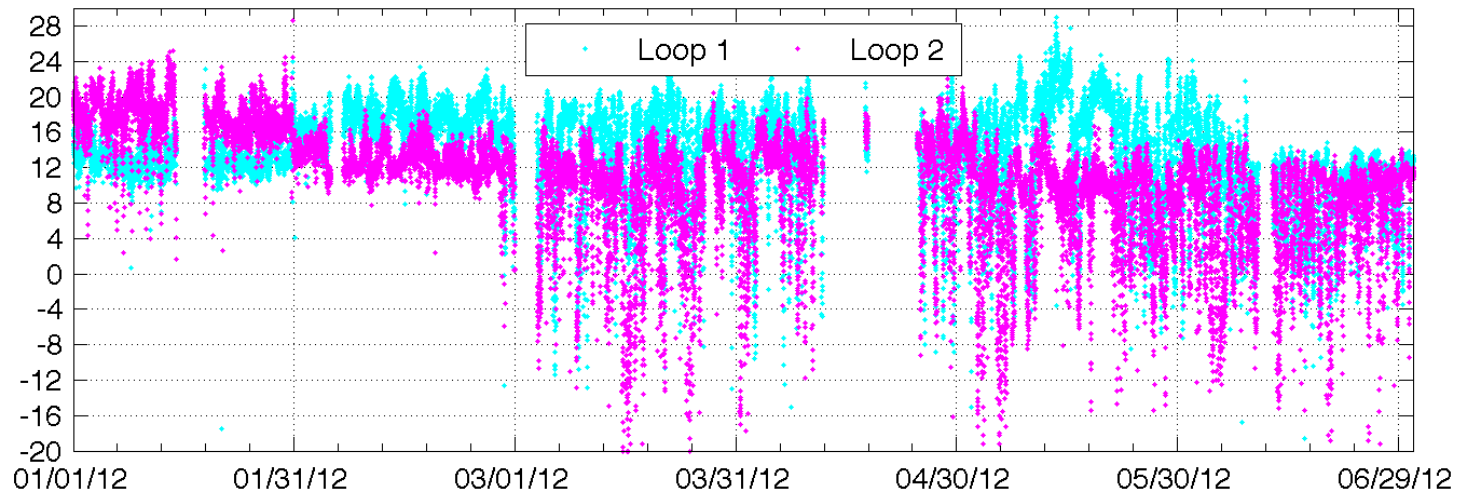
## Amplitude Measurements (dB) for 13 MHz Codar System at BRMR



01/22/13

/Users/hroarty/Documents/MATLAB/HJR\_Scripts/Codar\_DIAG\_Scripts/plot\_AMP.m

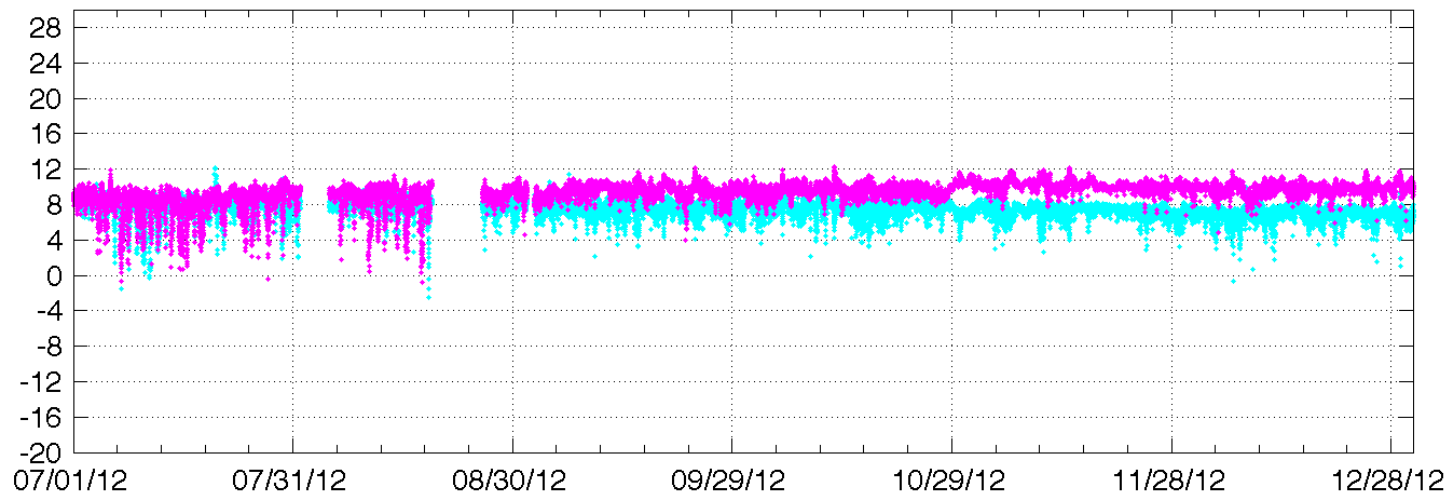
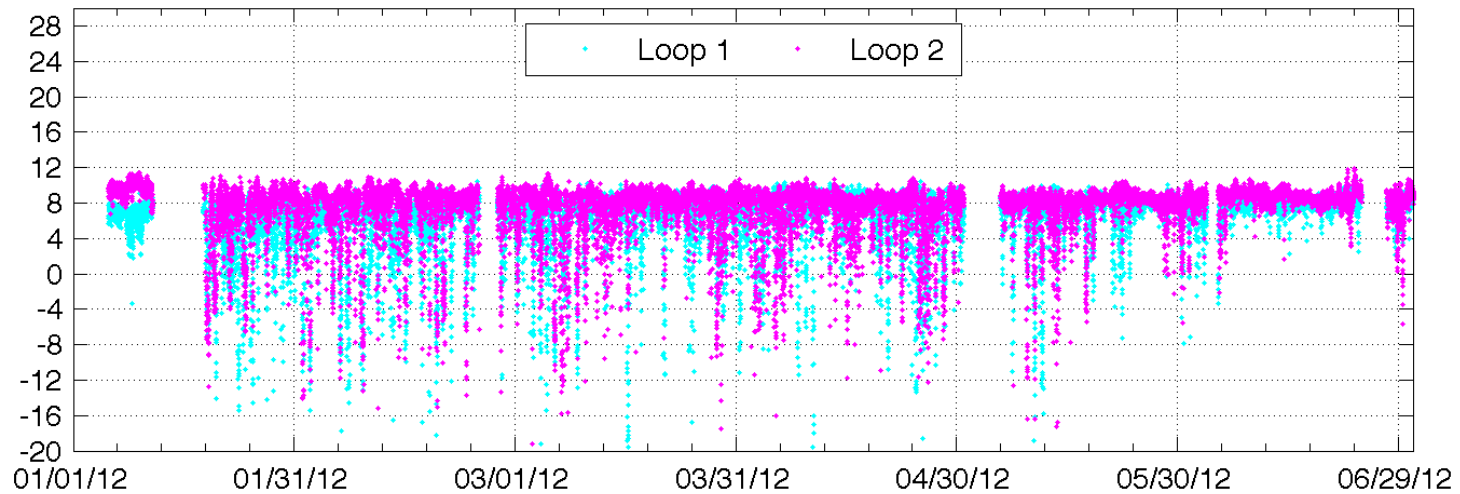
## Amplitude Measurements (dB) for 13 MHz Codar System at BRNT



01/22/13

/Users/hroarty/Documents/MATLAB/HJR\_Scripts/Codar\_DIAG\_Scripts/plot\_AMP.m

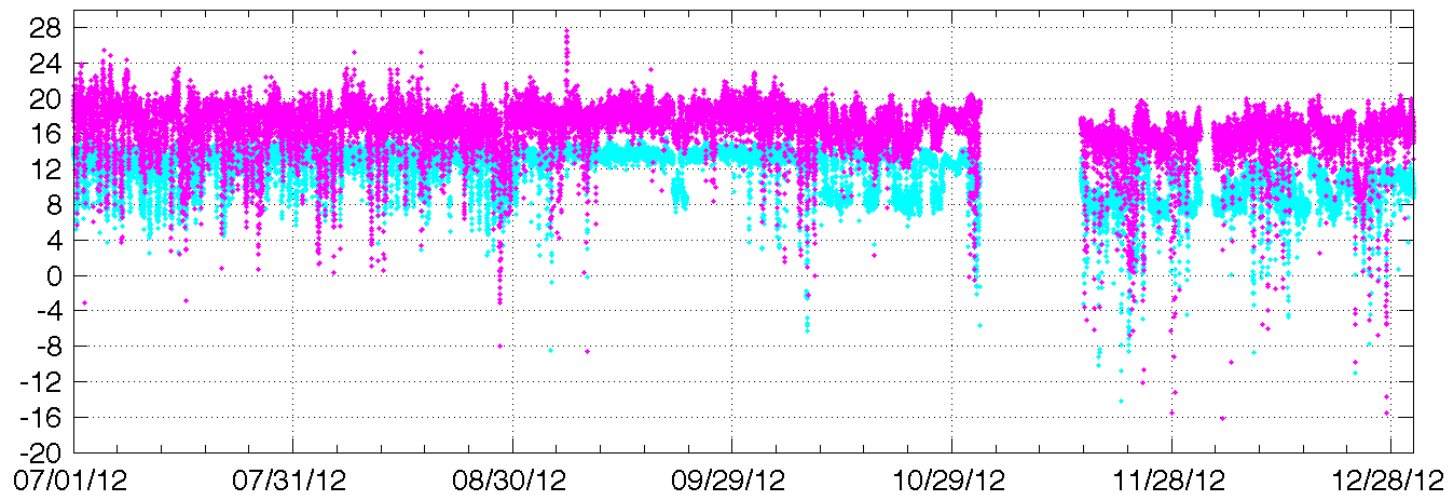
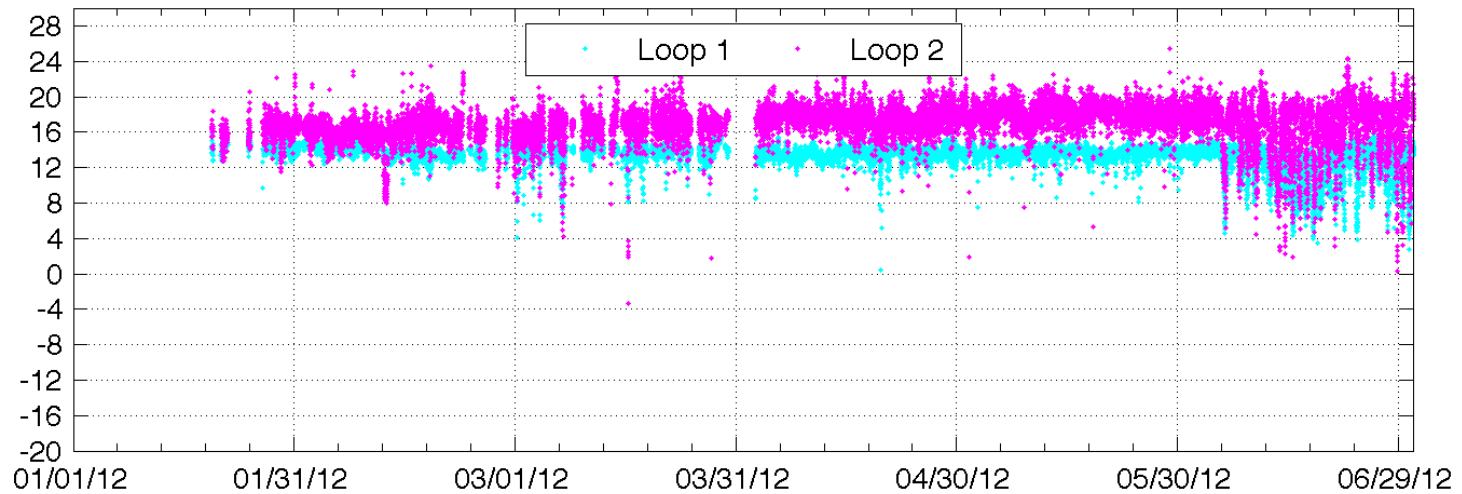
## Amplitude Measurements (dB) for 13 MHz Codar System at RATH



01/22/13

/Users/hroarty/Documents/MATLAB/HJR\_Scripts/Codar\_DIAG\_Scripts/plot\_AMP.m

## Amplitude Measurements (dB) for 13 MHz Codar System at WOOD



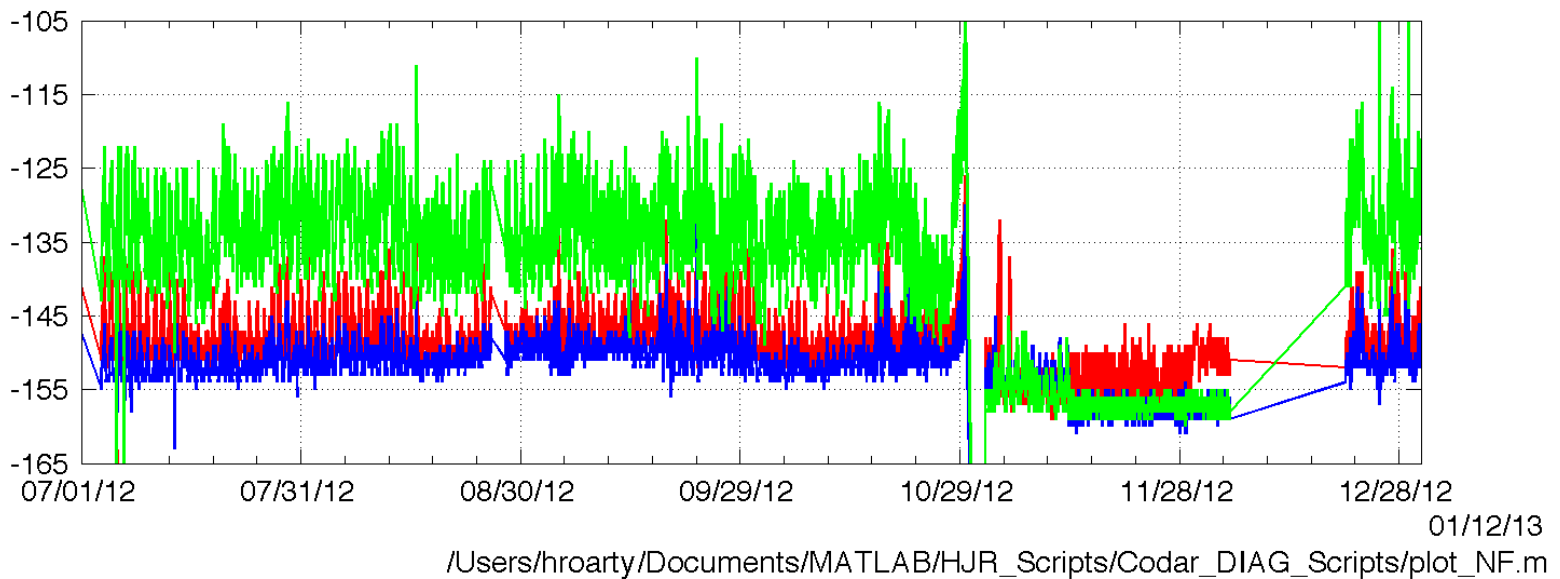
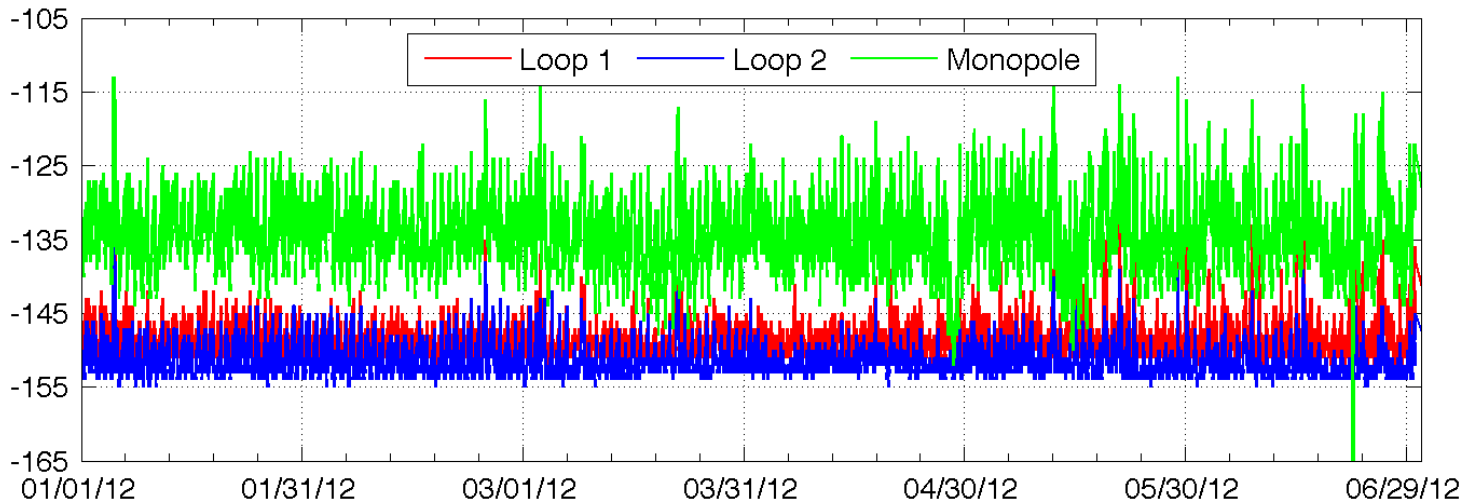
01/22/13

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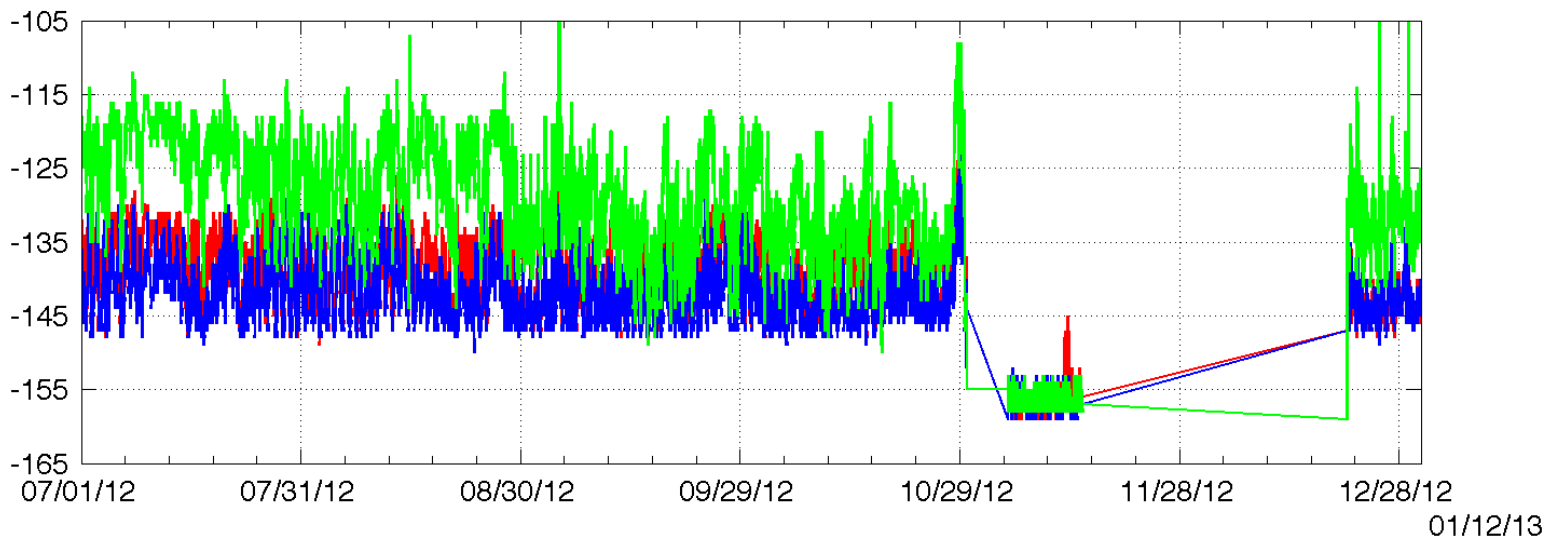
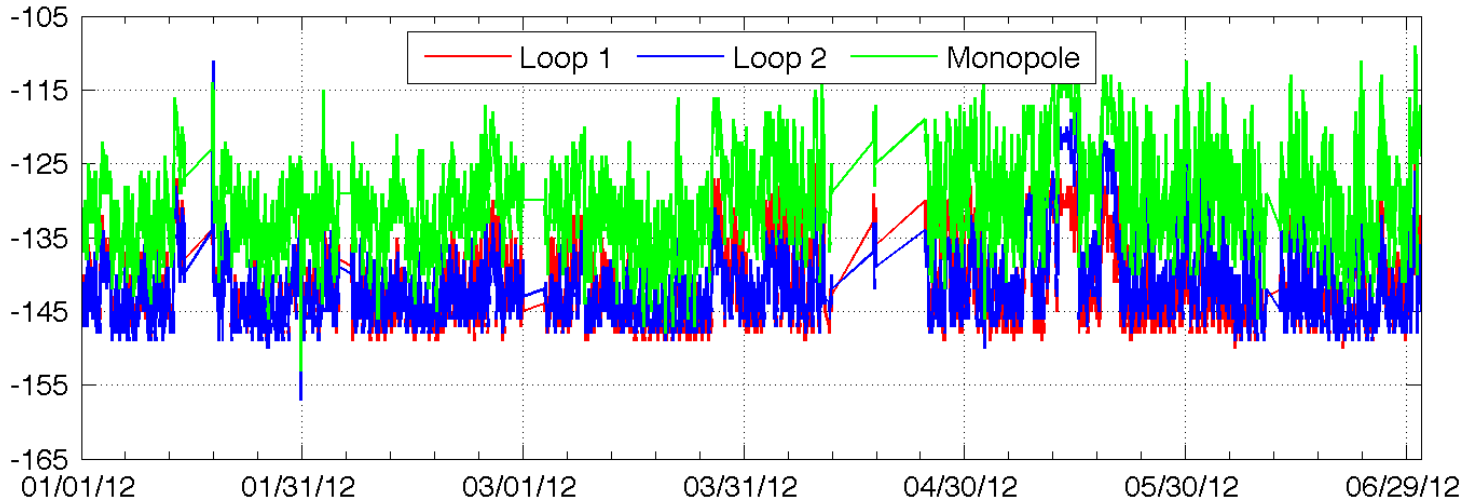
**NOISE FLOOR**



## Noise Floor Measurements (dBm) for SeaSonde BRMR

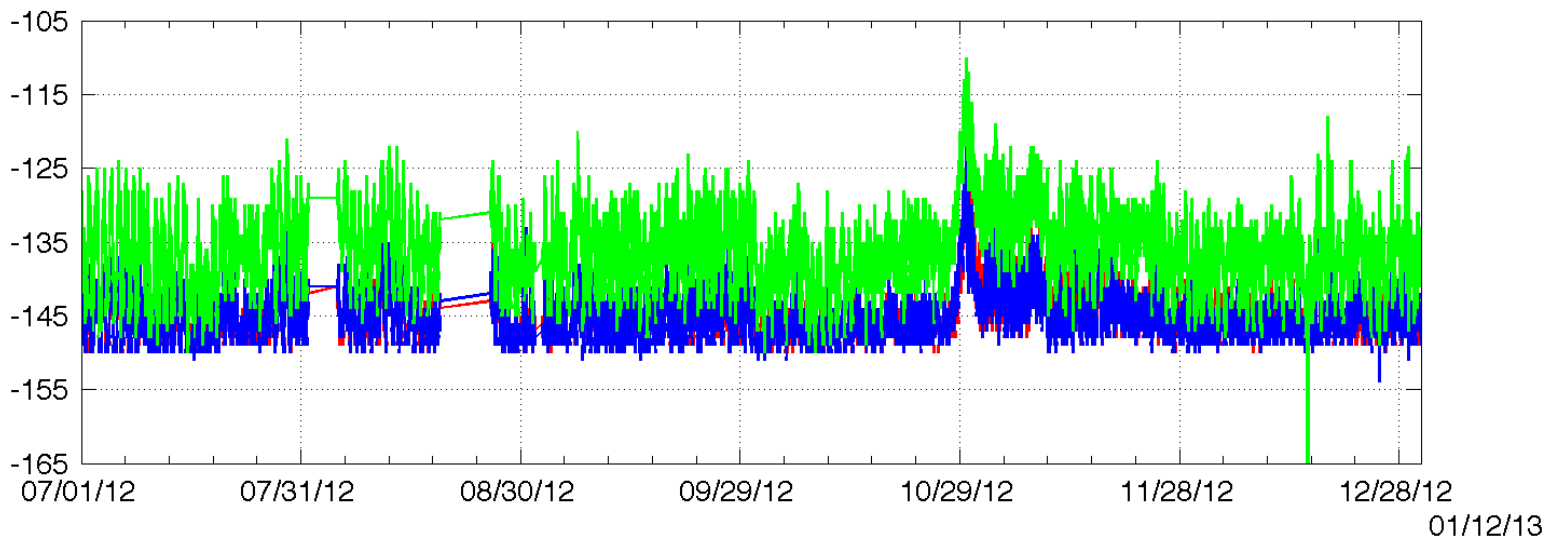
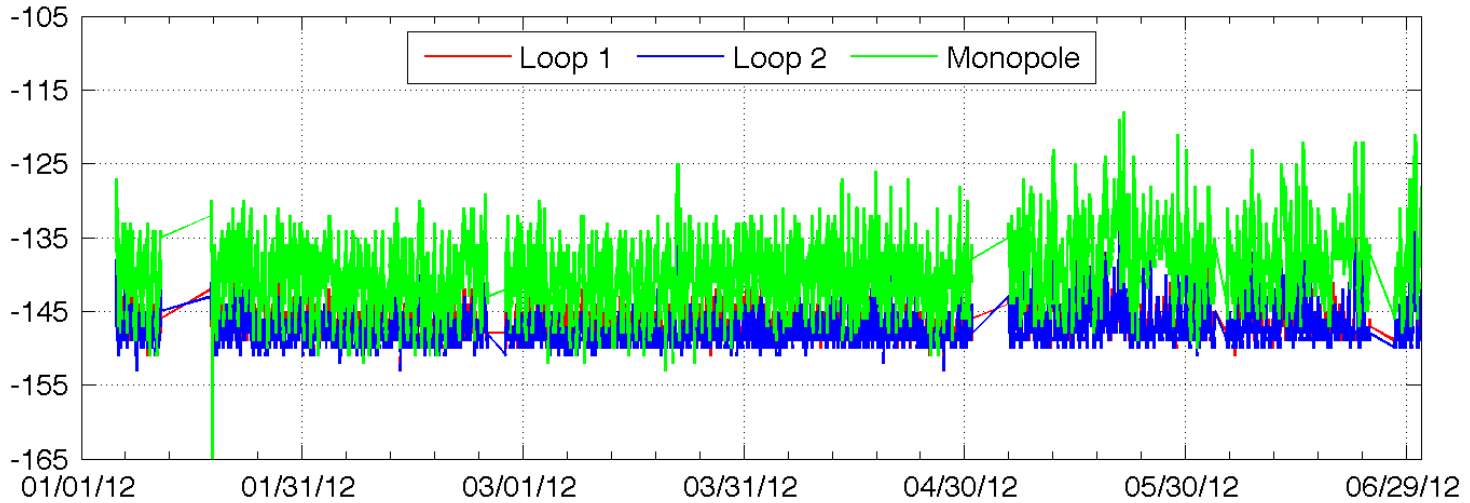


## Noise Floor Measurements (dBm) for SeaSonde BRNT



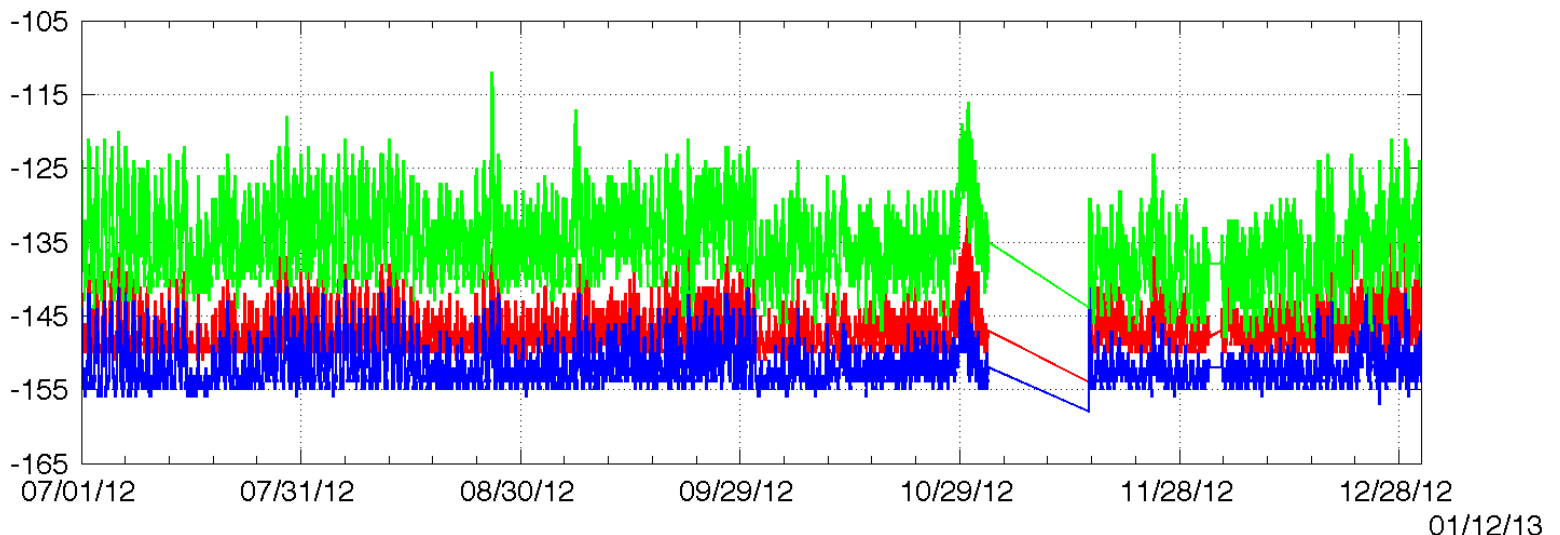
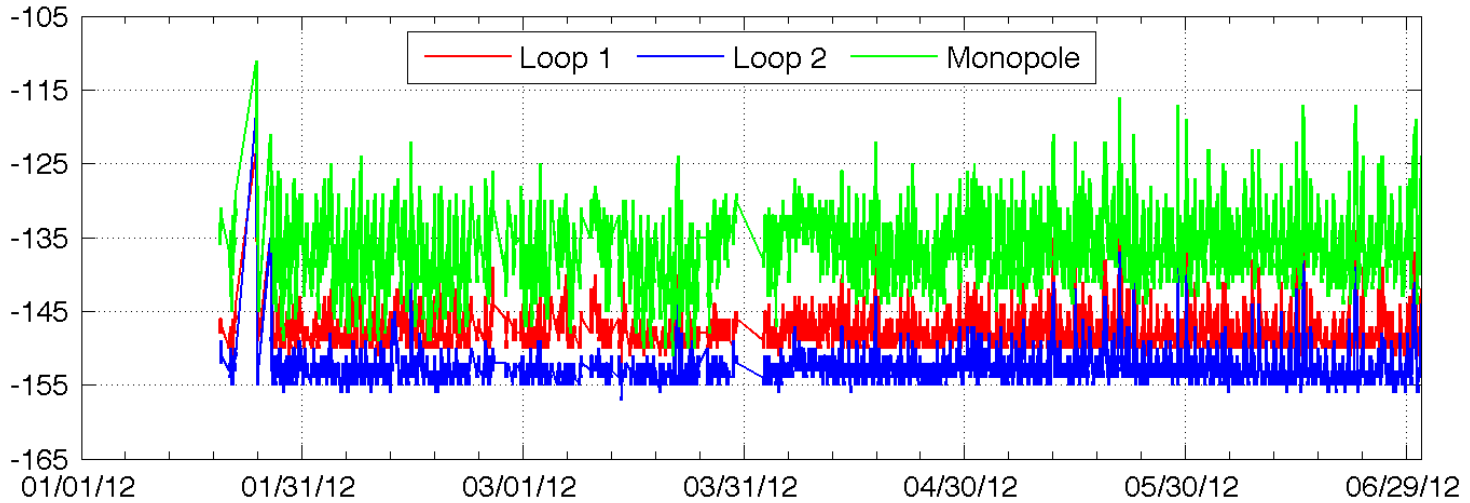
/Users/hroarty/Documents/MATLAB/HJR\_Scripts/Codar\_DIAG\_Scripts/plot\_NF.m

## Noise Floor Measurements (dBm) for SeaSonde RATH



/Users/hroarty/Documents/MATLAB/HJR\_Scripts/Codar\_DIAG\_Scripts/plot\_NF.m

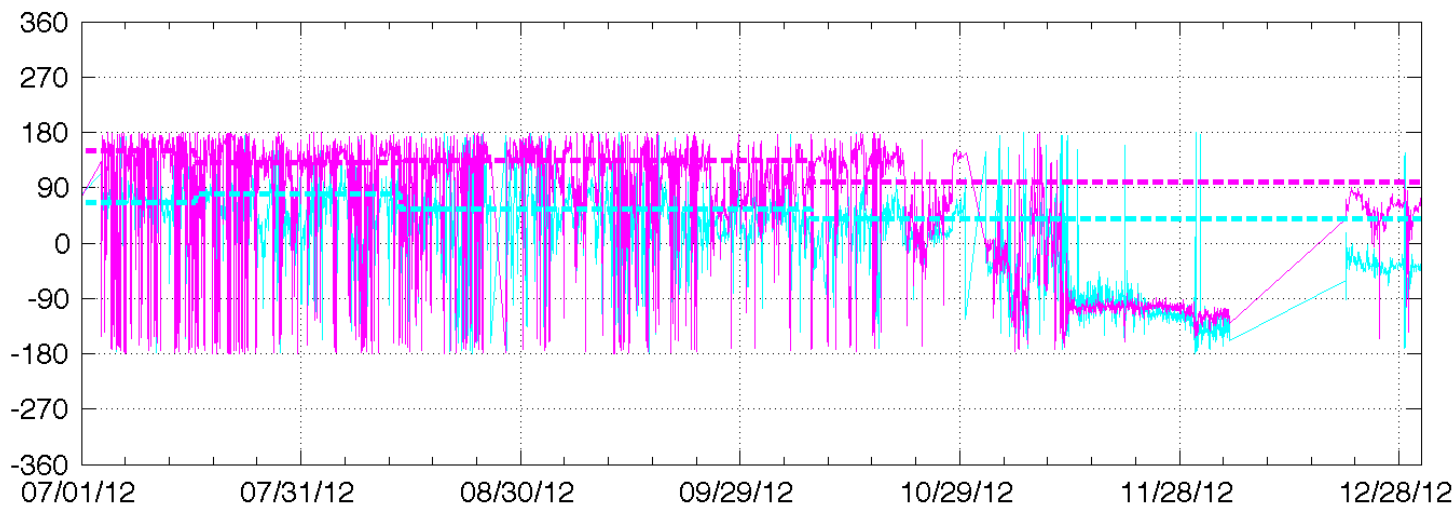
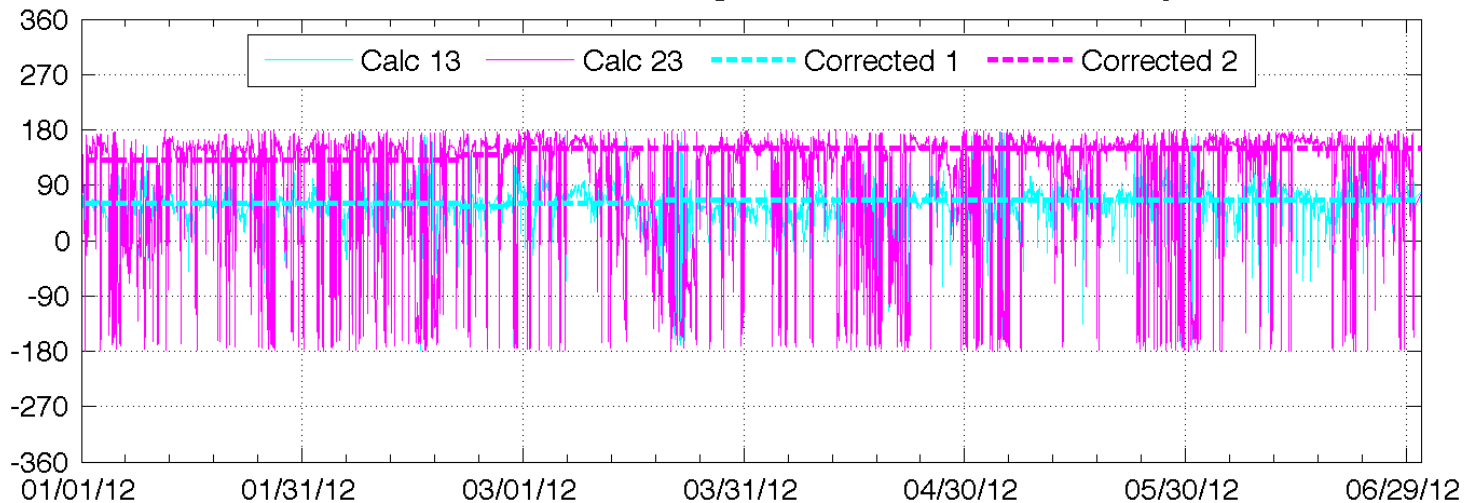
## Noise Floor Measurements (dBm) for SeaSonde WOOD



/Users/hroarty/Documents/MATLAB/HJR\_Scripts/Codar\_DIAG\_Scripts/plot\_NF.m

# PHASES

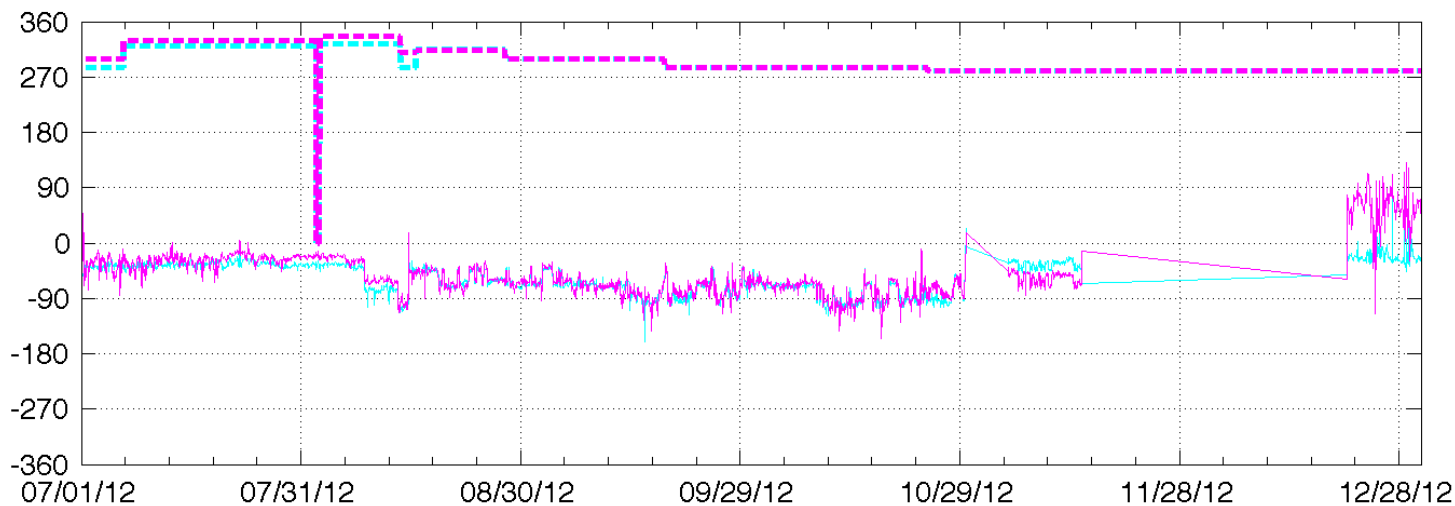
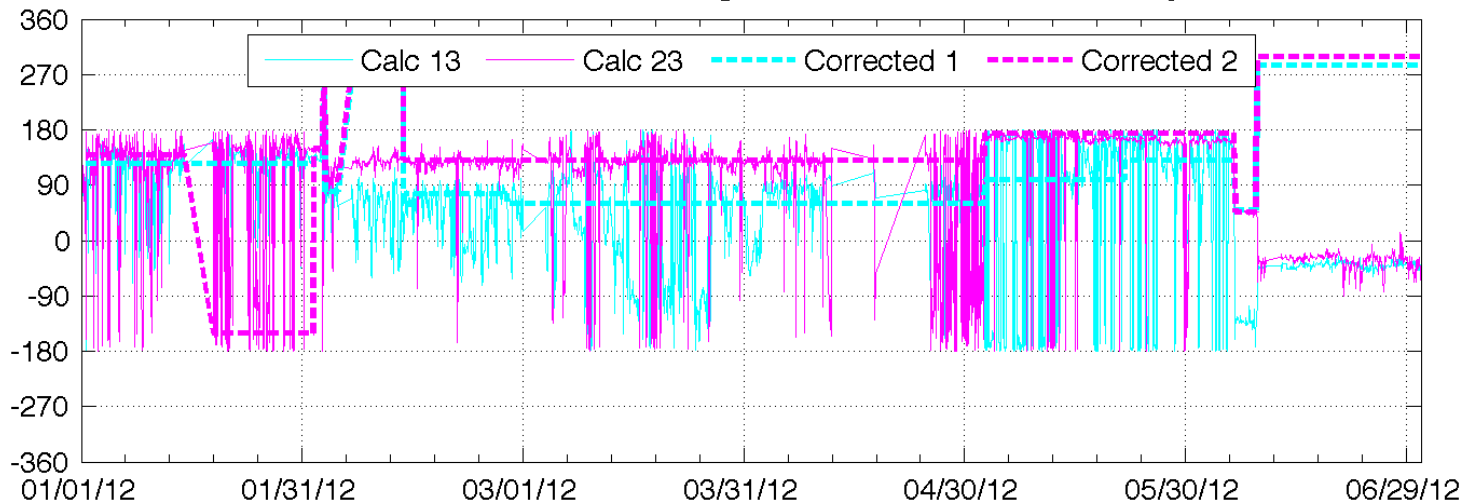
## Antenna Phase Measurements (deg) for 13 MHz Codar System at BRMR



01/14/13

/Users/hroarty/Documents/MATLAB/HJR\_Scripts/Codar\_DIAG\_Scripts/plot\_Phase.m

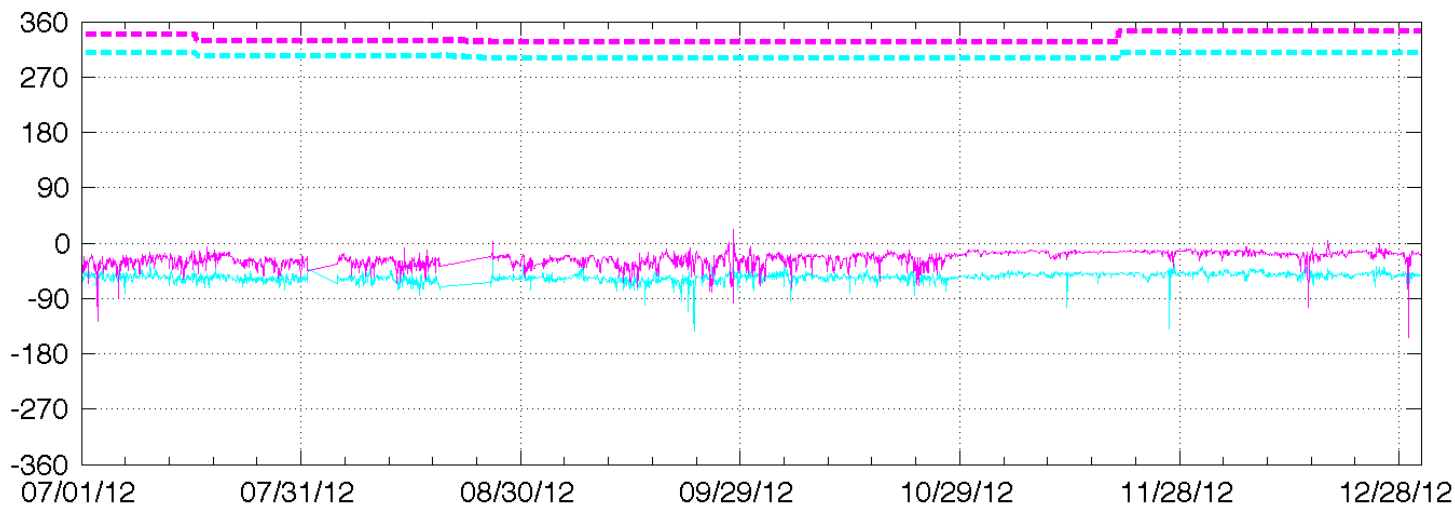
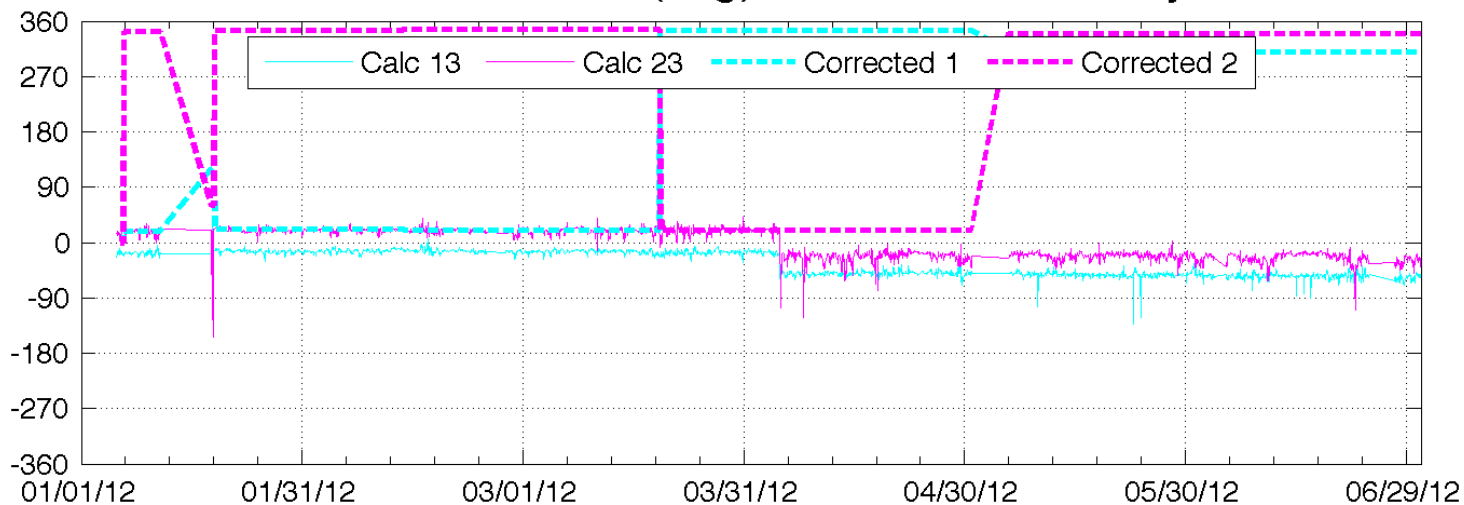
# Antenna Phase Measurements (deg) for 13 MHz Codar System at BRNT



01/14/13

/Users/hroarty/Documents/MATLAB/HJR\_Scripts/Codar\_DIAG\_Scripts/plot\_Phase.m

## Antenna Phase Measurements (deg) for 13 MHz Codar System at RATH

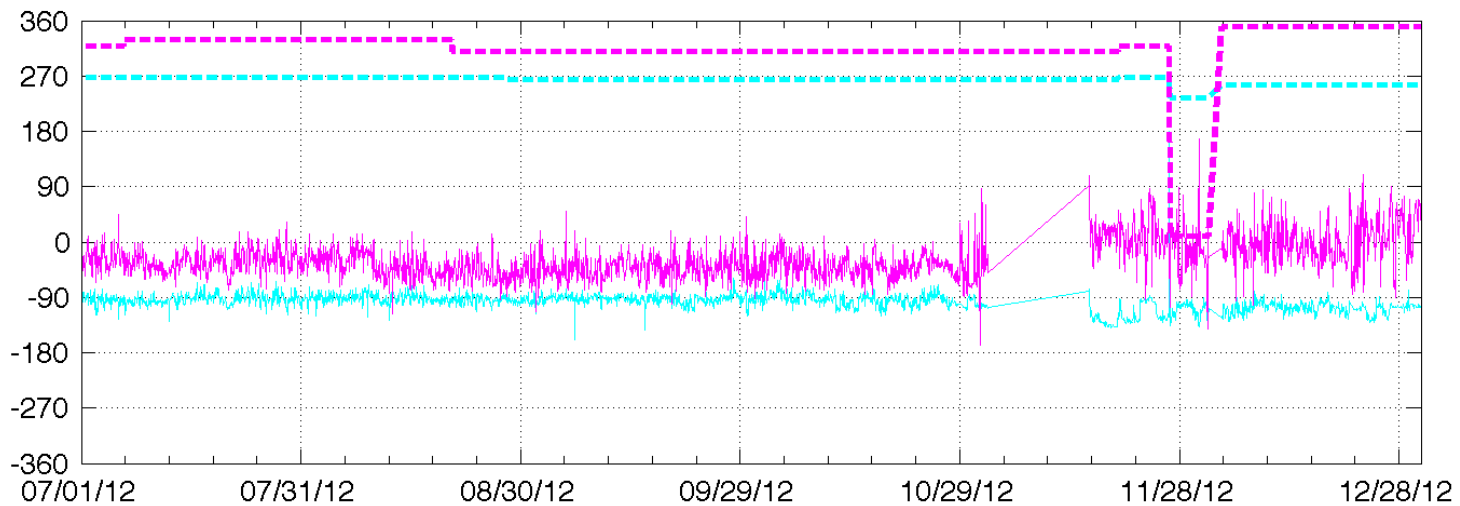
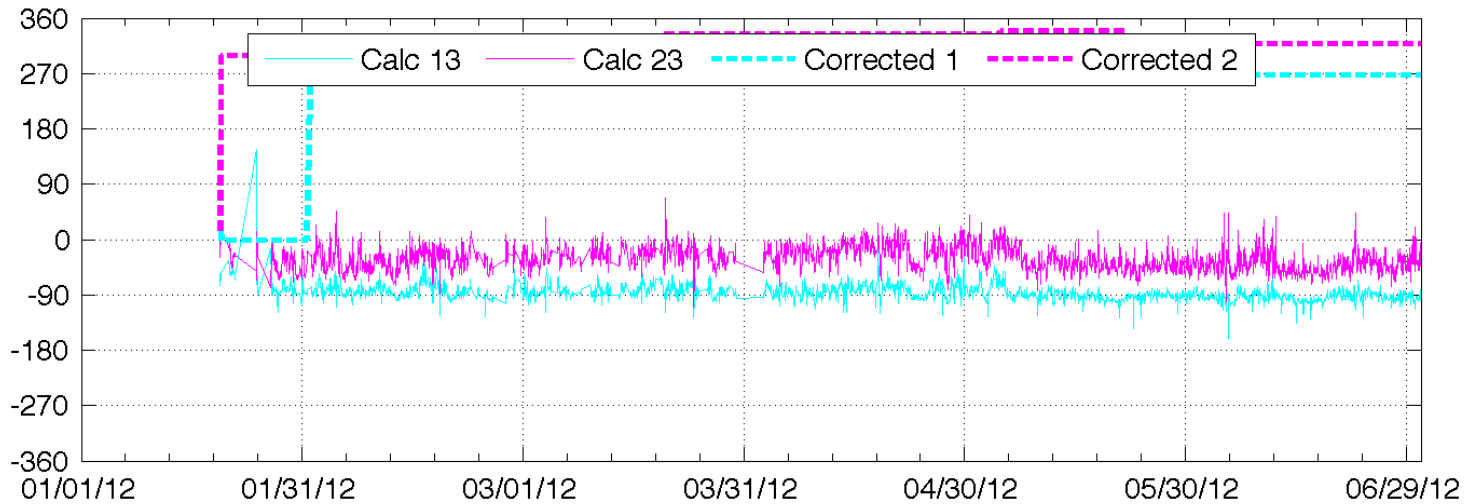


01/14/13

/Users/hroarty/Documents/MATLAB/HJR\_Scripts/Codar\_DIAG\_Scripts/plot\_Phase.m



# Antenna Phase Measurements (deg) for 13 MHz Codar System at WOOD

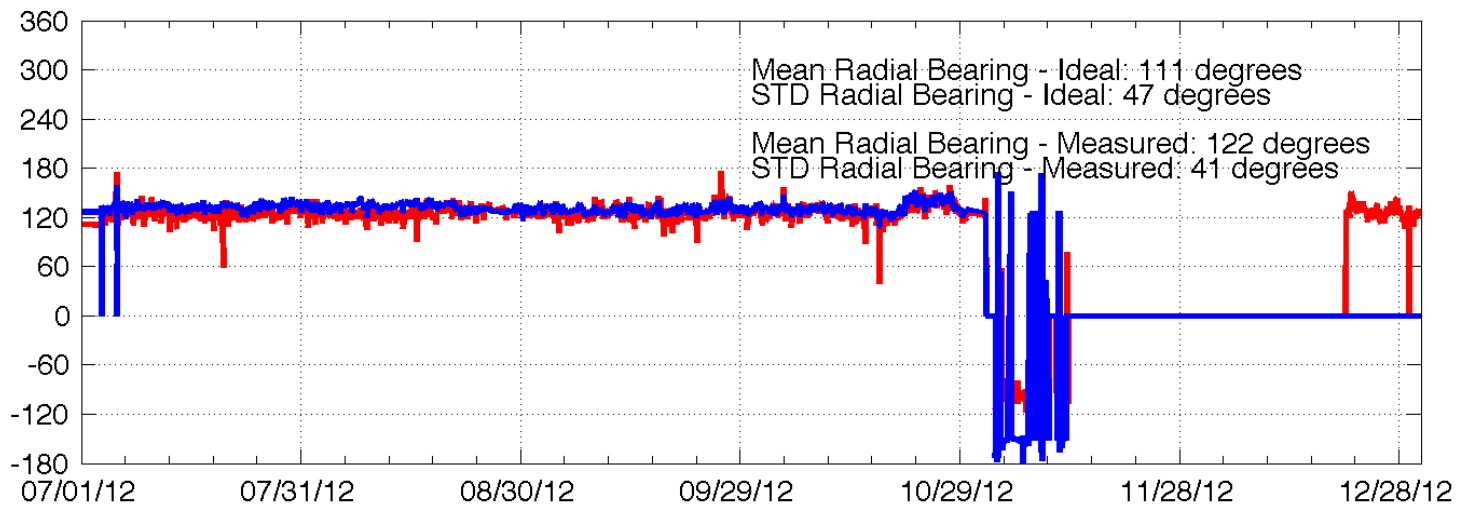
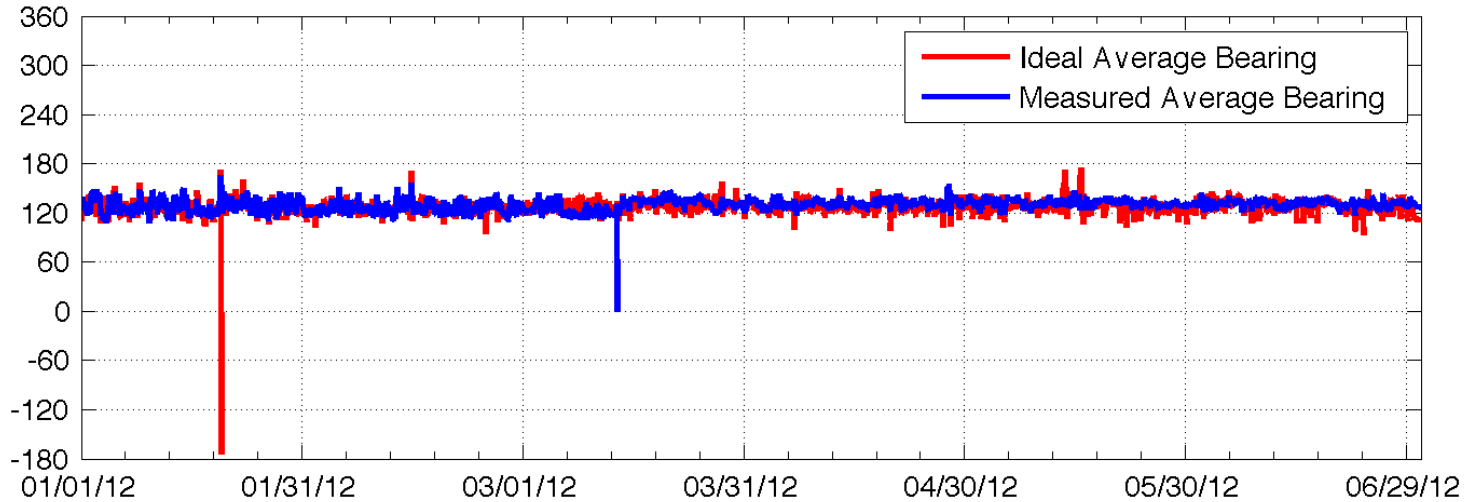


01/14/13

/Users/hroarty/Documents/MATLAB/HJR\_Scripts/Codar\_DIAG\_Scripts/plot\_Phase.m

# **AVERAGE RADIAL BEARING**

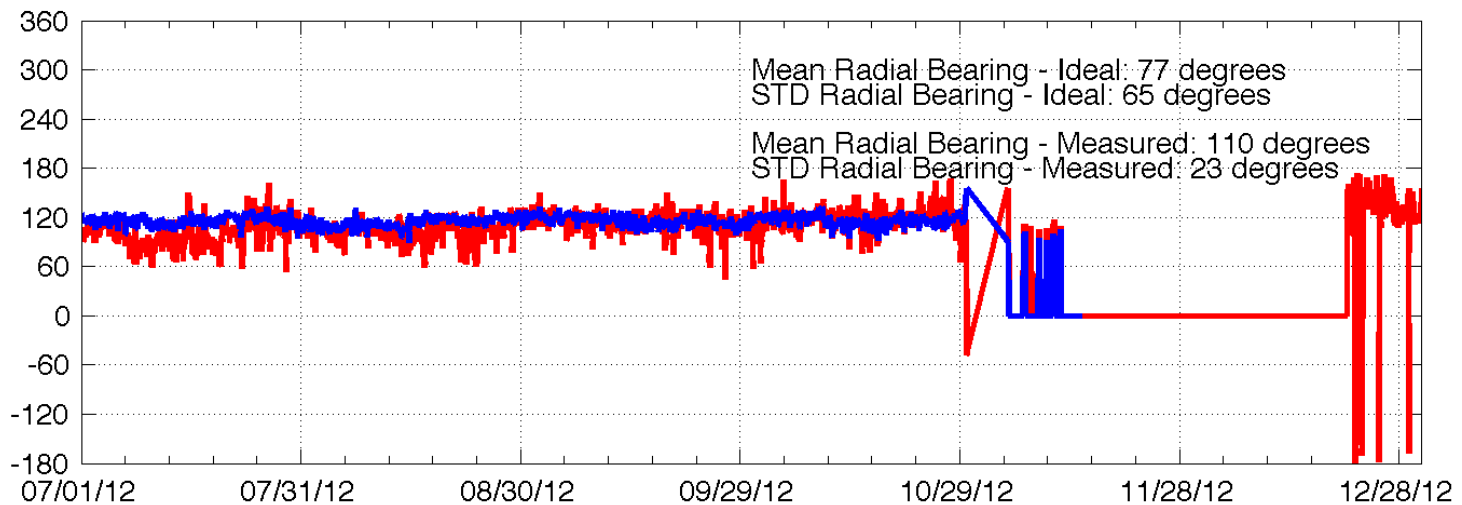
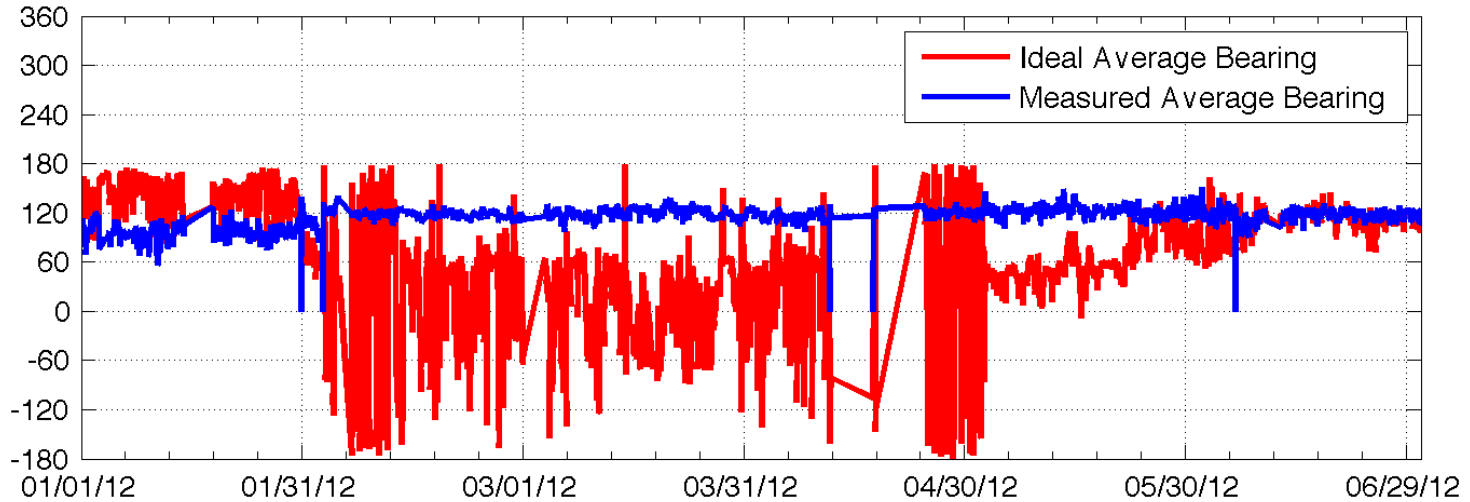
## Average Radial Bearing for 13 MHz Codar System at BRMR



01/11/13

/Users/hroarty/Documents/MATLAB/HJR\_Scripts/Codar\_DIAG\_Scripts/plot\_RABA.m

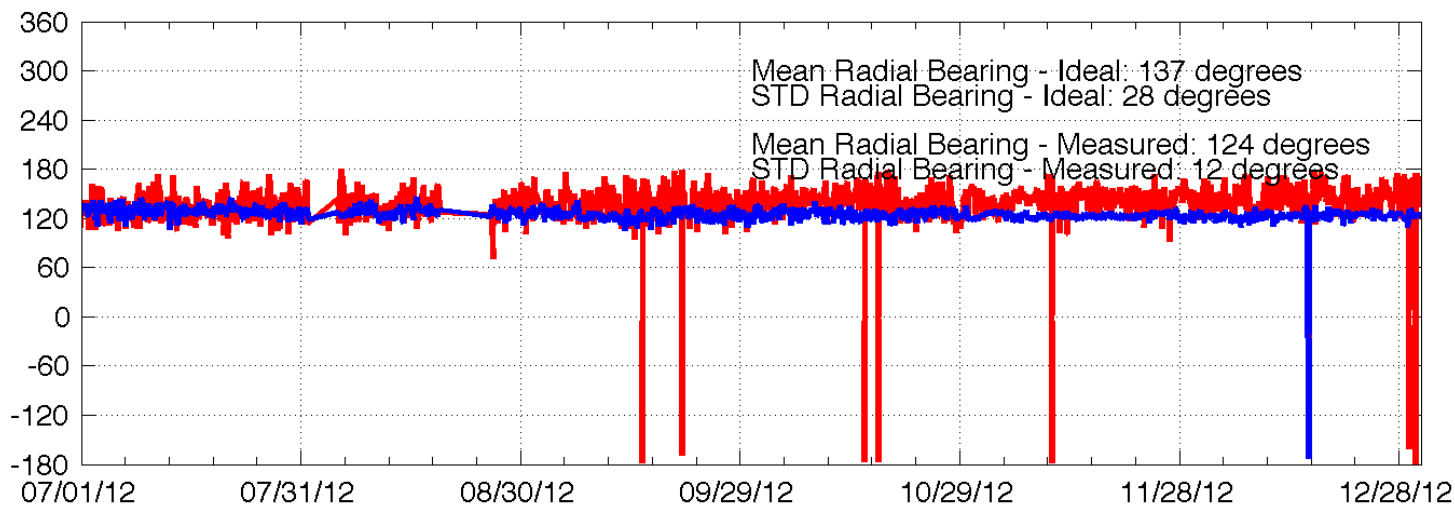
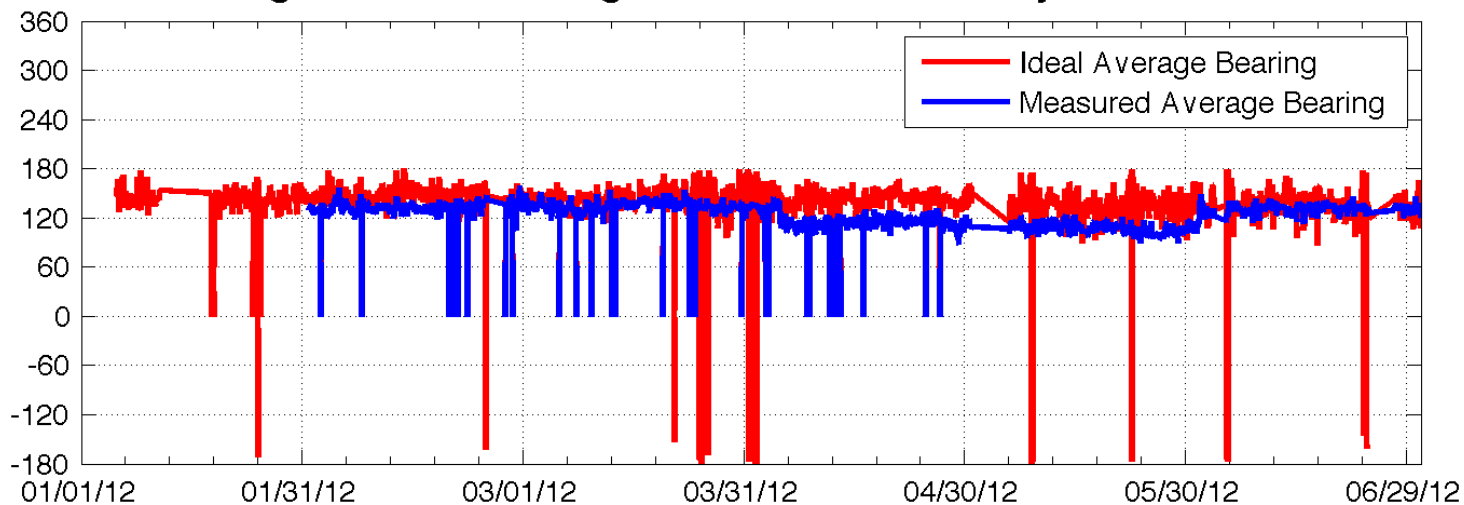
## Average Radial Bearing for 13 MHz Codar System at BRNT



01/11/13

/Users/hroarty/Documents/MATLAB/HJR\_Scripts/Codar\_DIAG\_Scripts/plot\_RABA.m

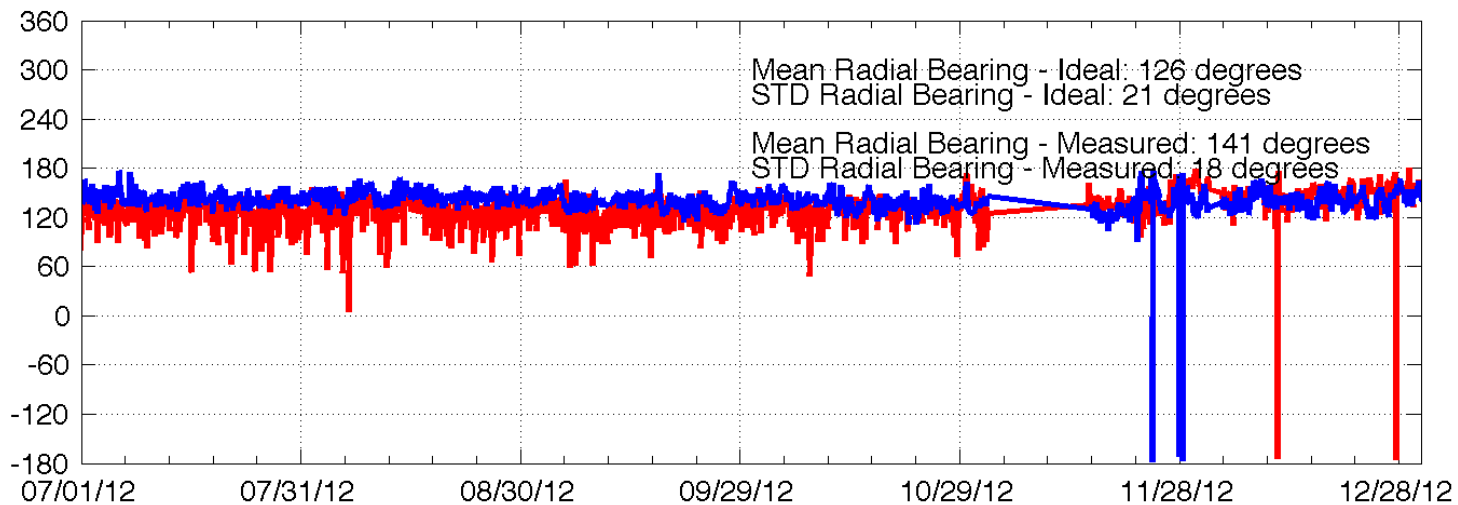
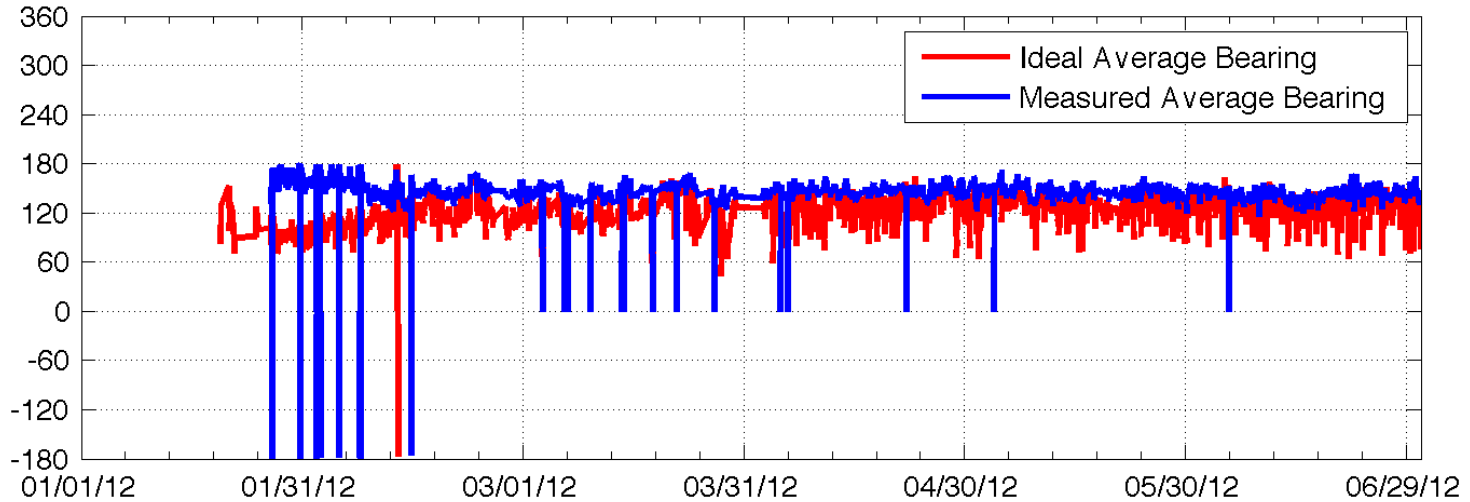
## Average Radial Bearing for 13 MHz Codar System at RATH



01/11/13

/Users/hroarty/Documents/MATLAB/HJR\_Scripts/Codar\_DIAG\_Scripts/plot\_RABA.m

## Average Radial Bearing for 13 MHz Codar System at WOOD

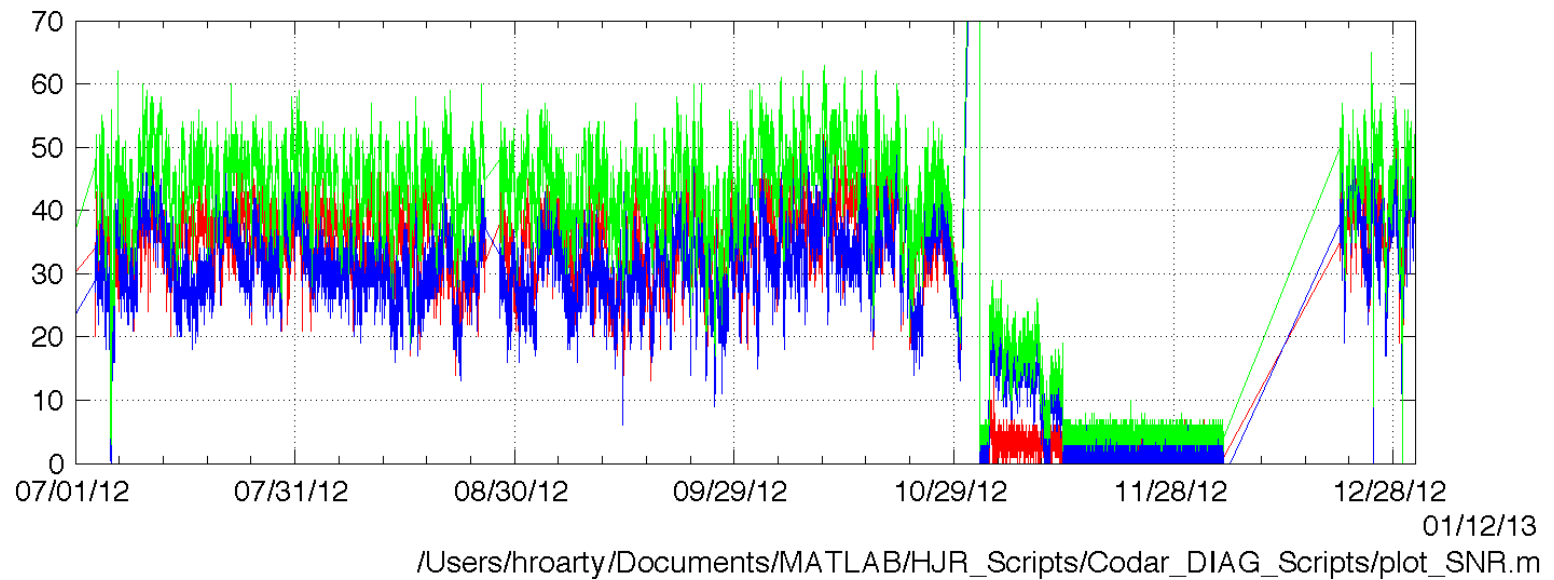
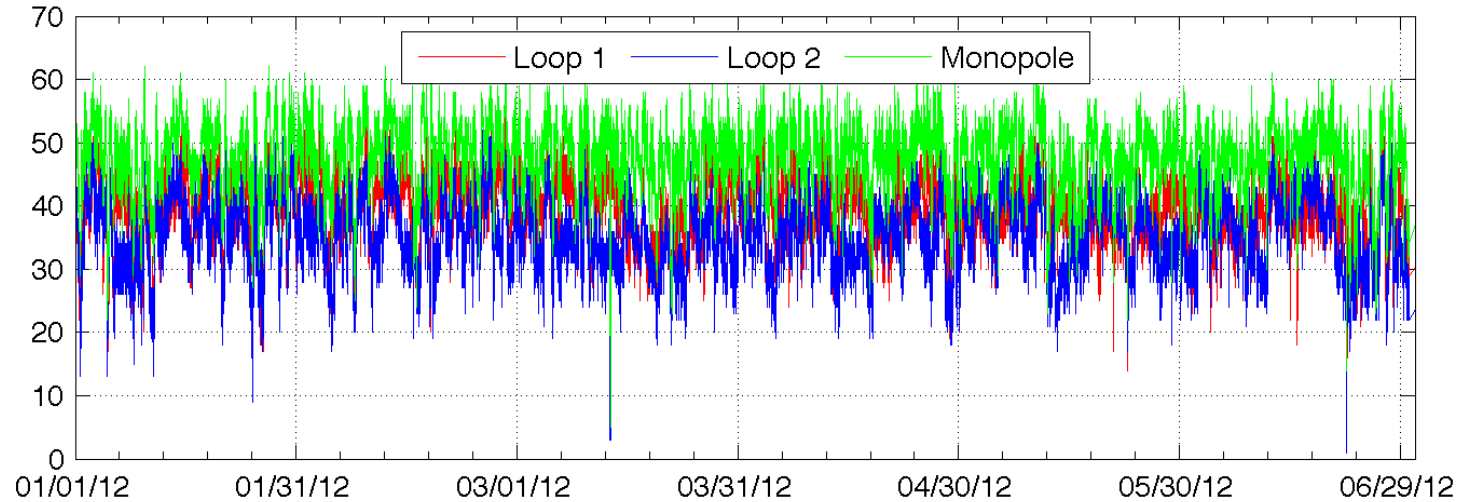


01/11/13

/Users/hroarty/Documents/MATLAB/HJR\_Scripts/Codar\_DIAG\_Scripts/plot\_RABA.m

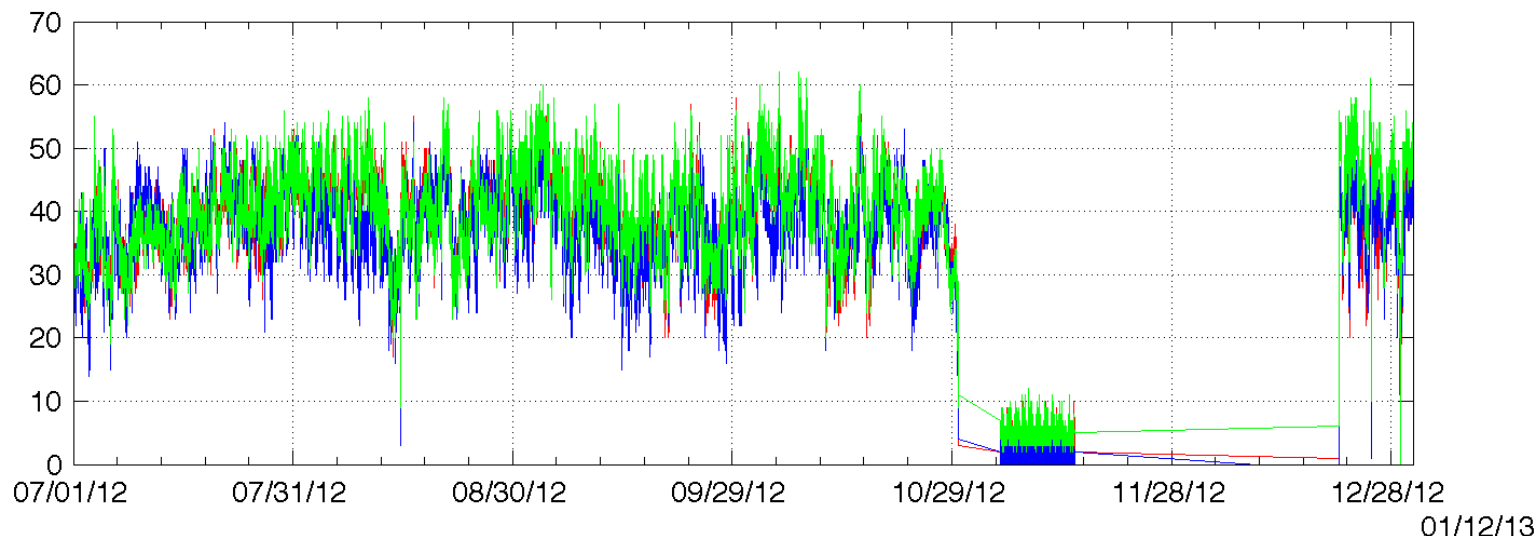
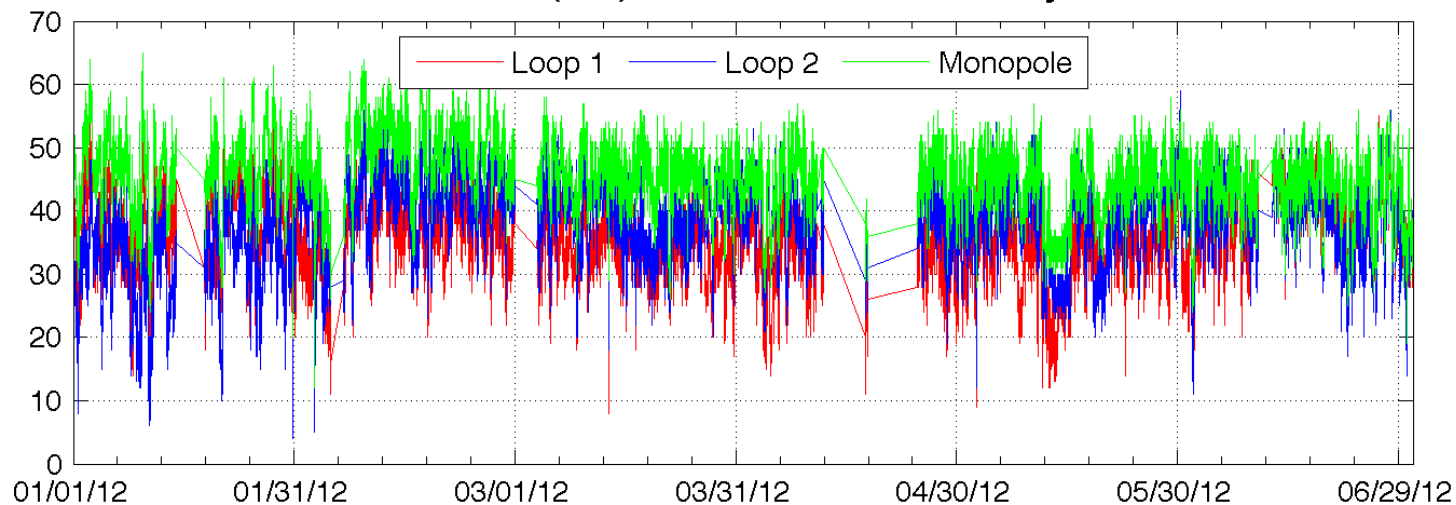
**SIGNAL TO NOISE**

## SNR Measurements (dB) for 13 MHz Codar System at BRMR



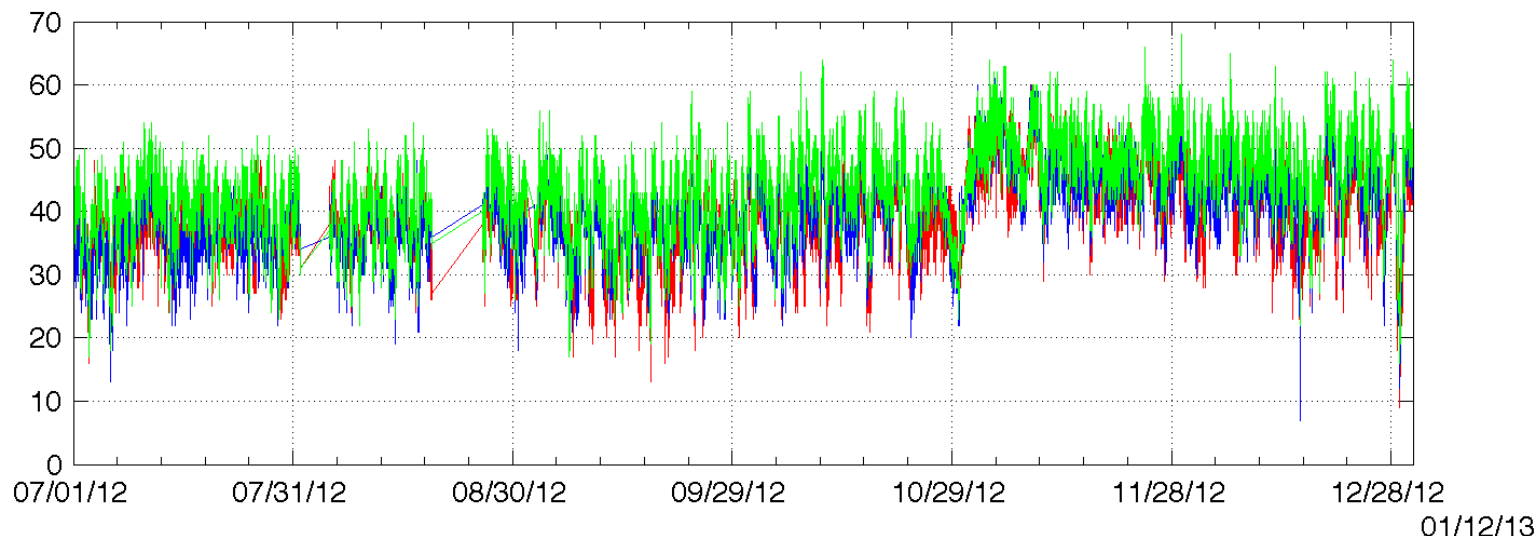
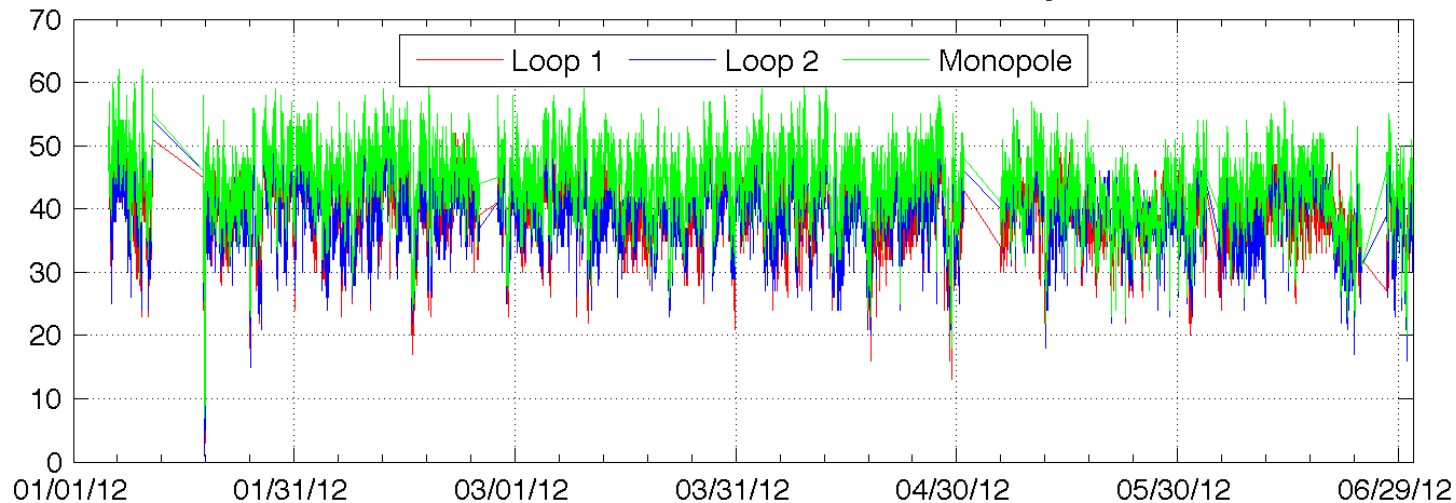


## SNR Measurements (dB) for 13 MHz Codar System at BRNT



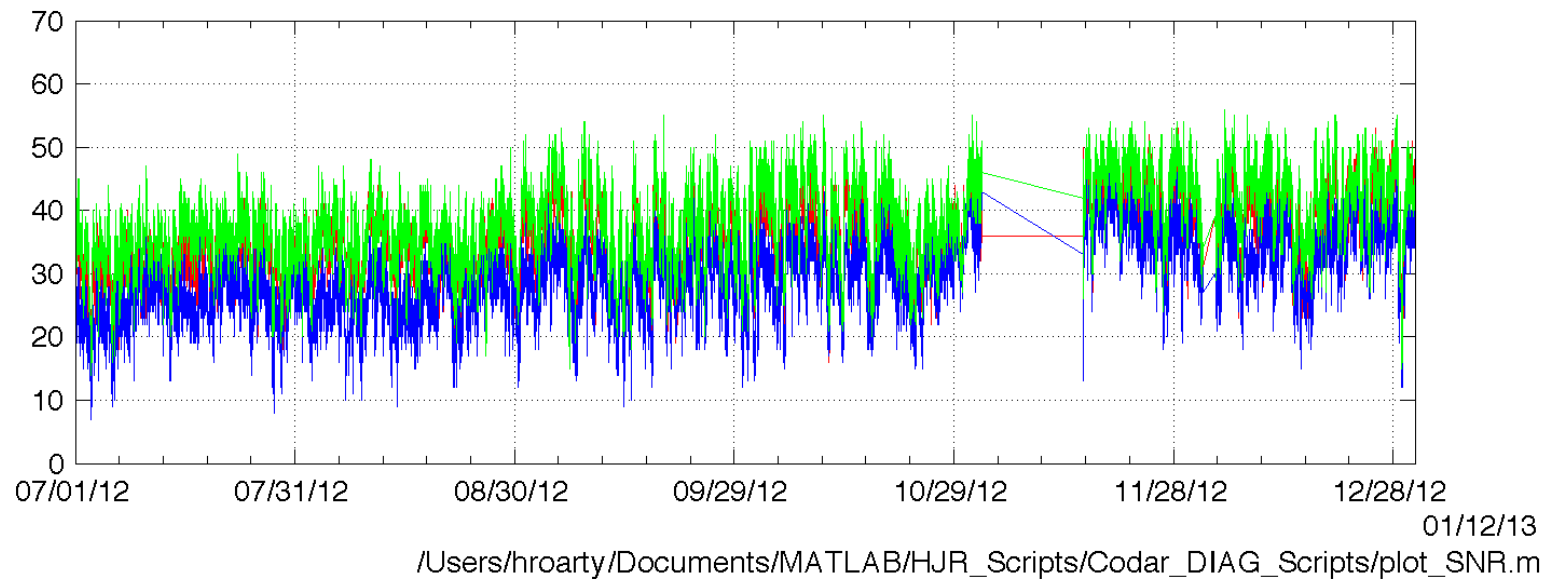
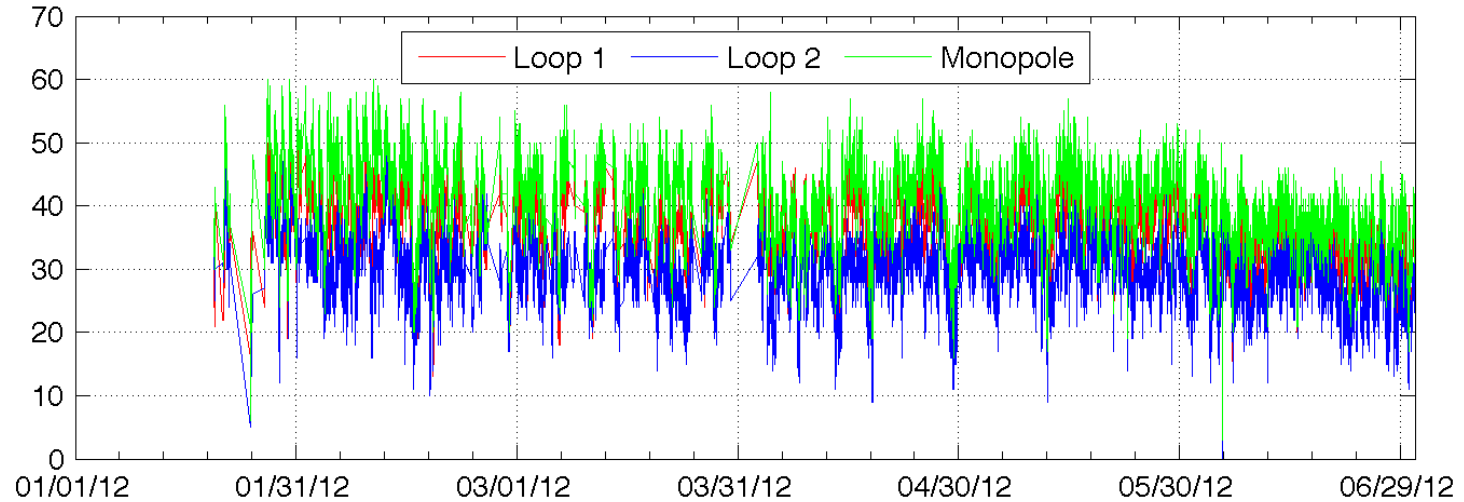
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## SNR Measurements (dB) for 13 MHz Codar System at RATH



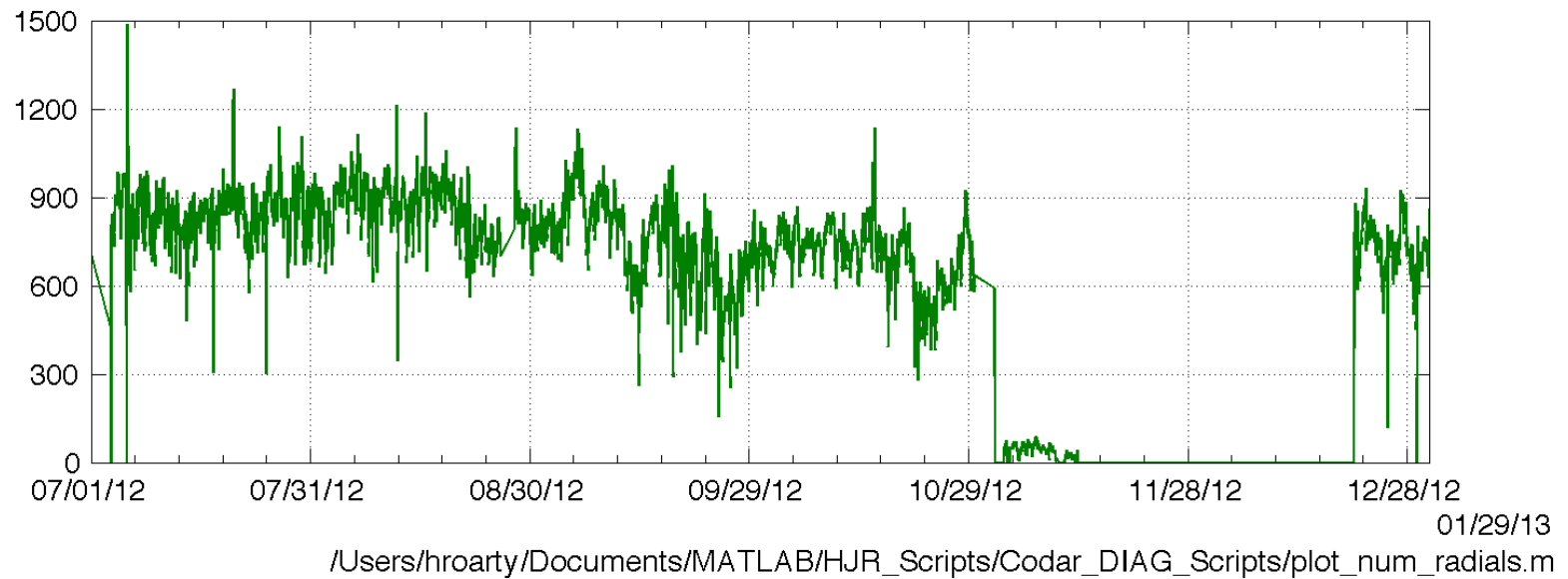
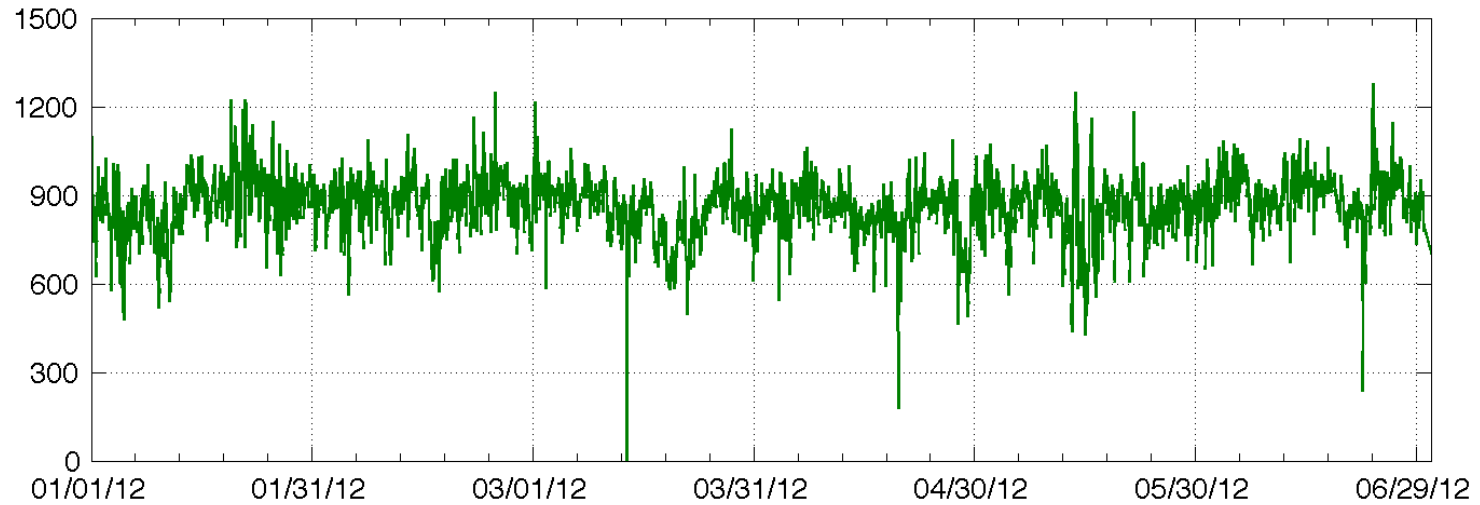
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## SNR Measurements (dB) for 13 MHz Codar System at WOOD

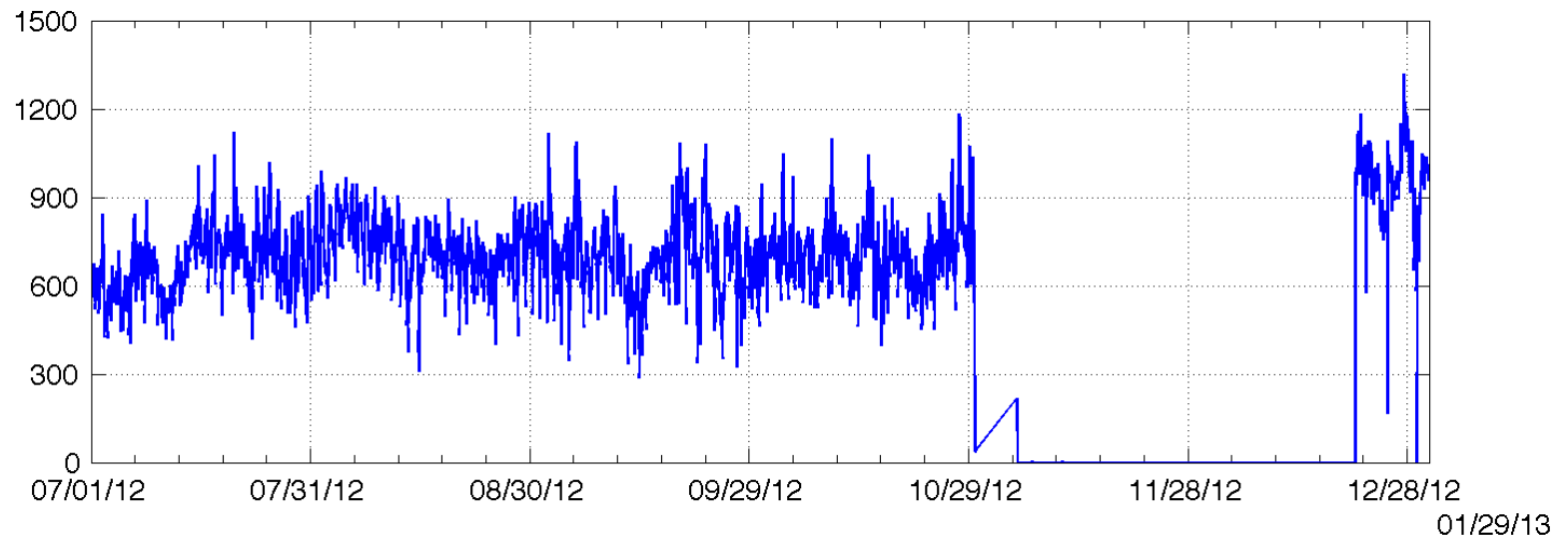
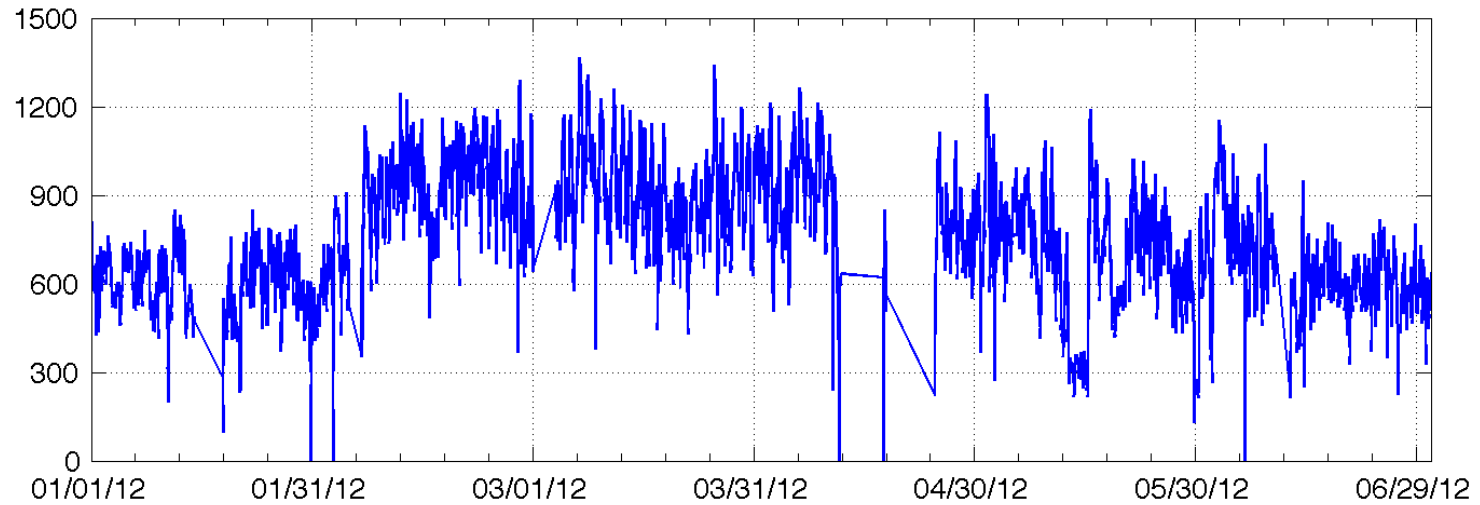


**NUMBER OF RADIALS PER FILE**  
**IDEAL RADIALS**

## Ideal Radial Vector Count for SeaSonde BRMR

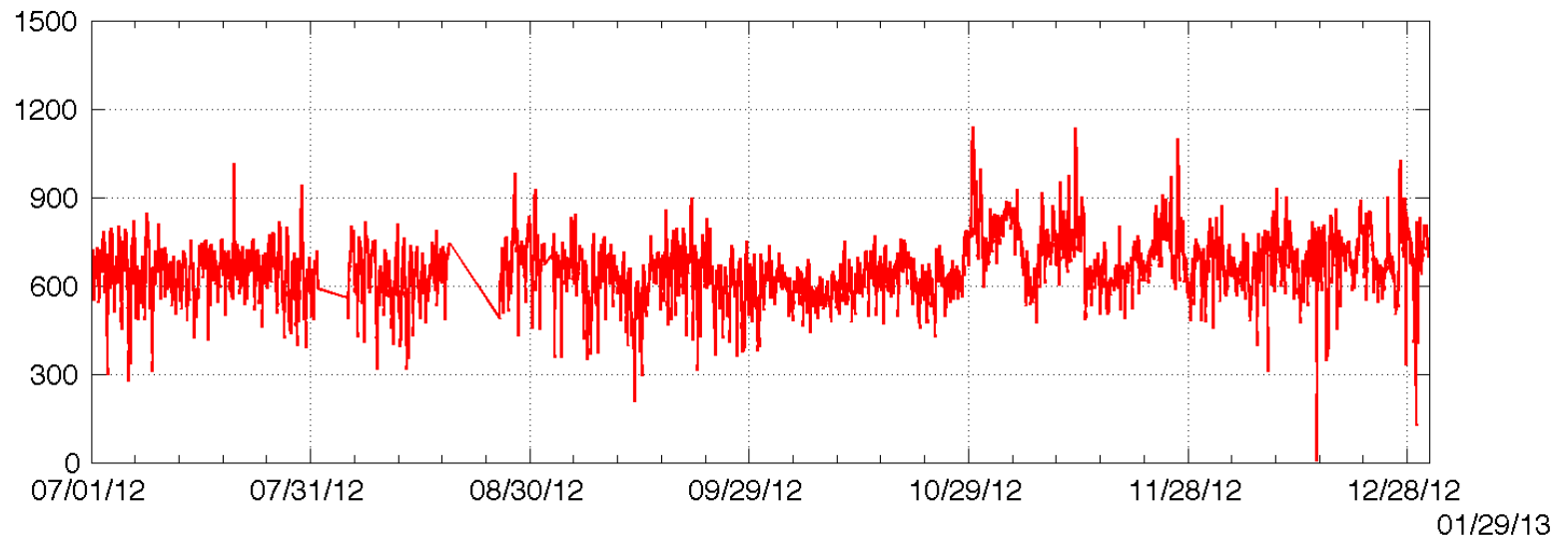
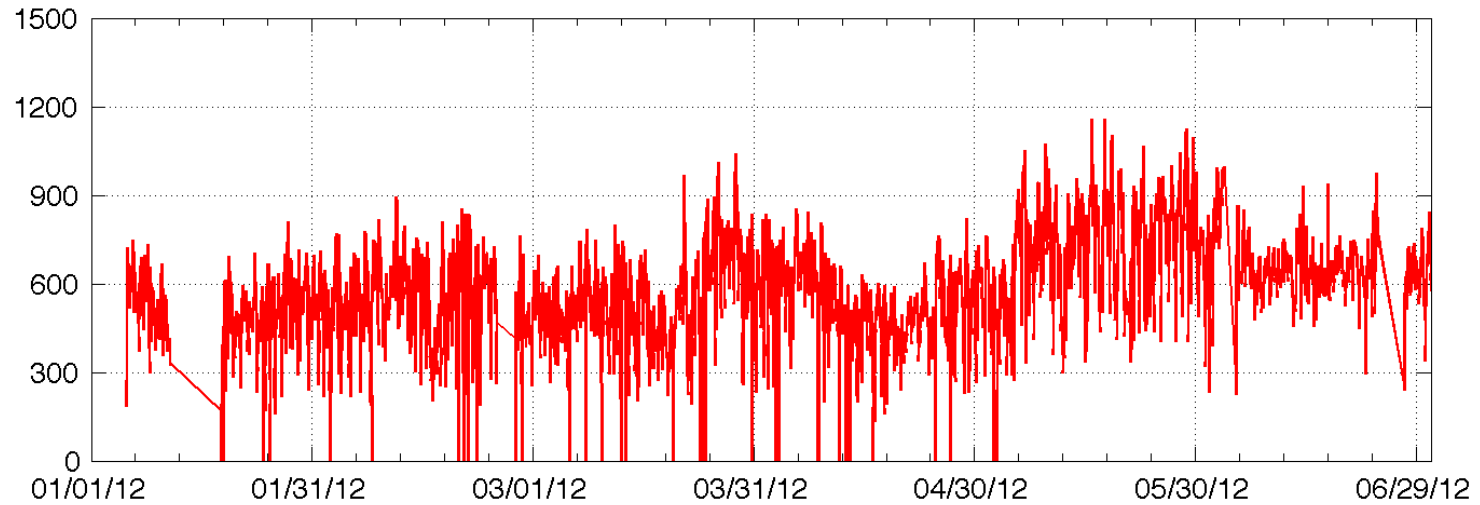


## Ideal Radial Vector Count for SeaSonde BRNT



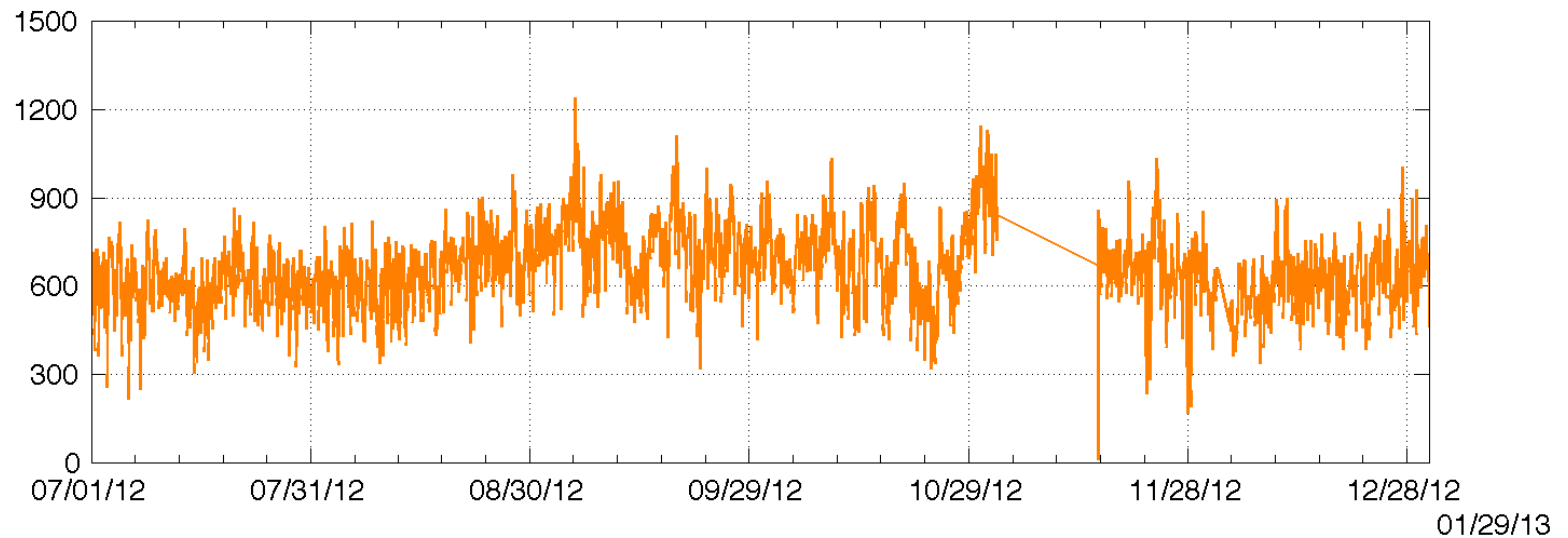
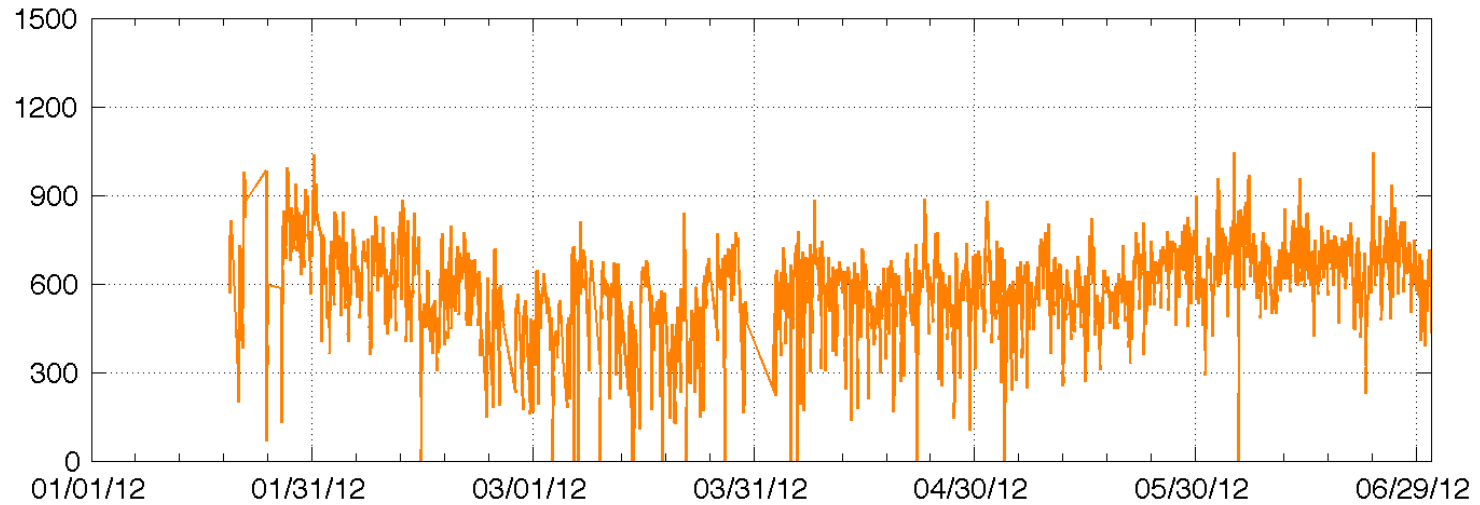
/Users/hroarty/Documents/MATLAB/HJR\_Scripts/Codar\_DIAG\_Scripts/plot\_num\_radials.m

## Ideal Radial Vector Count for SeaSonde RATH



/Users/hroarty/Documents/MATLAB/HJR\_Scripts/Codar\_DIAG\_Scripts/plot\_num\_radials.m

## Ideal Radial Vector Count for SeaSonde WOOD

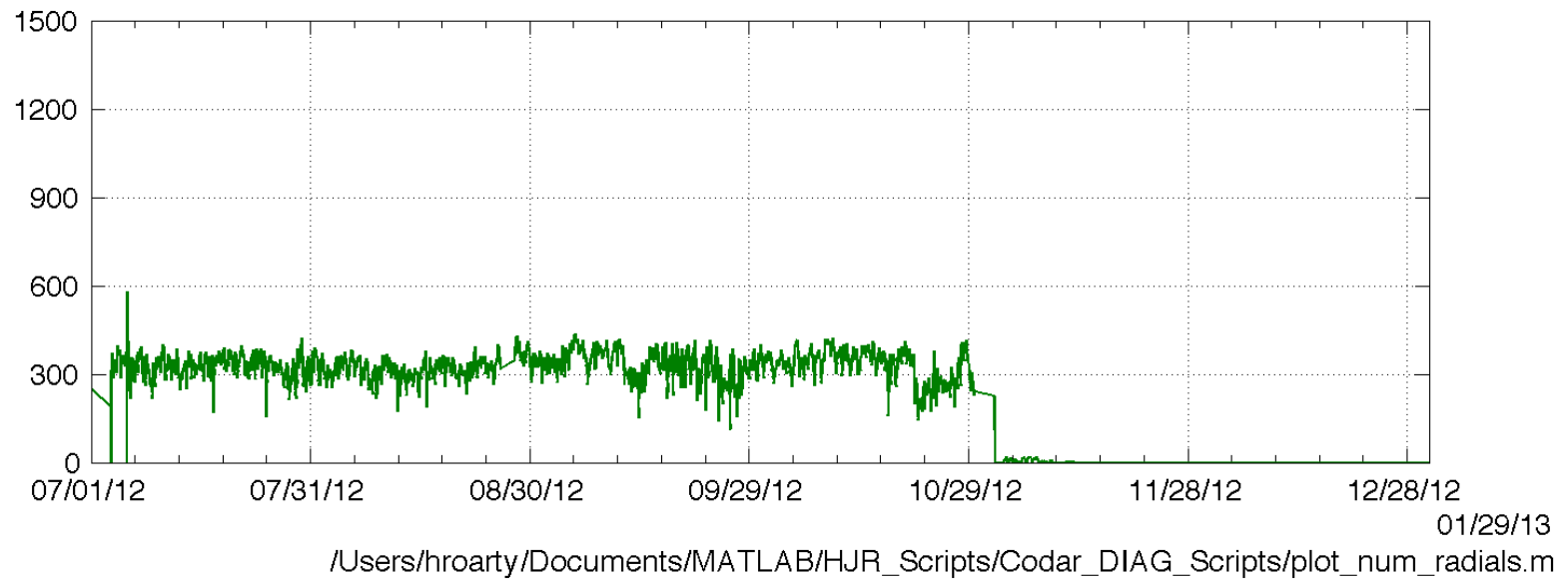
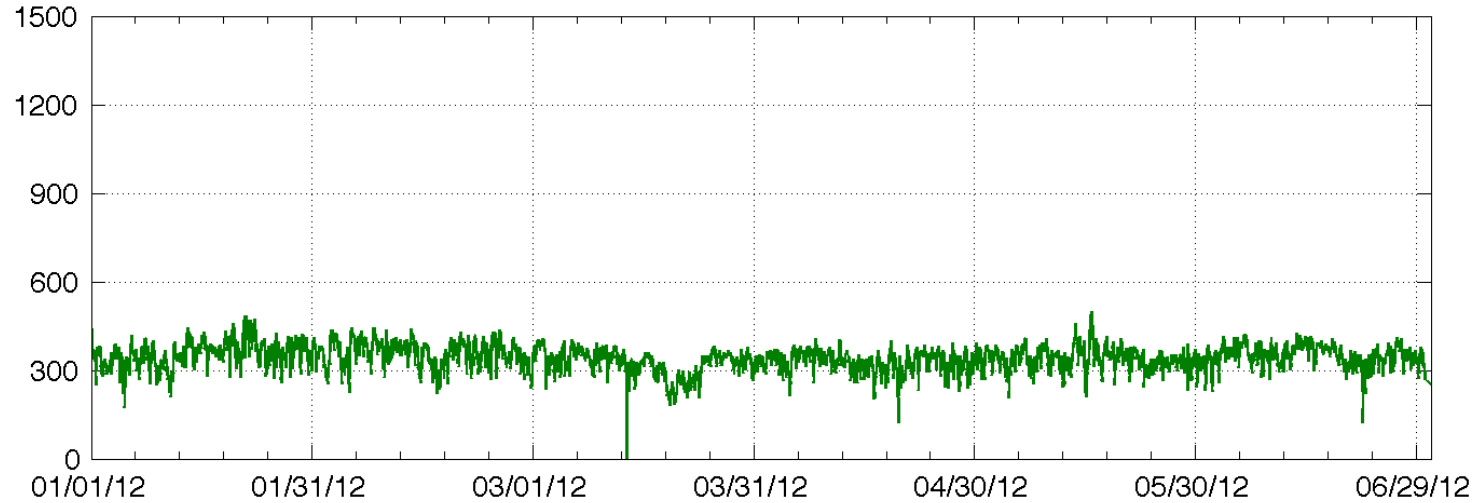


/Users/hroarty/Documents/MATLAB/HJR\_Scripts/Codar\_DIAG\_Scripts/plot\_num\_radials.m



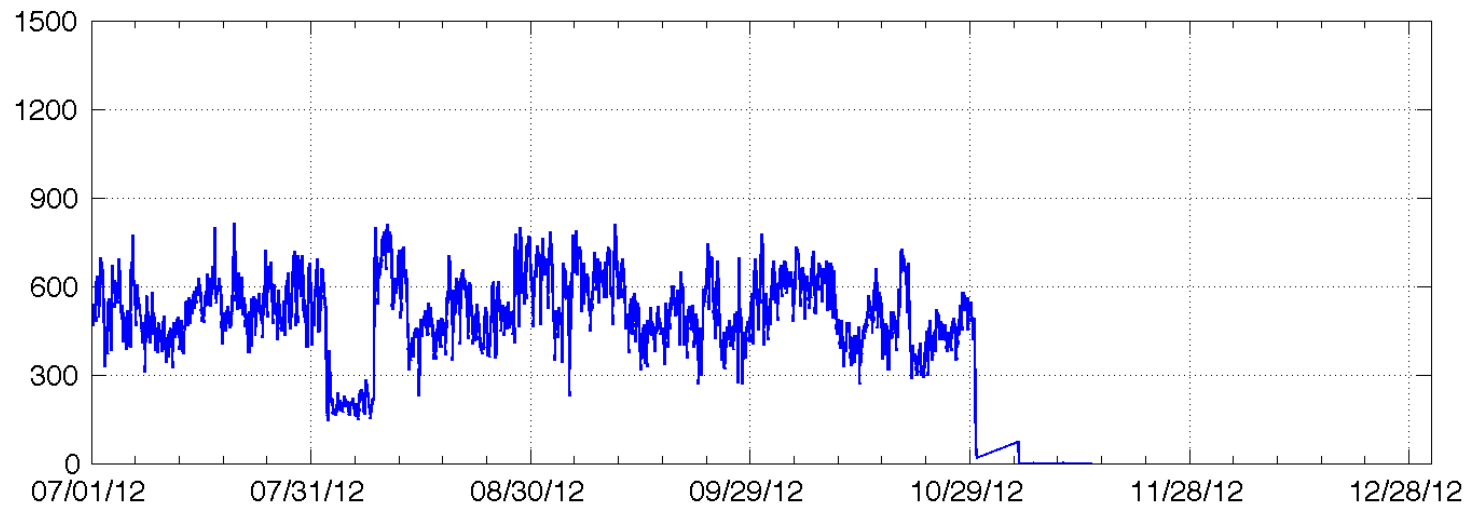
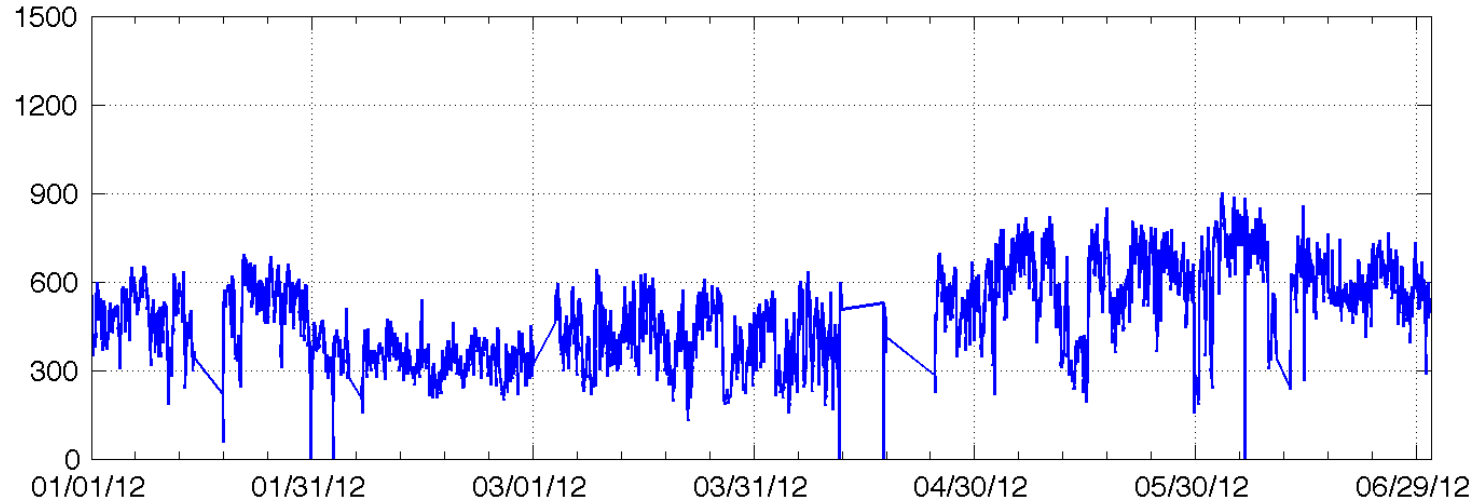
**NUMBER OF RADIALS PER FILE**  
**MEASURED RADIALS**

## Measured Radial Vector Count for SeaSonde BRMR



/Users/hroarty/Documents/MATLAB/HJR\_Scripts/Codar\_DIAG\_Scripts/plot\_num\_radials.m

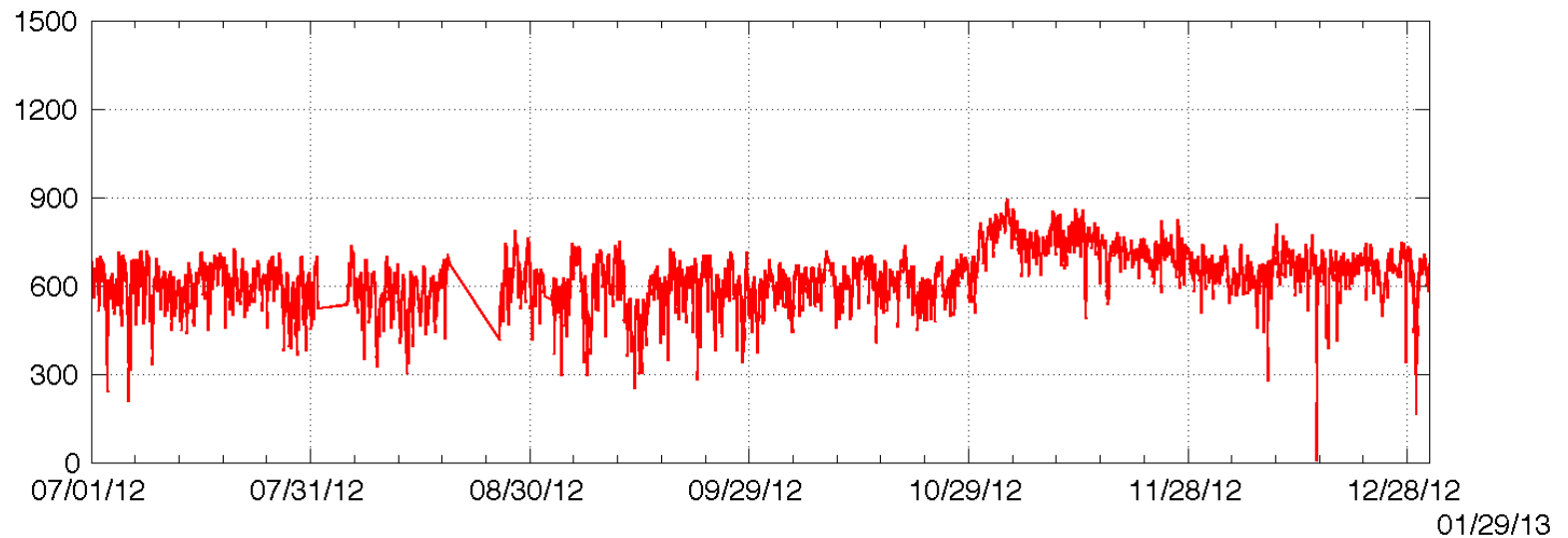
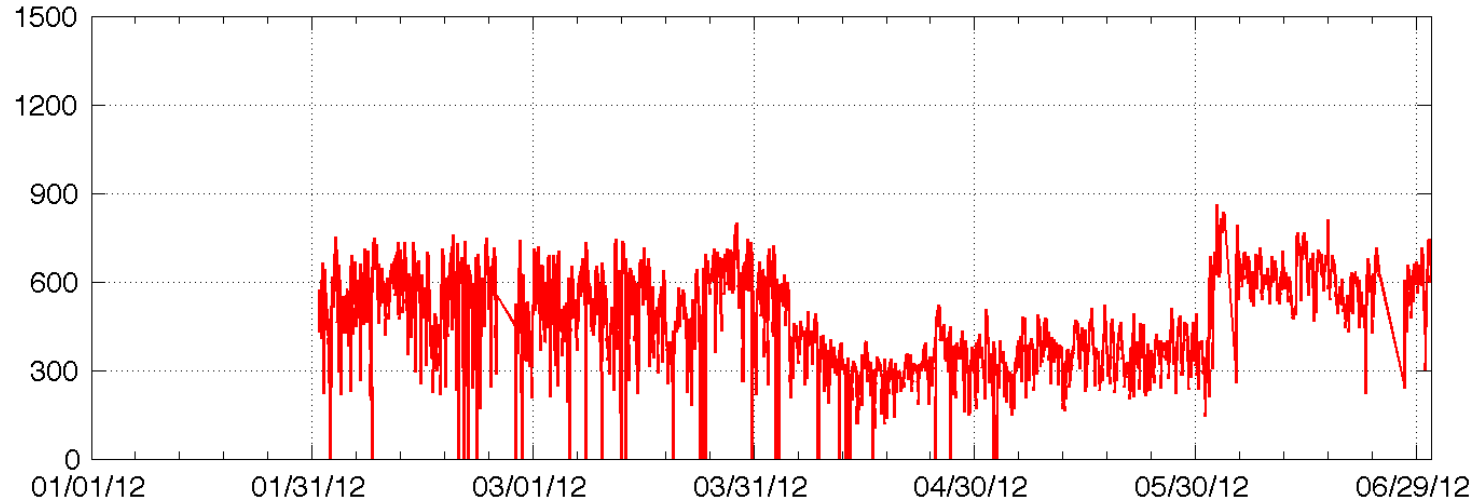
## Measured Radial Vector Count for SeaSonde BRNT



01/29/13

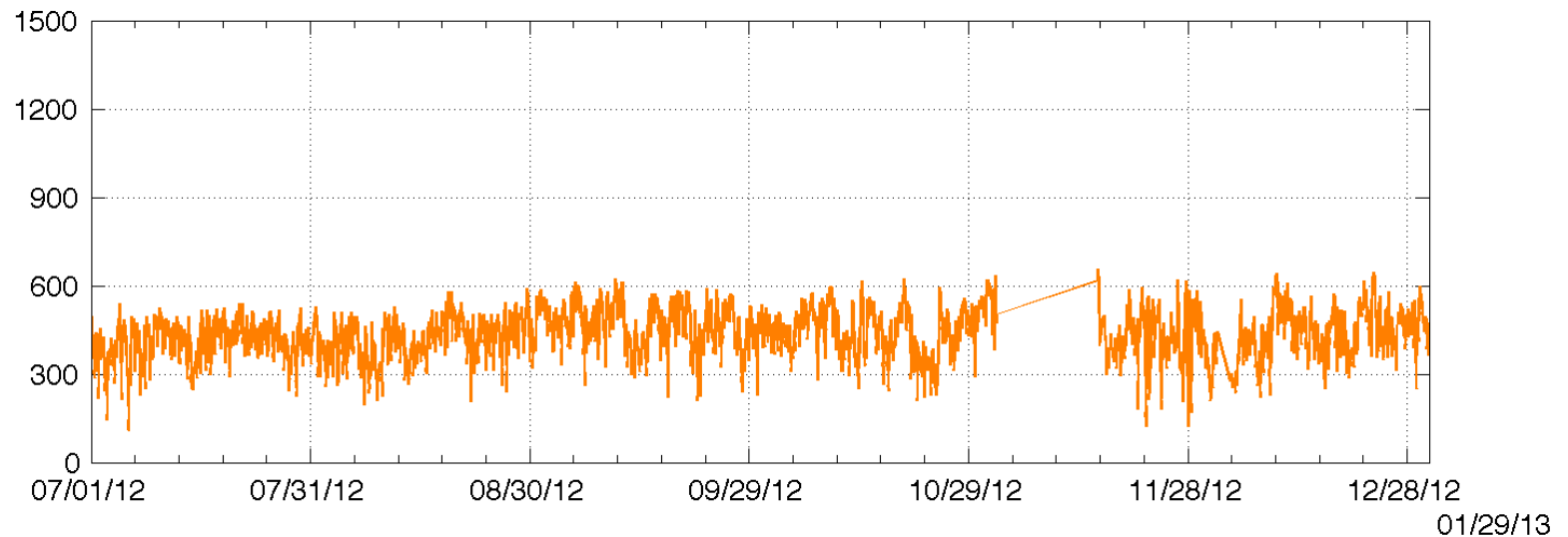
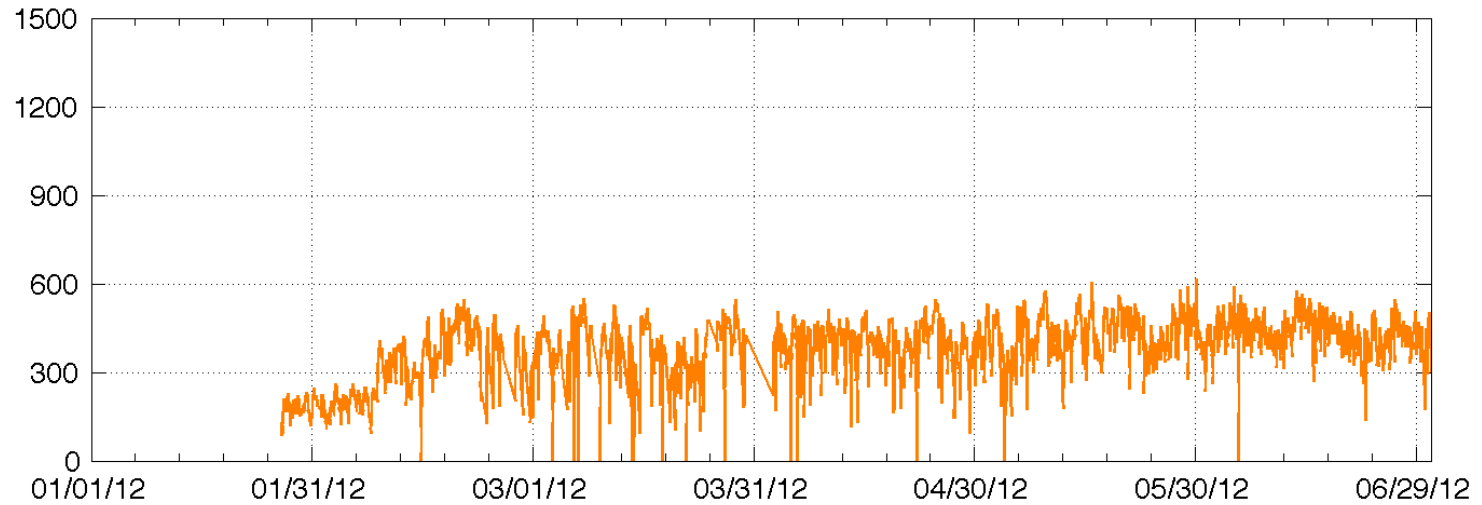
/Users/hroarty/Documents/MATLAB/HJR\_Scripts/Codar\_DIAG\_Scripts/plot\_num\_radials.m

## Measured Radial Vector Count for SeaSonde RATH



/Users/hroarty/Documents/MATLAB/HJR\_Scripts/Codar\_DIAG\_Scripts/plot\_num\_radials.m

## Measured Radial Vector Count for SeaSonde WOOD



/Users/hroarty/Documents/MATLAB/HJR\_Scripts/Codar\_DIAG\_Scripts/plot\_num\_radials.m

Section 03:

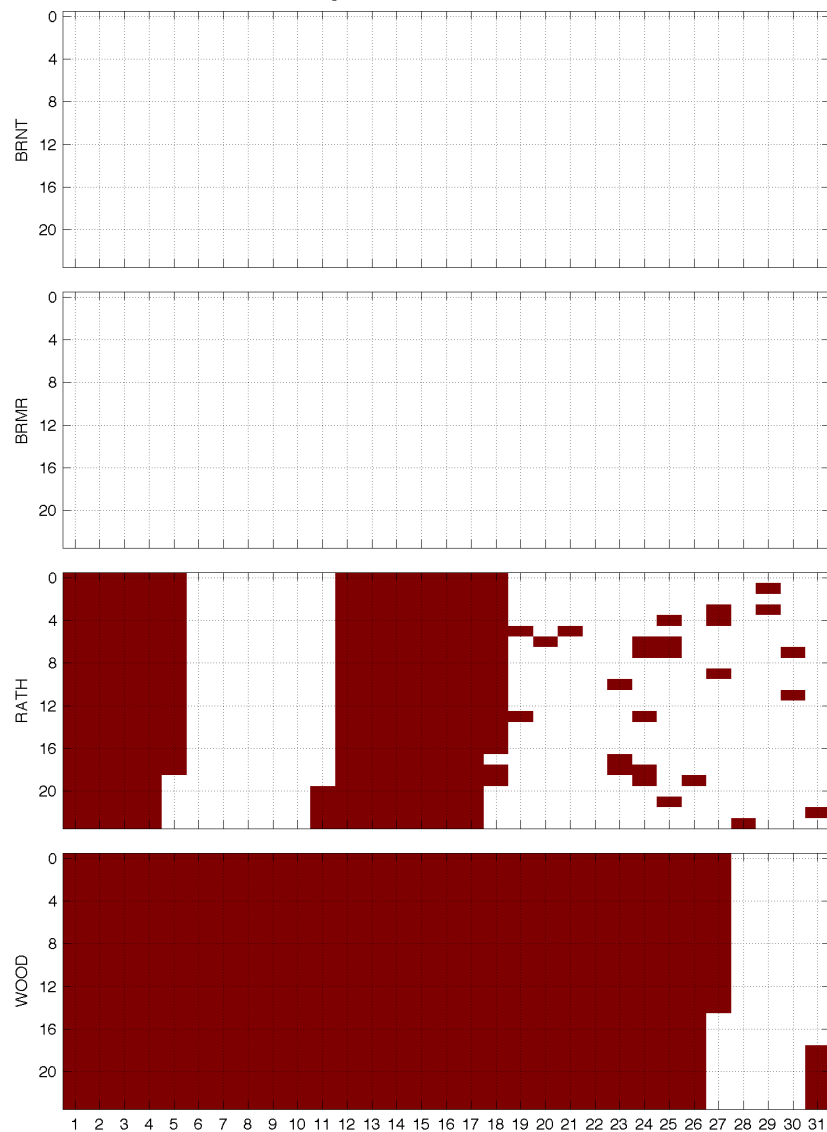
**BPU**

# **Ideal Radial Inventory**

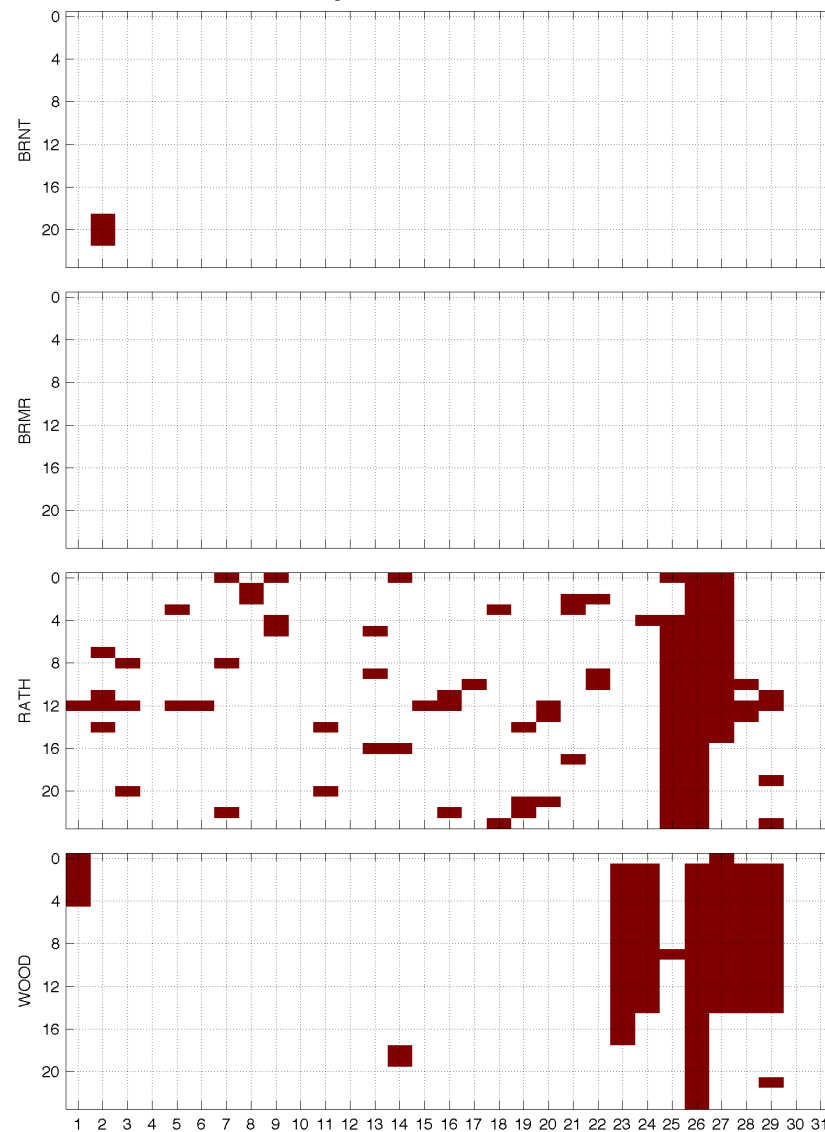
Red Indicates Missing Data

January 1, 2012 to December 31, 2012

Missing Ideal Radials from 1/2012

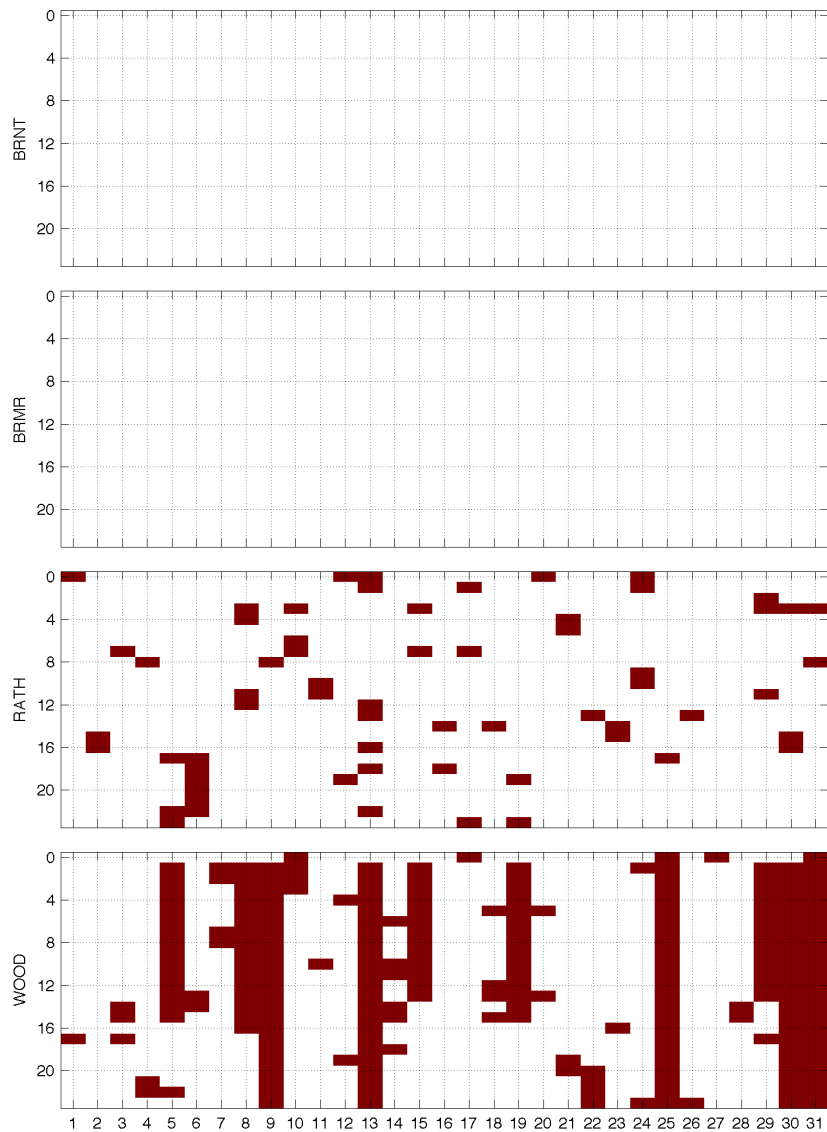


Missing Ideal Radials from 2/2012

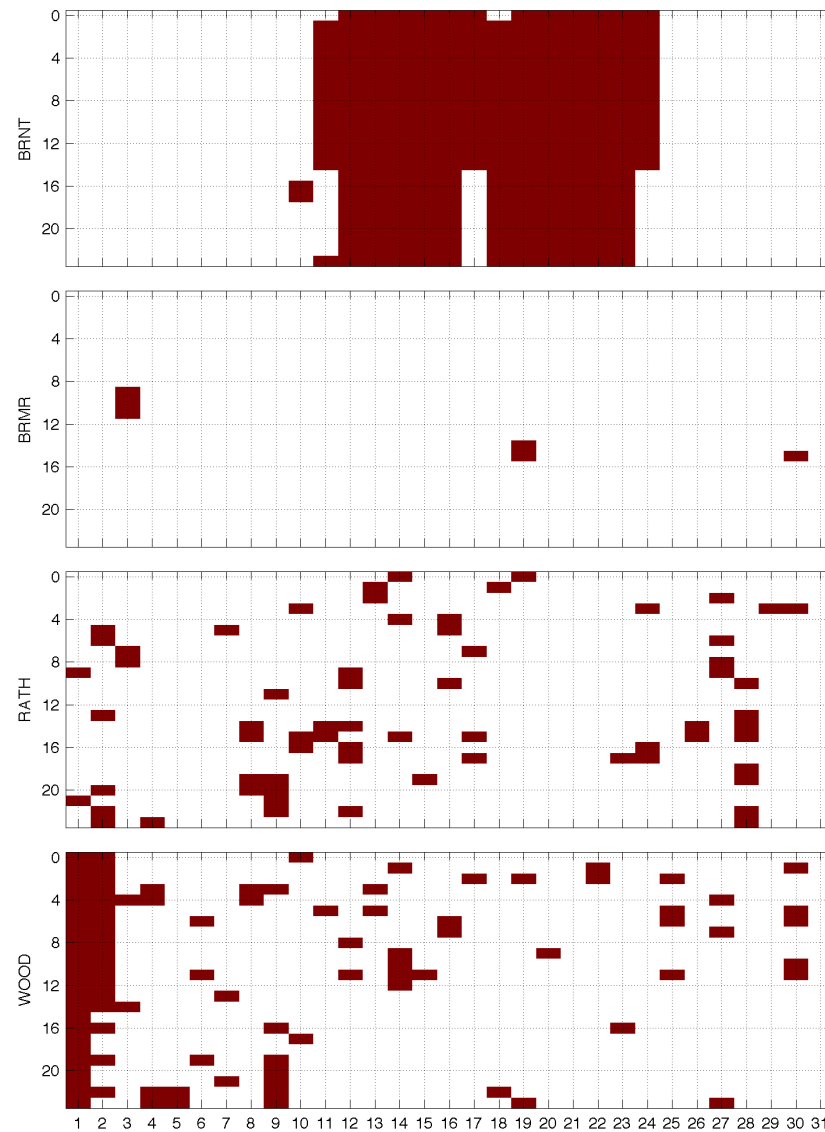


Ideal

Missing Ideal Radials from 3/2012



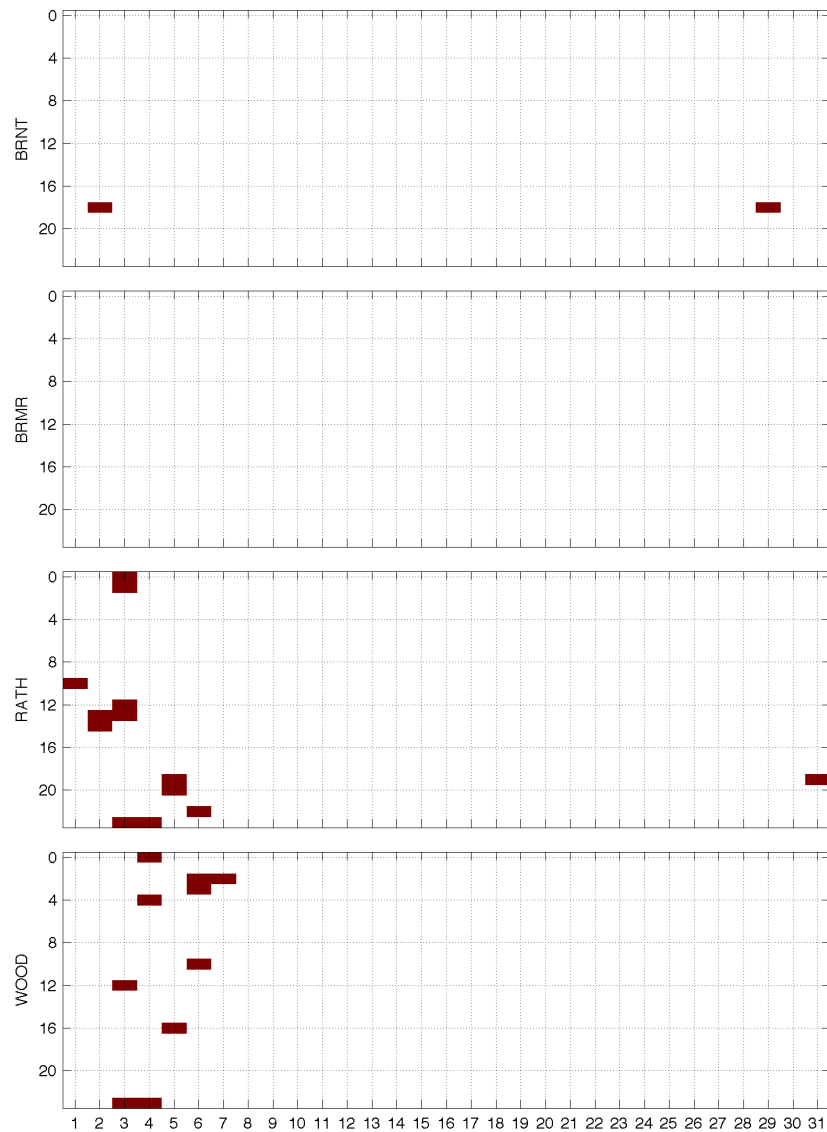
Missing Ideal Radials from 4/2012



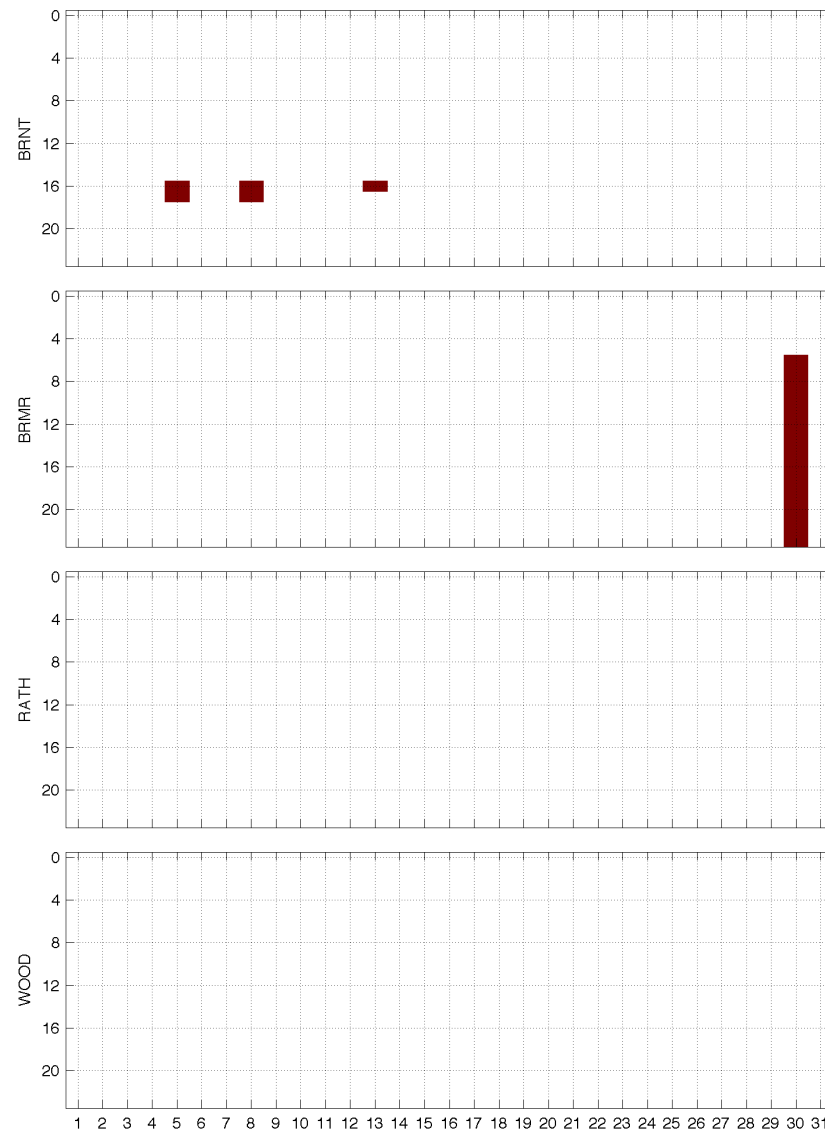
Ideal



Missing Ideal Radials from 5/2012

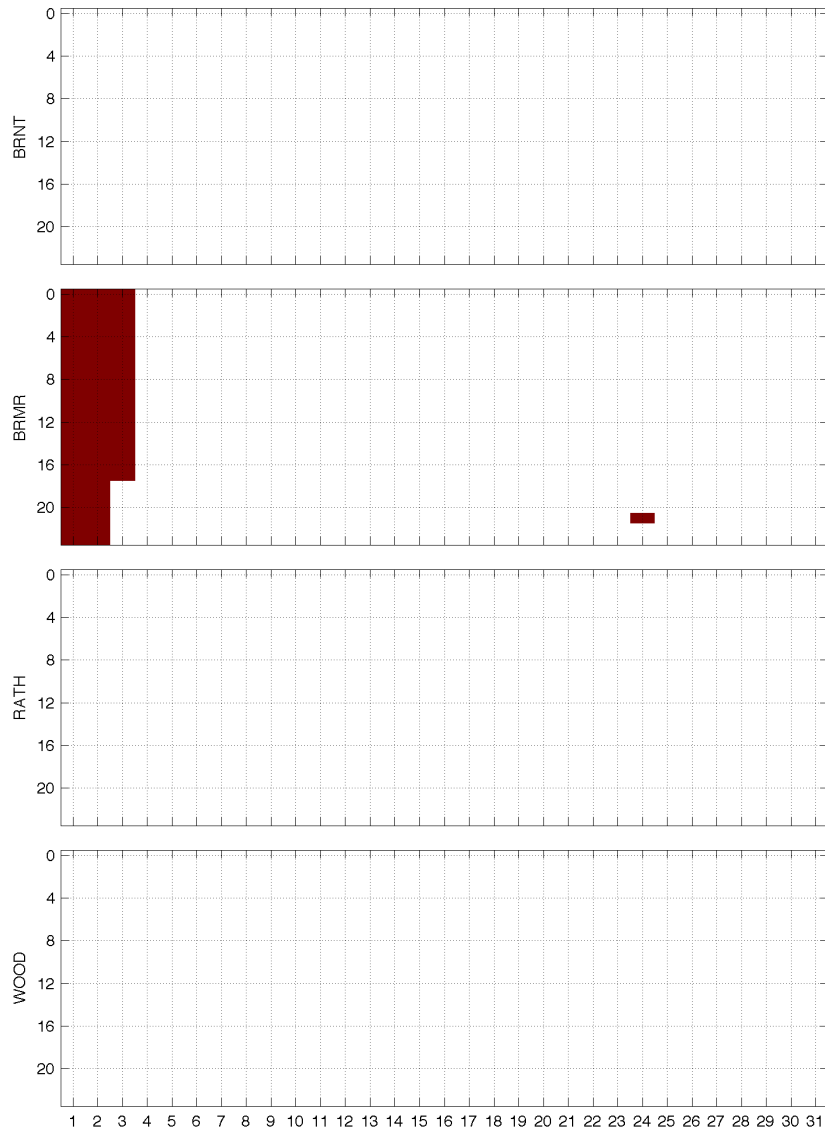


Missing Ideal Radials from 6/2012

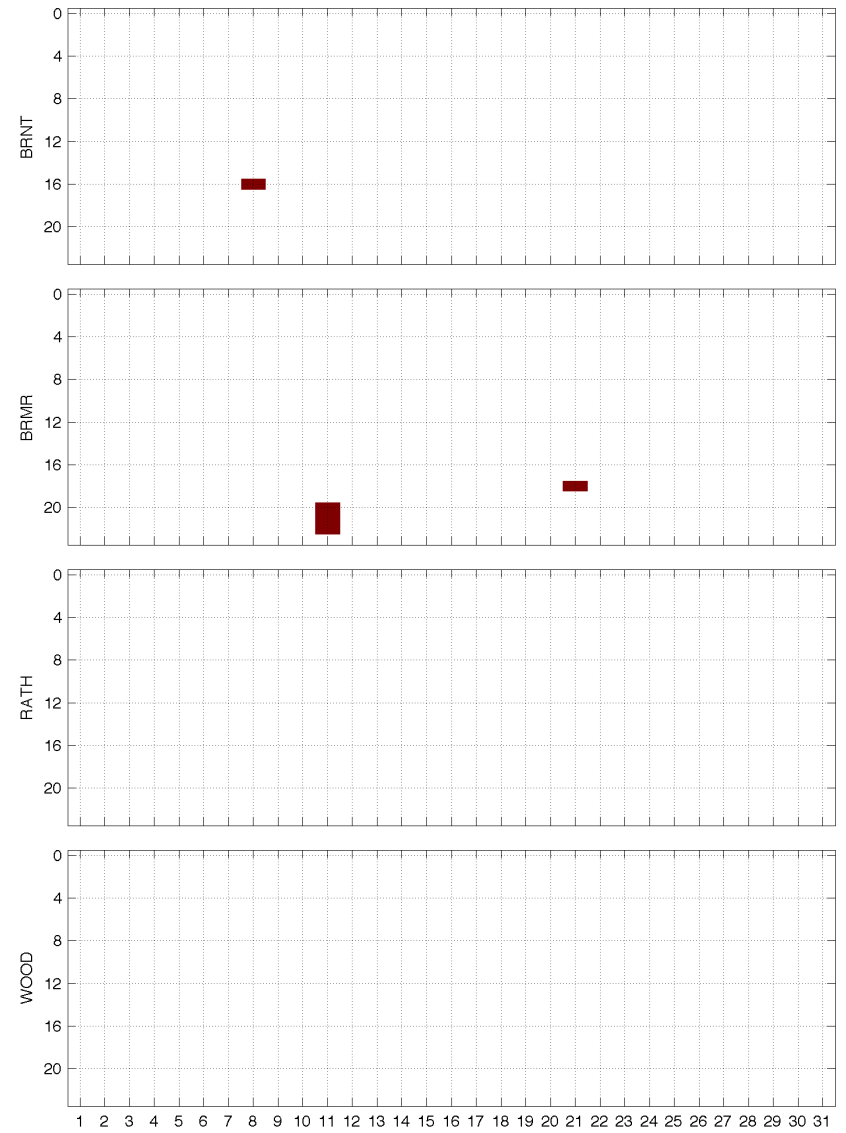


Ideal

Missing Ideal Radials from 7/2012

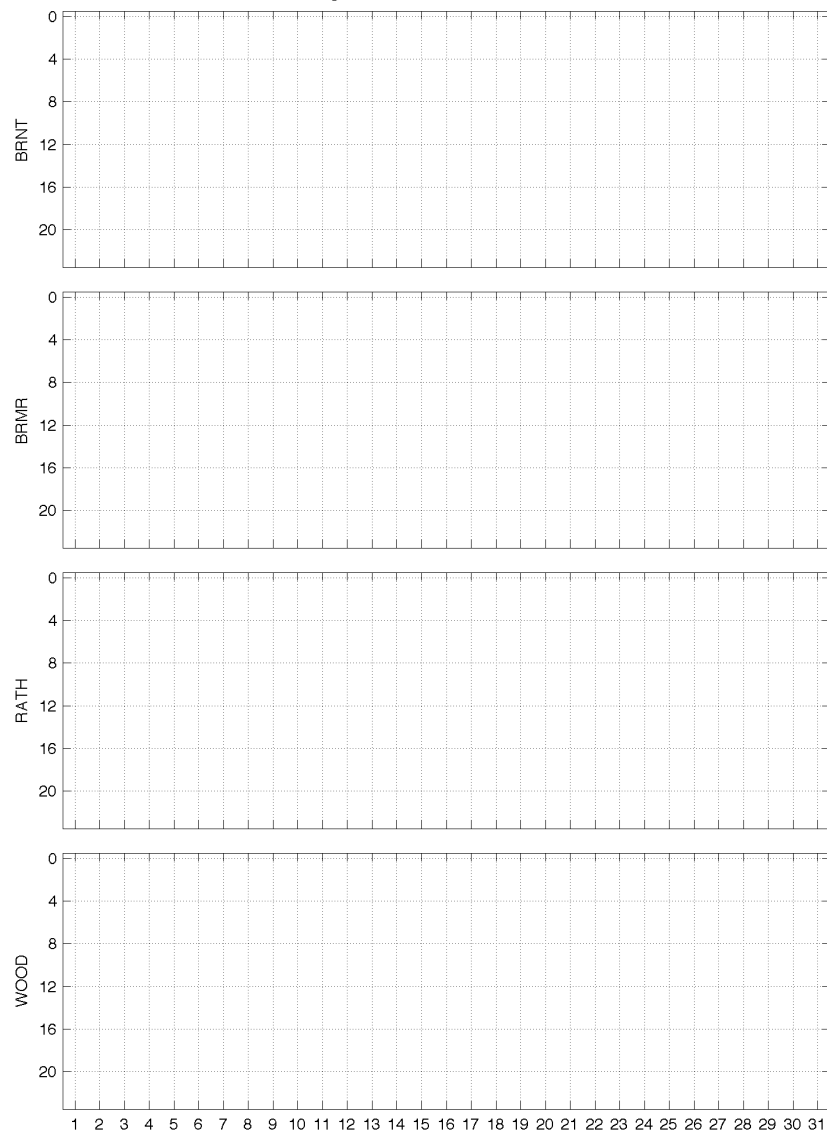


Missing Ideal Radials from 8/2012

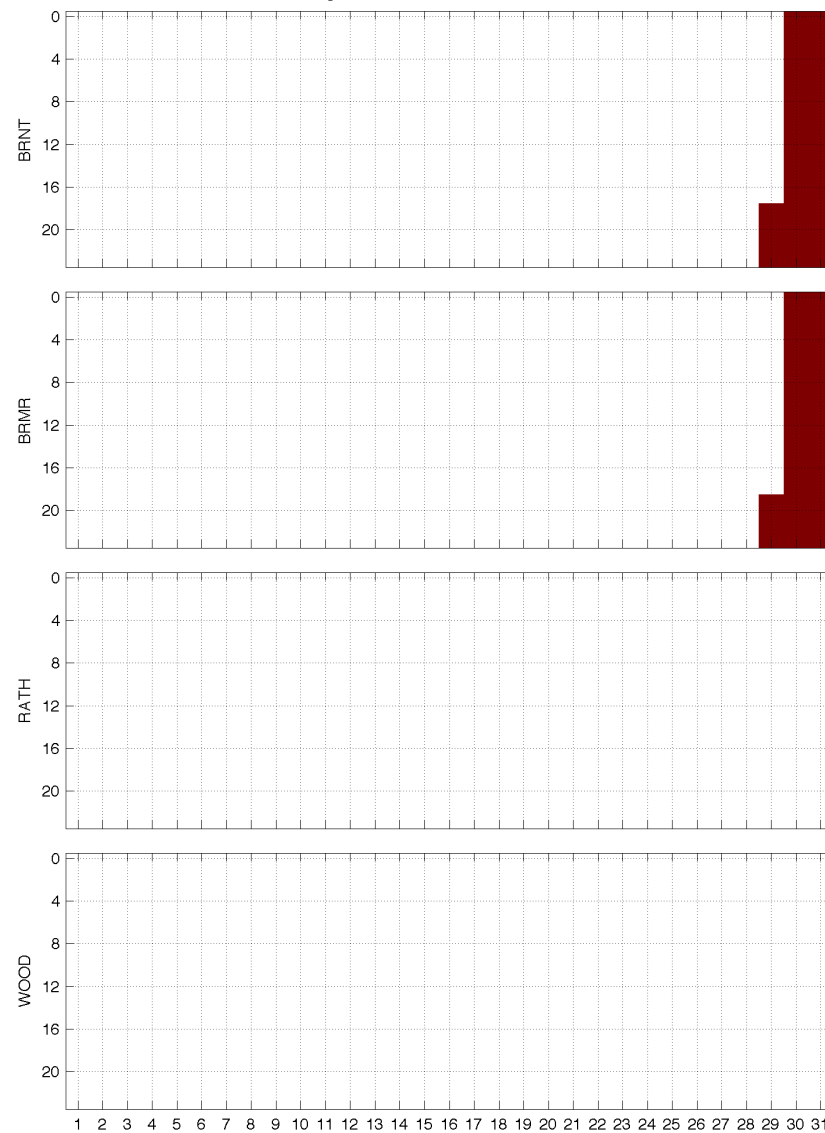


Ideal

Missing Ideal Radials from 9/2012

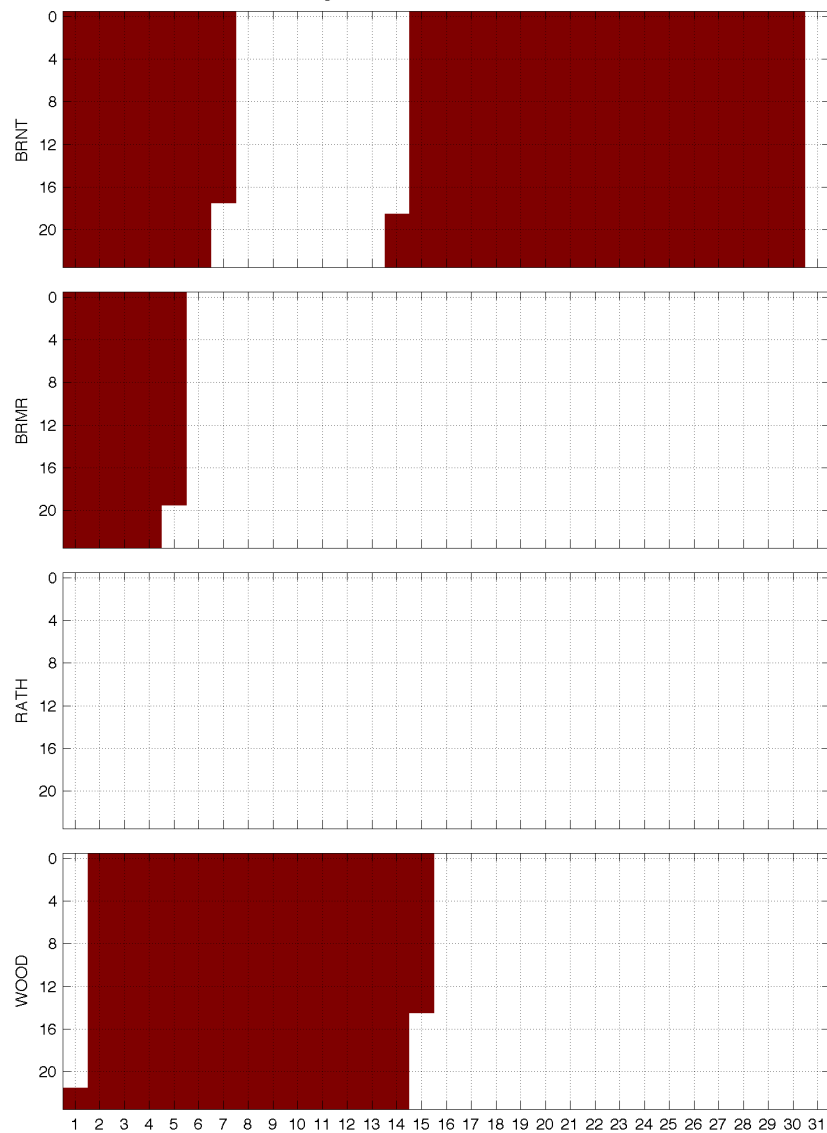


Missing Ideal Radials from 10/2012

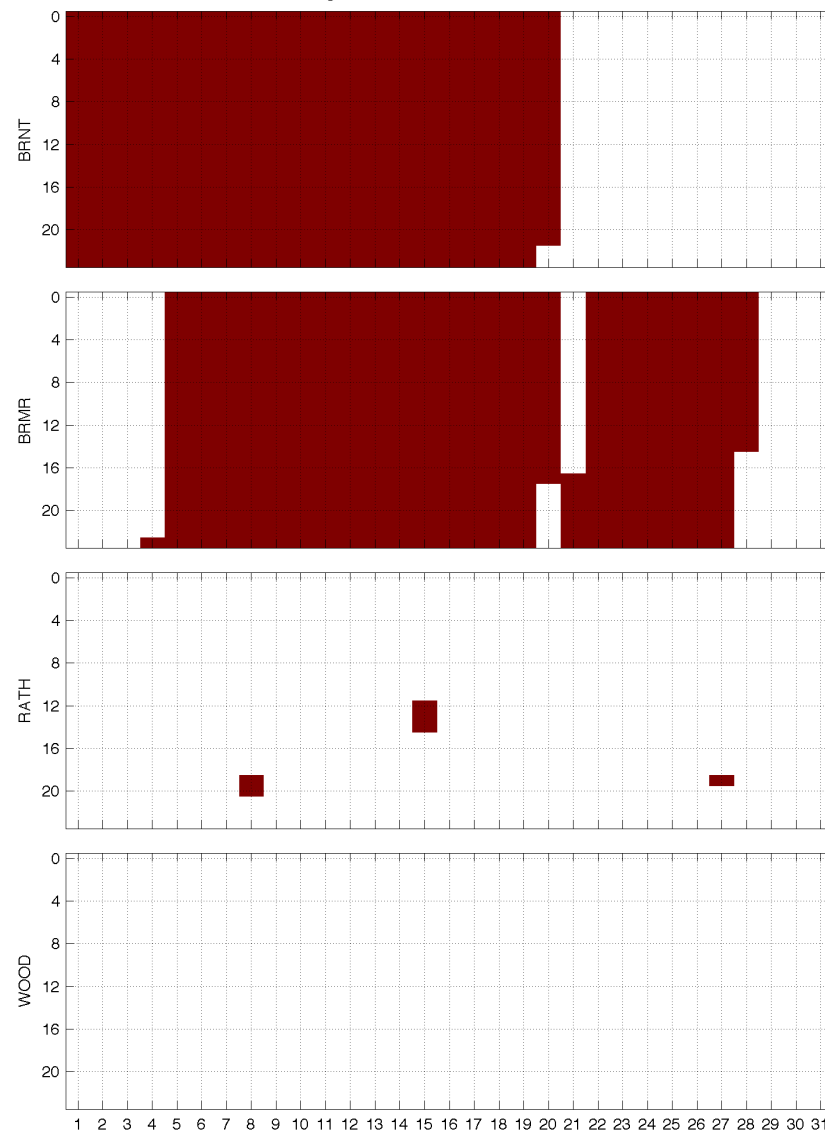


Ideal

Missing Ideal Radials from 11/2012



Missing Ideal Radials from 12/2012



Ideal

Section 04:

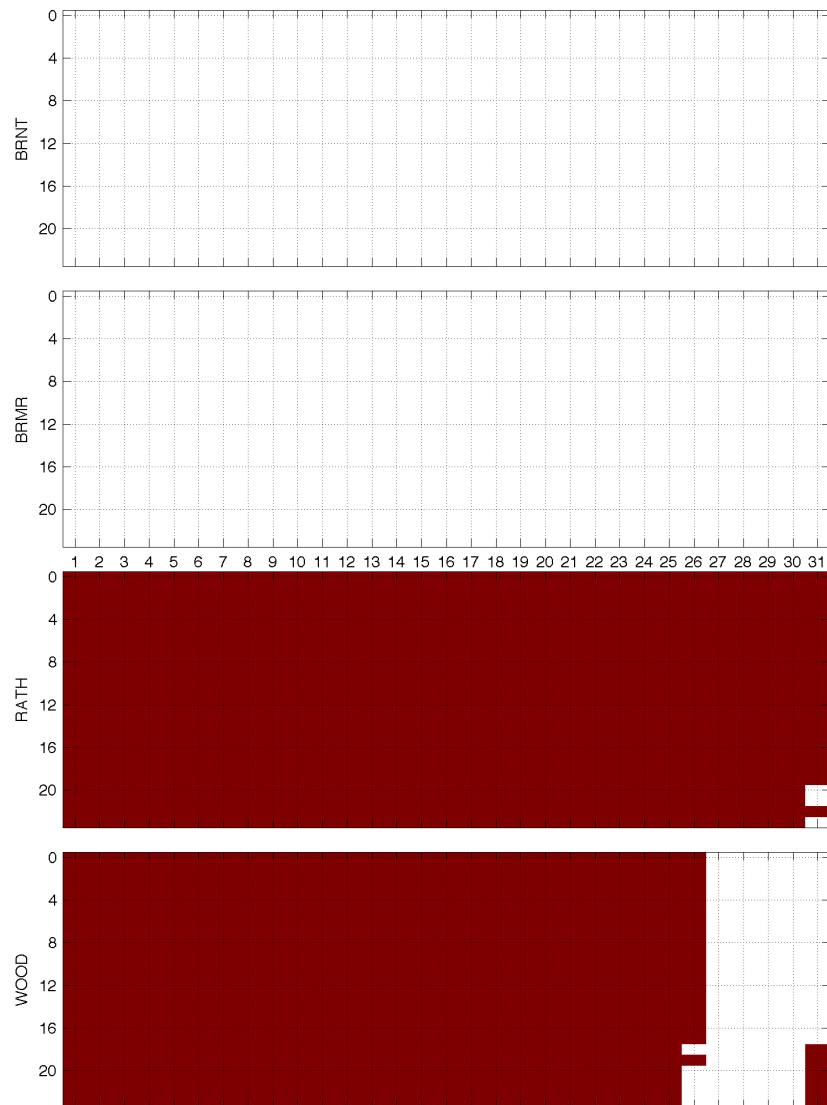
**BPU**

# Measured Radial Inventory

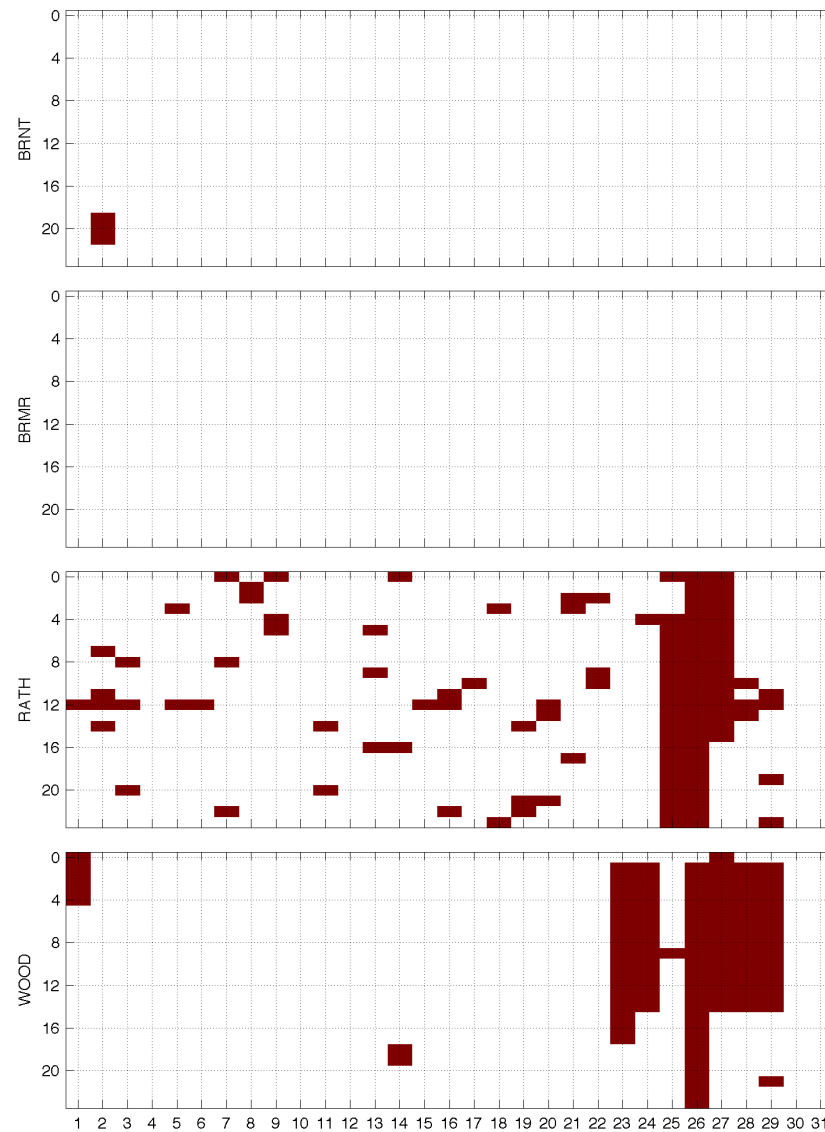
Red Indicates Missing Data

January 1, 2012 to December 31, 2012

Missing Measured Radials from 1/2012

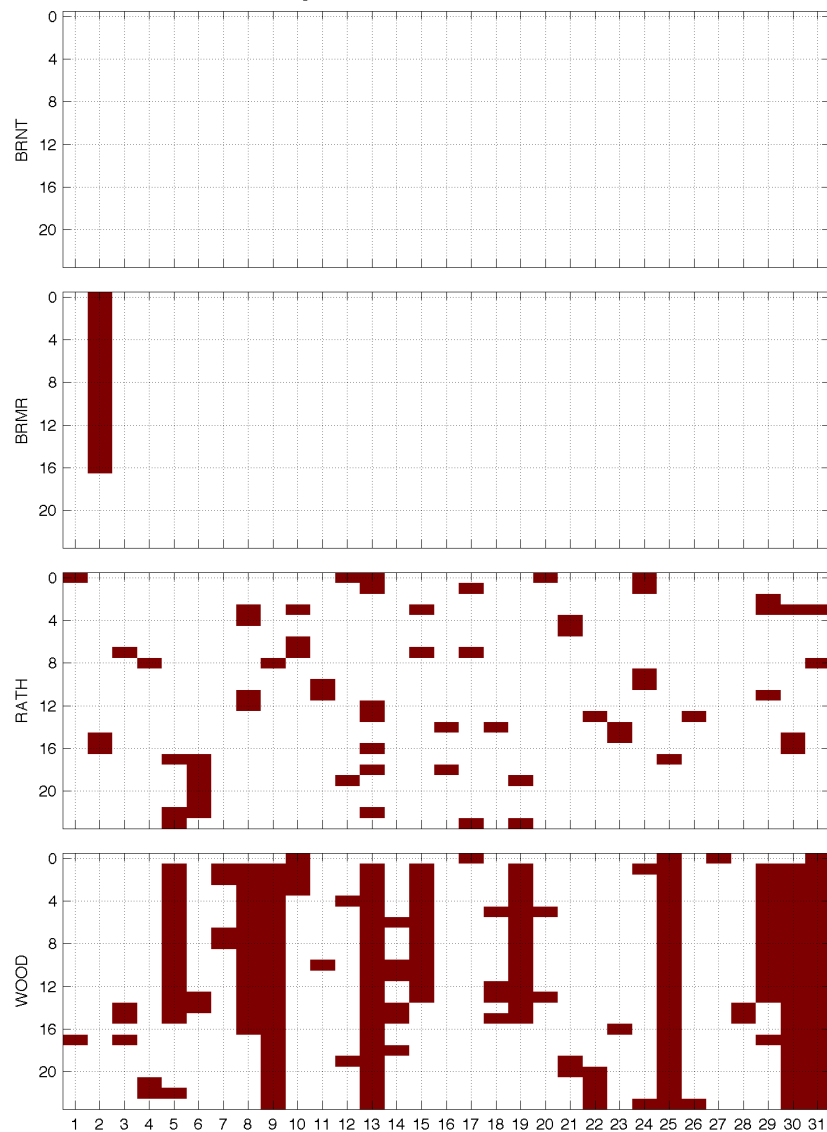


Missing Measured Radials from 2/2012

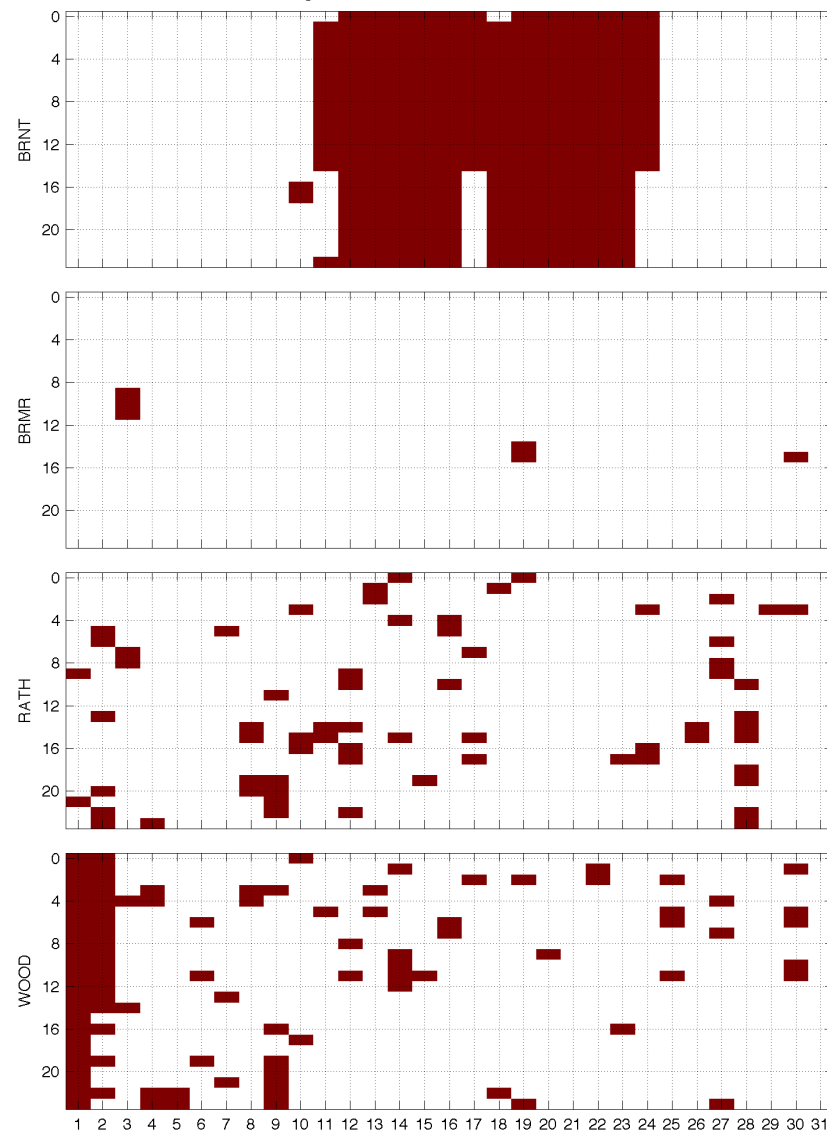


Measured

Missing Measured Radials from 3/2012

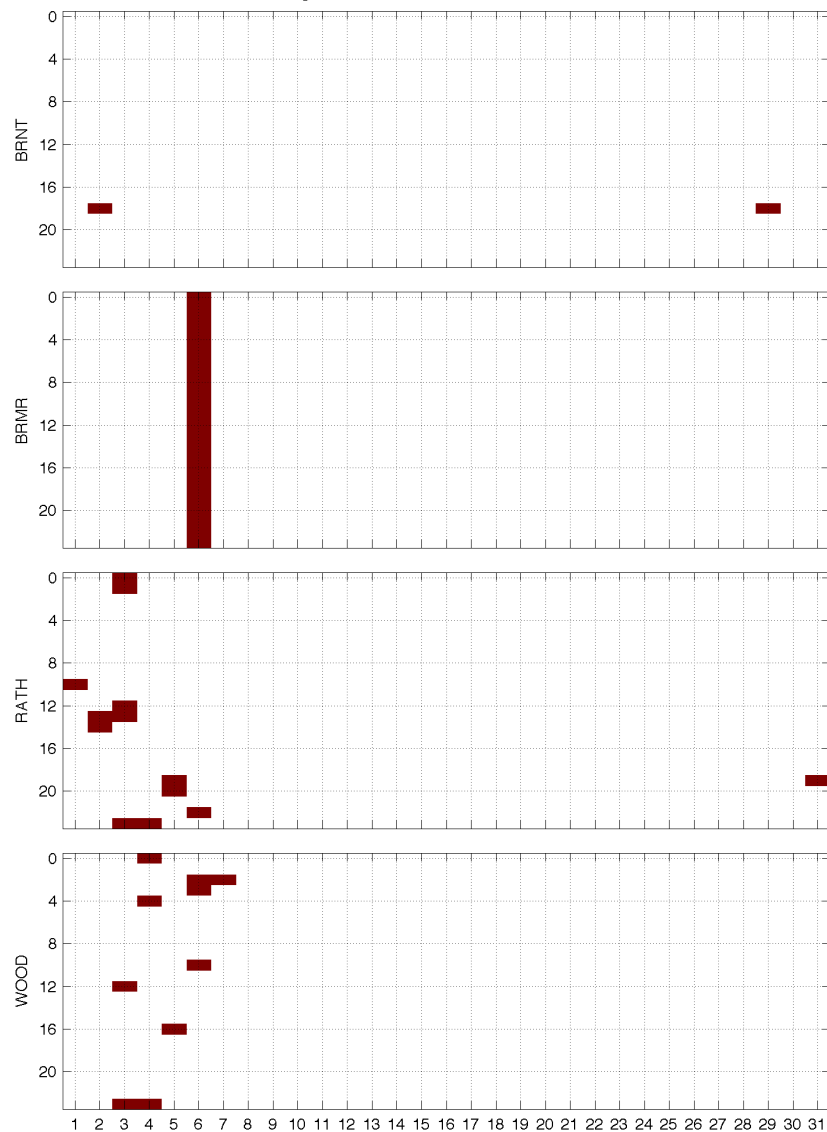


Missing Measured Radials from 4/2012

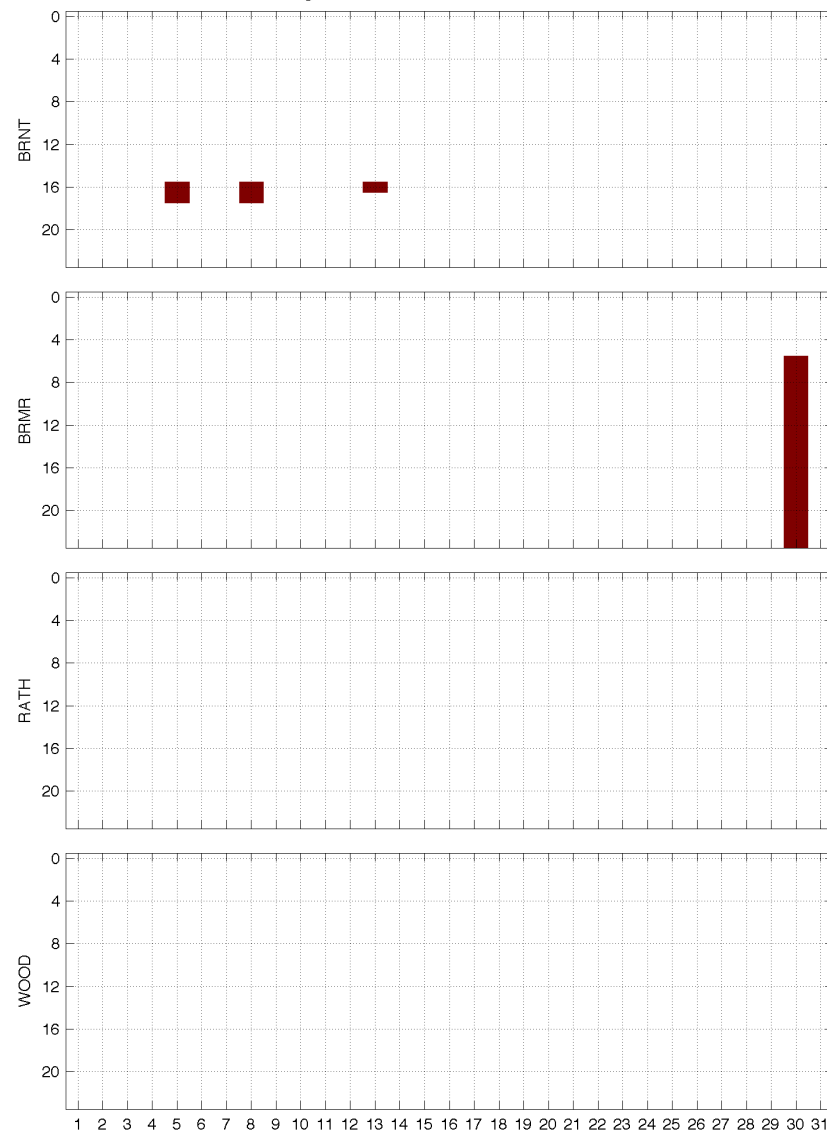


Measured

Missing Measured Radials from 5/2012



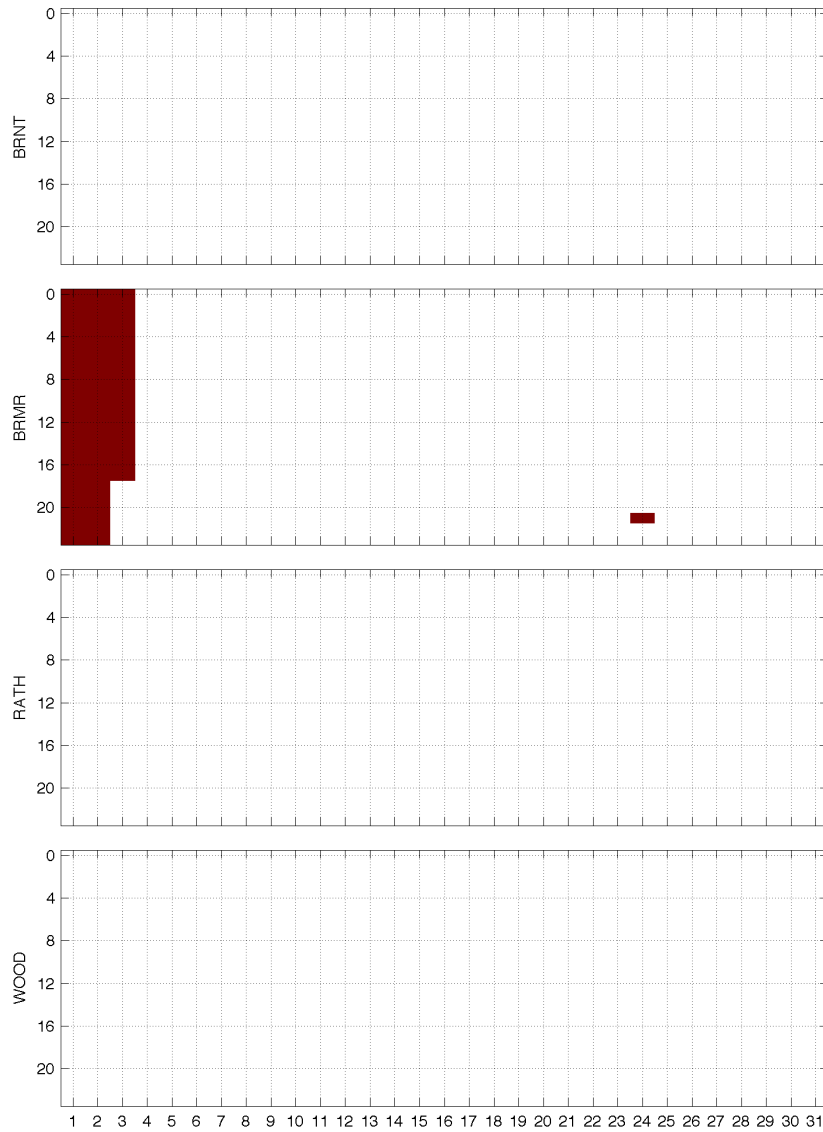
Missing Measured Radials from 6/2012



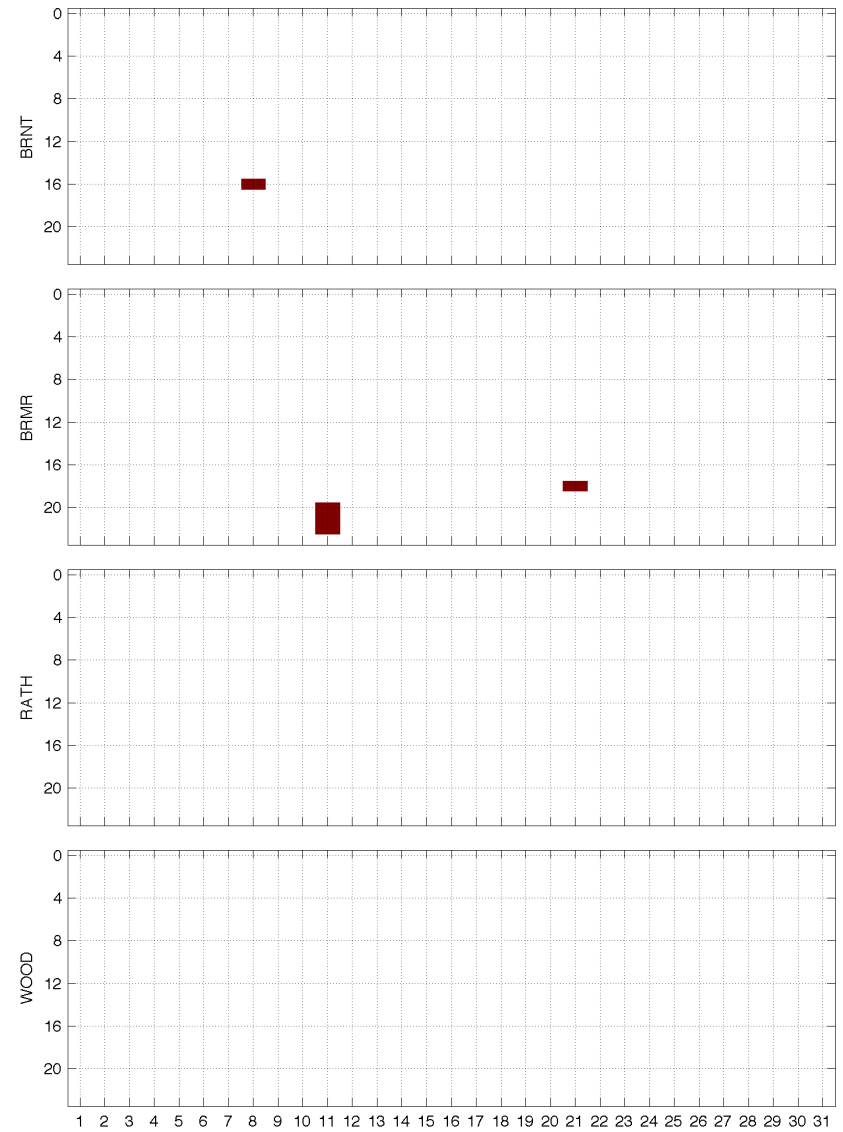
Measured



Missing Measured Radials from 7/2012

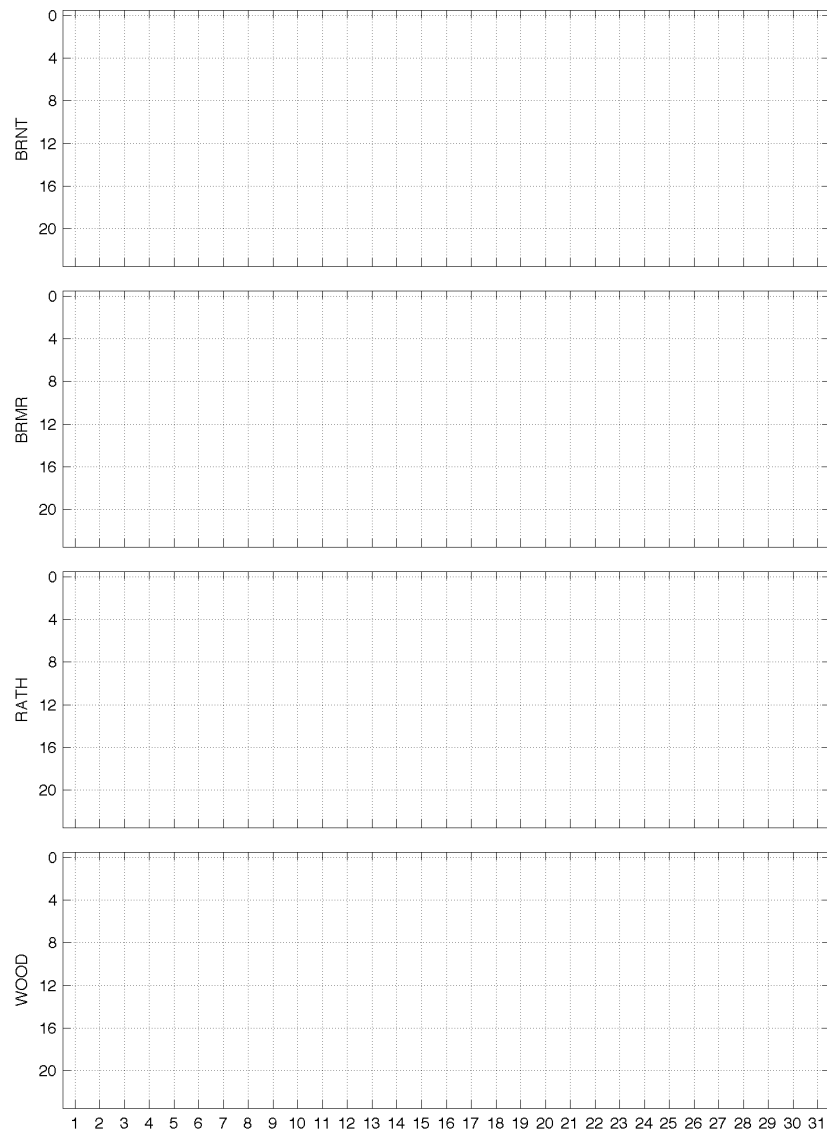


Missing Measured Radials from 8/2012

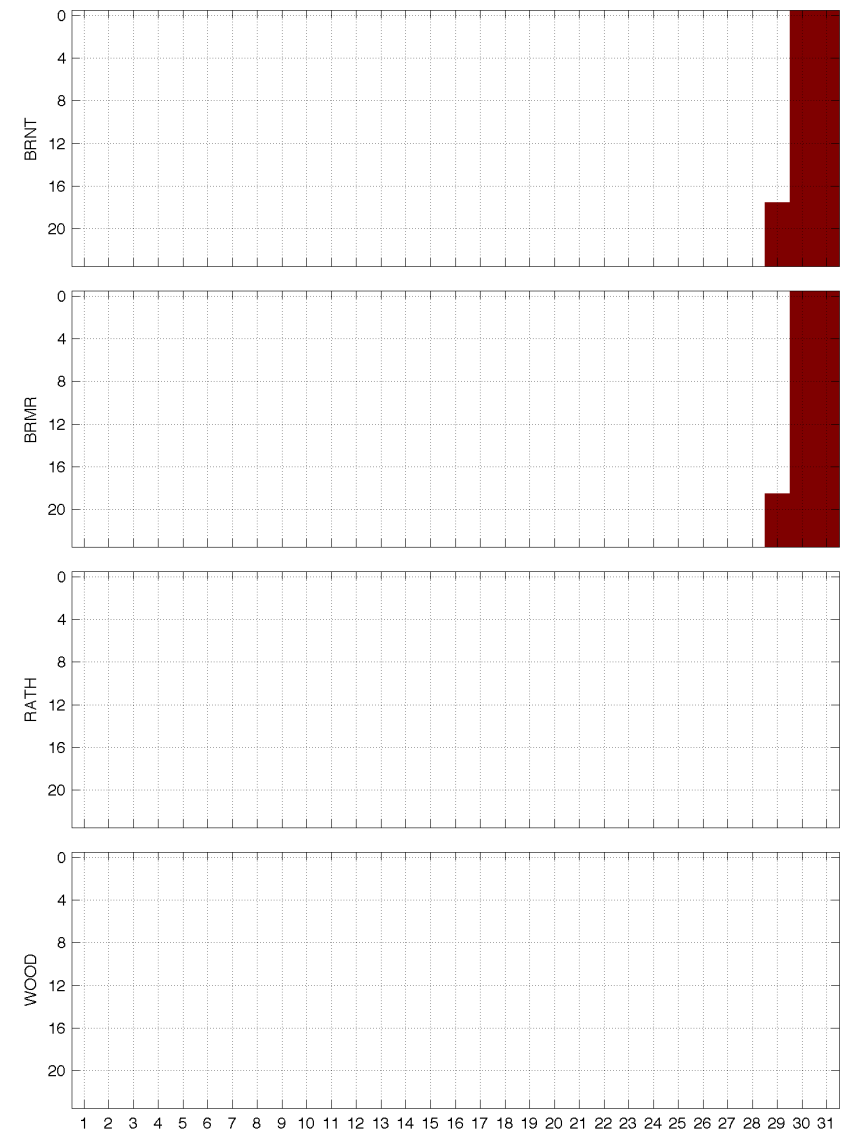


Measured

Missing Measured Radials from 9/2012

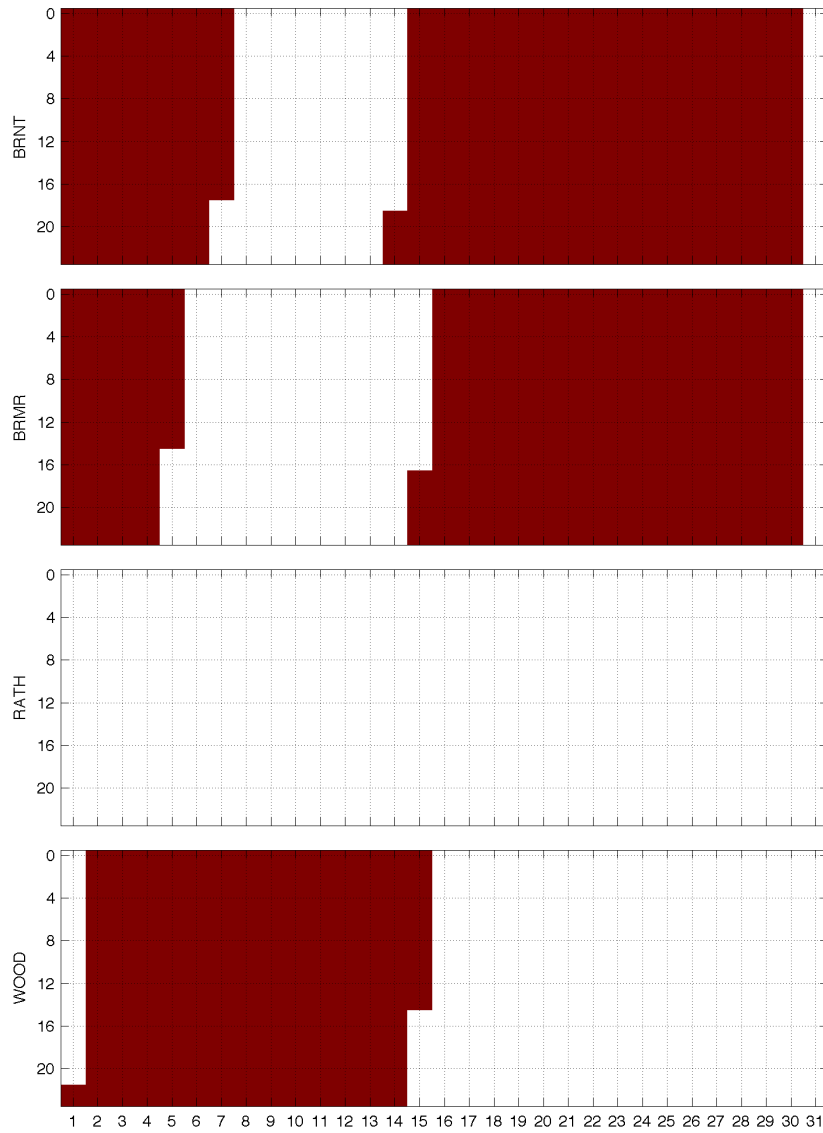


Missing Measured Radials from 10/2012

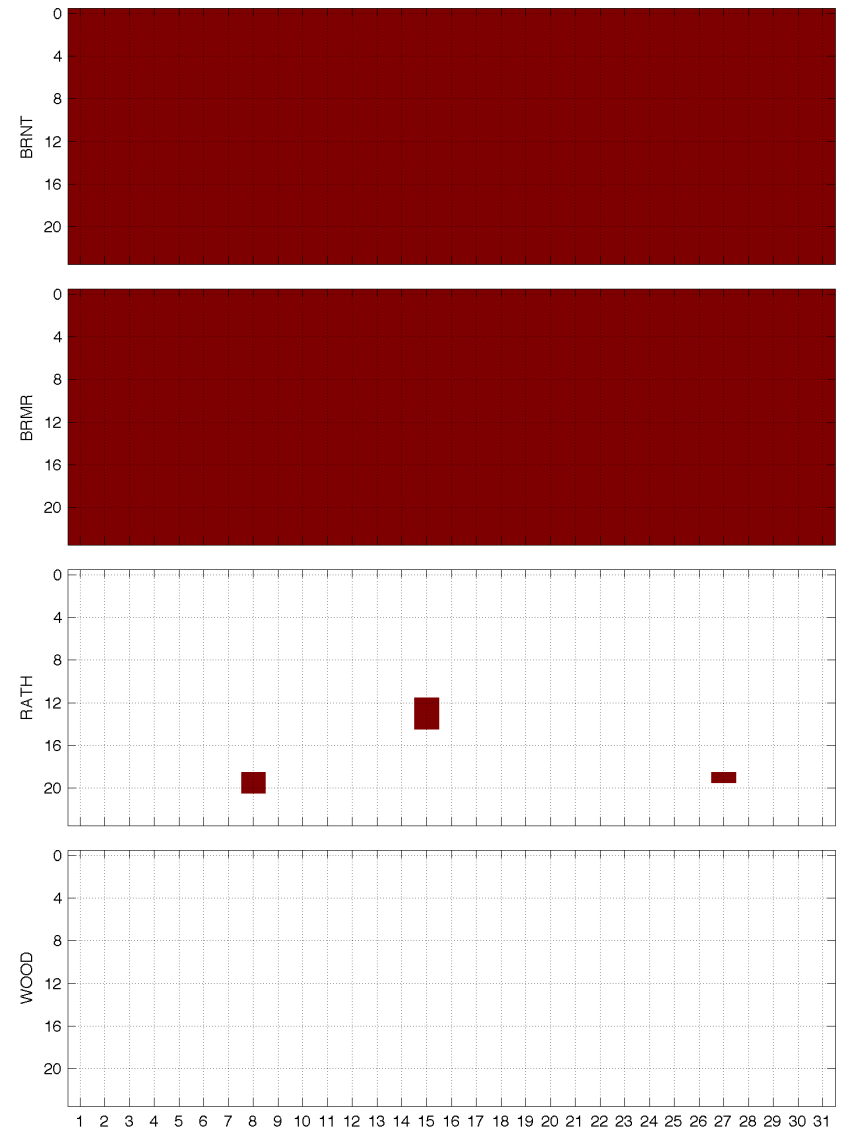


Measured

Missing Measured Radials from 11/2012



Missing Measured Radials from 12/2012



Measured

## Section 05:

# BPU Radial Contribution to Totals

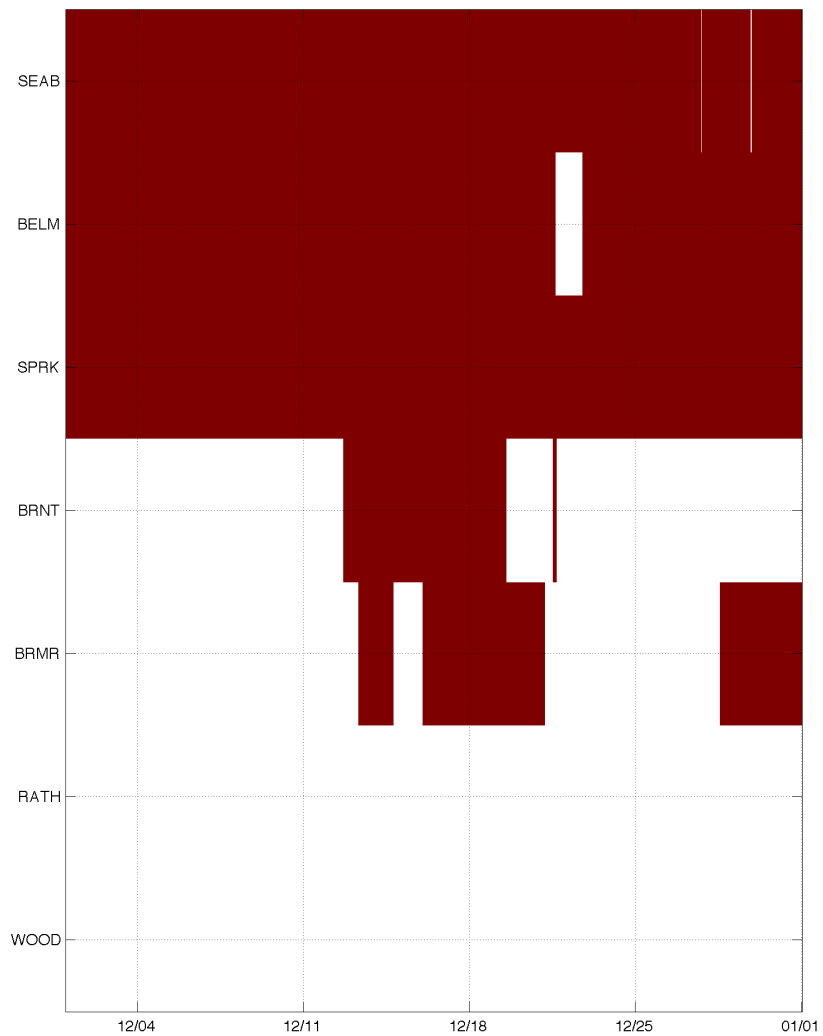
White – No radial data from that site contributed to the totals

Red – Ideal radials were used in totals

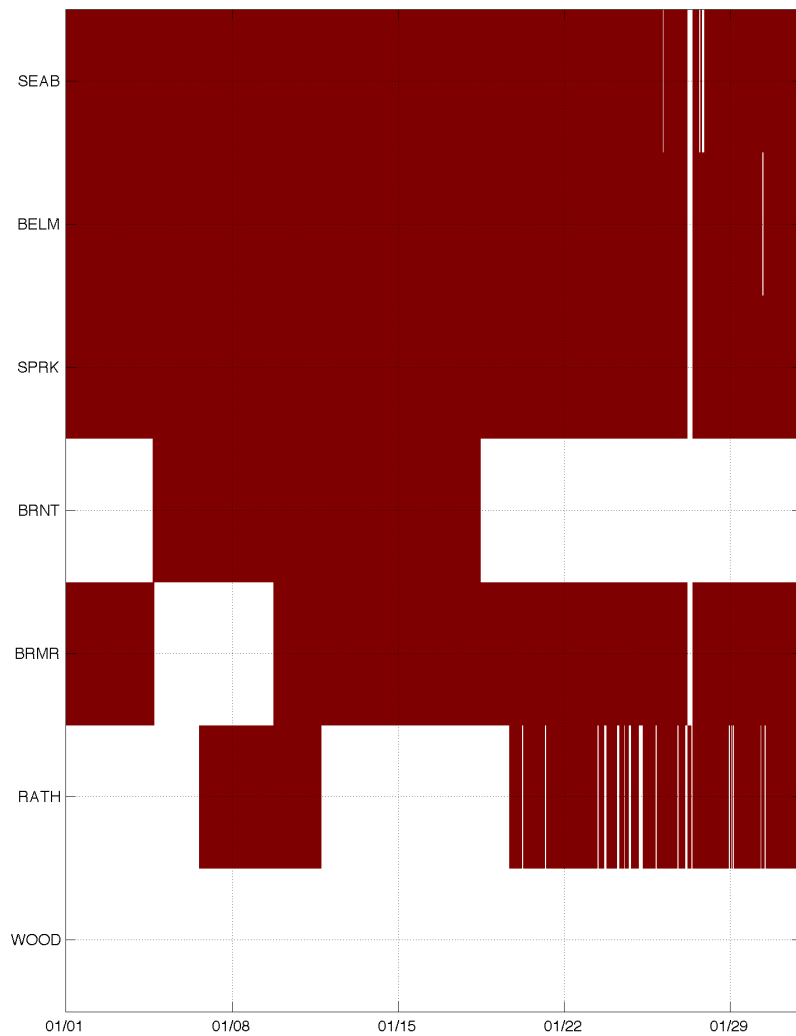
Green - Measured radials were used in totals

December 1, 2011 to December 31, 2012

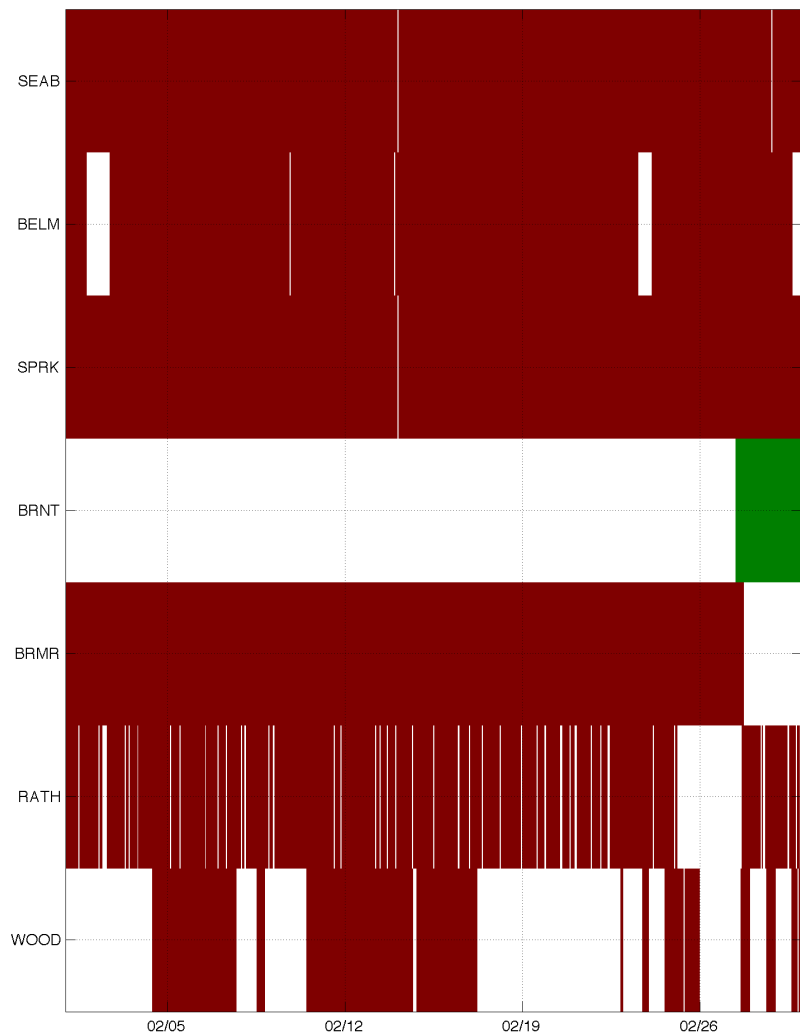
Radials in Totals during 12/2011



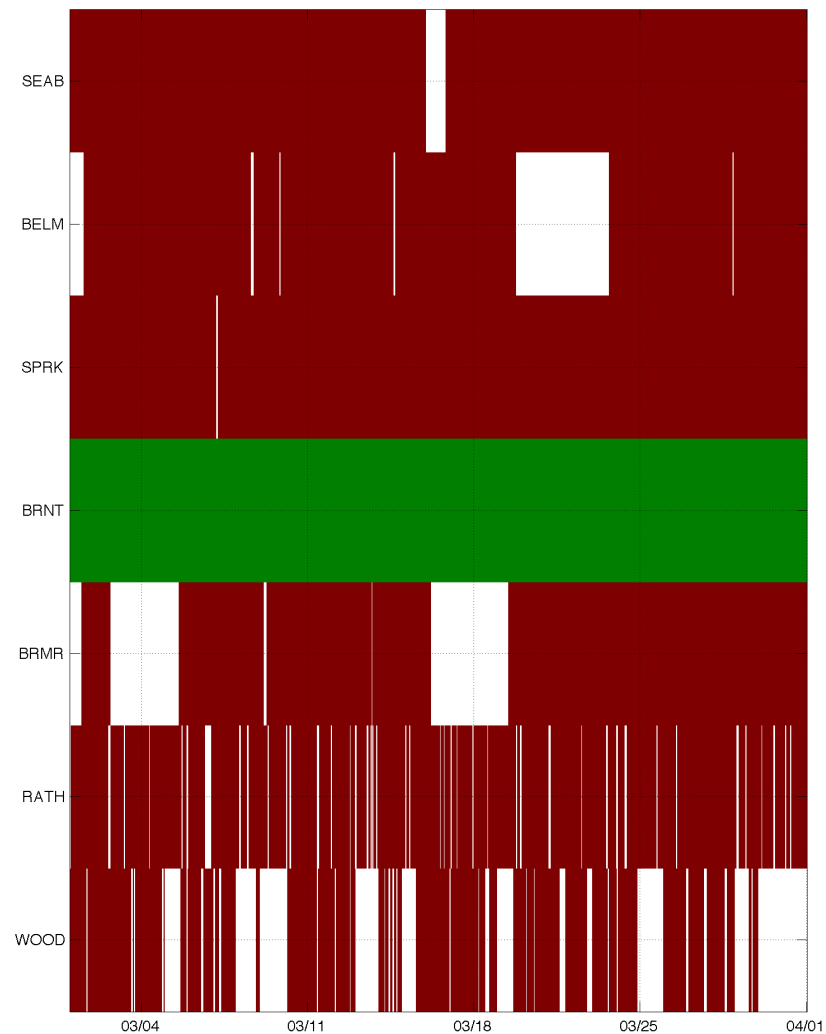
Radials in Totals during 1/2012



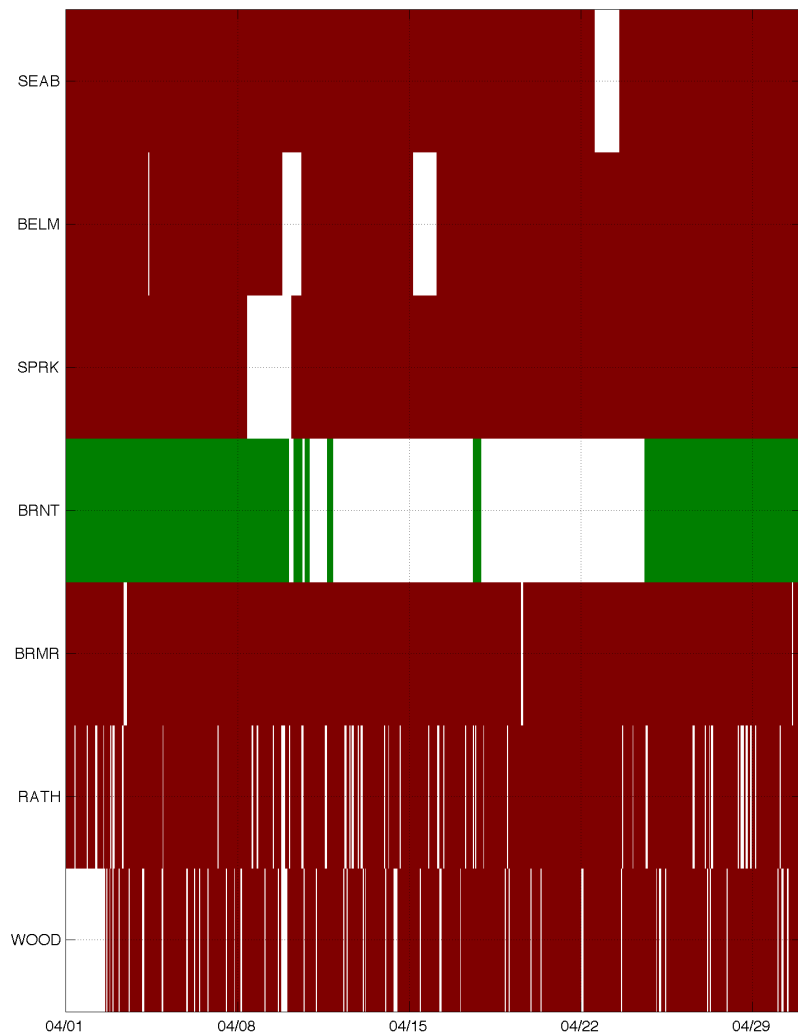
Radials in Totals during 2/2012



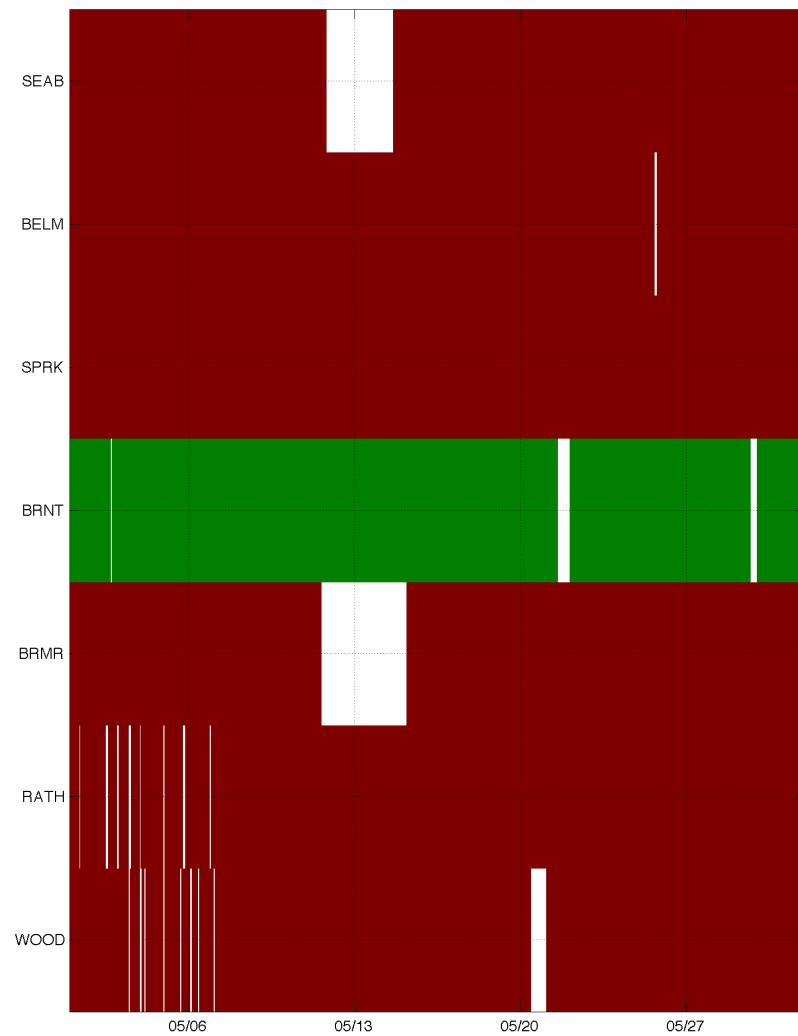
Radials in Totals during 3/2012



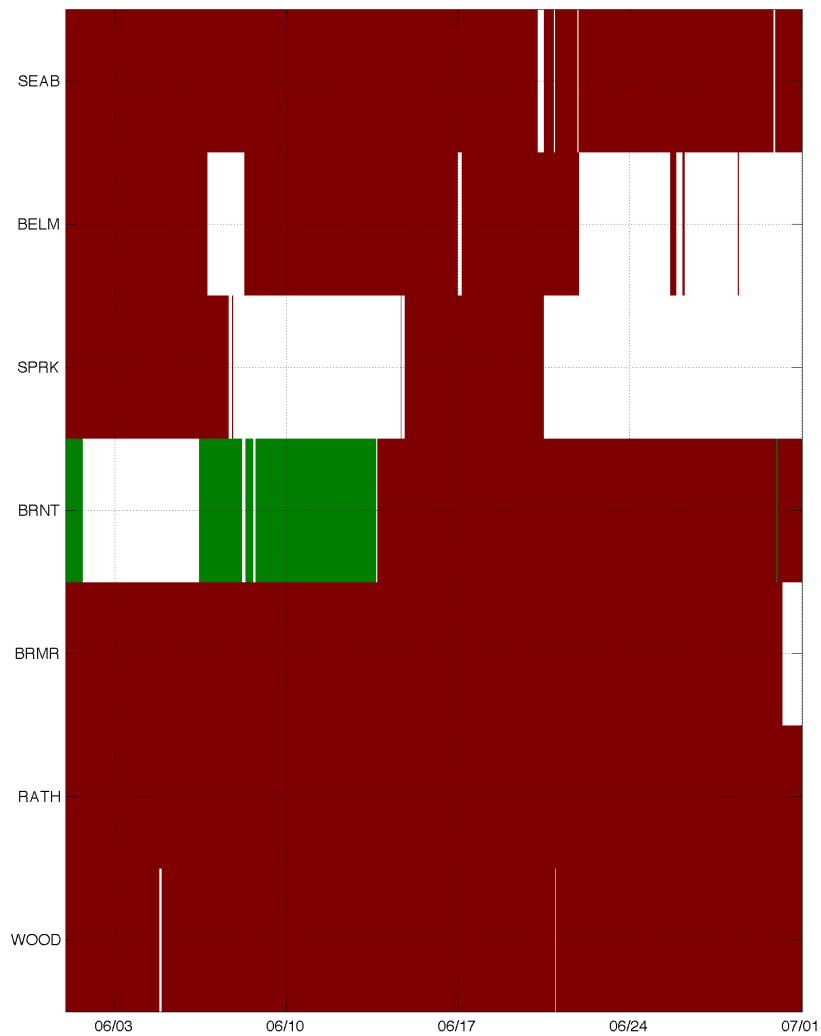
Radials in Totals during 4/2012



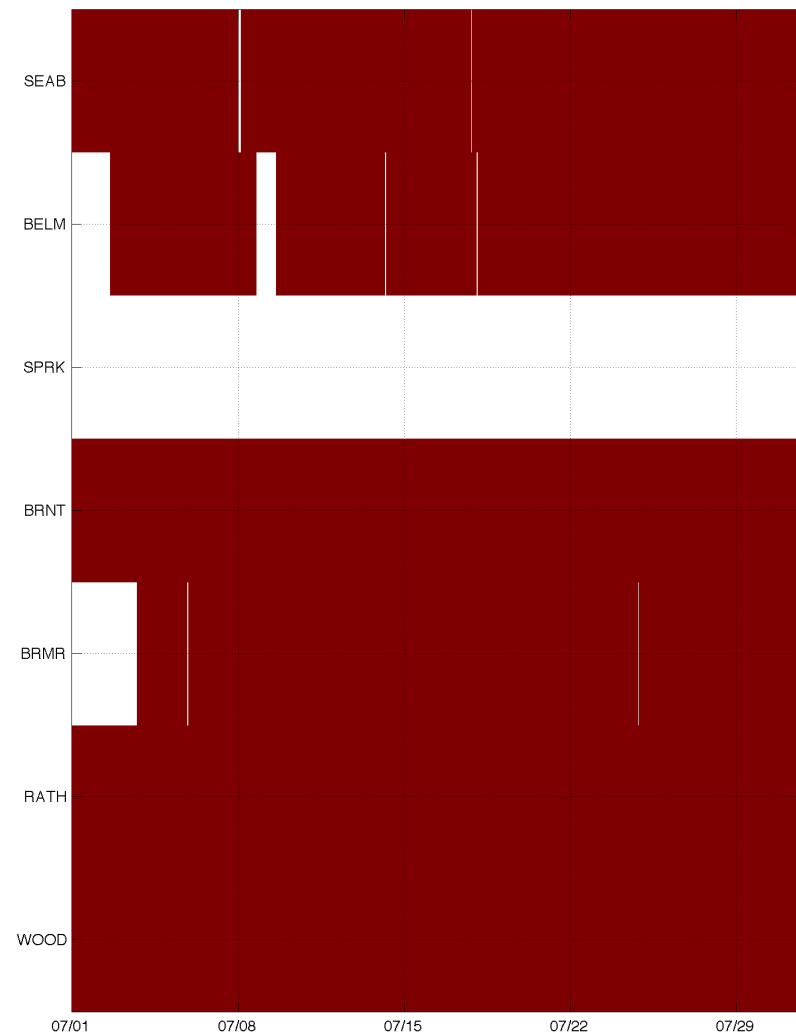
Radials in Totals during 5/2012



Radials in Totals during 6/2012

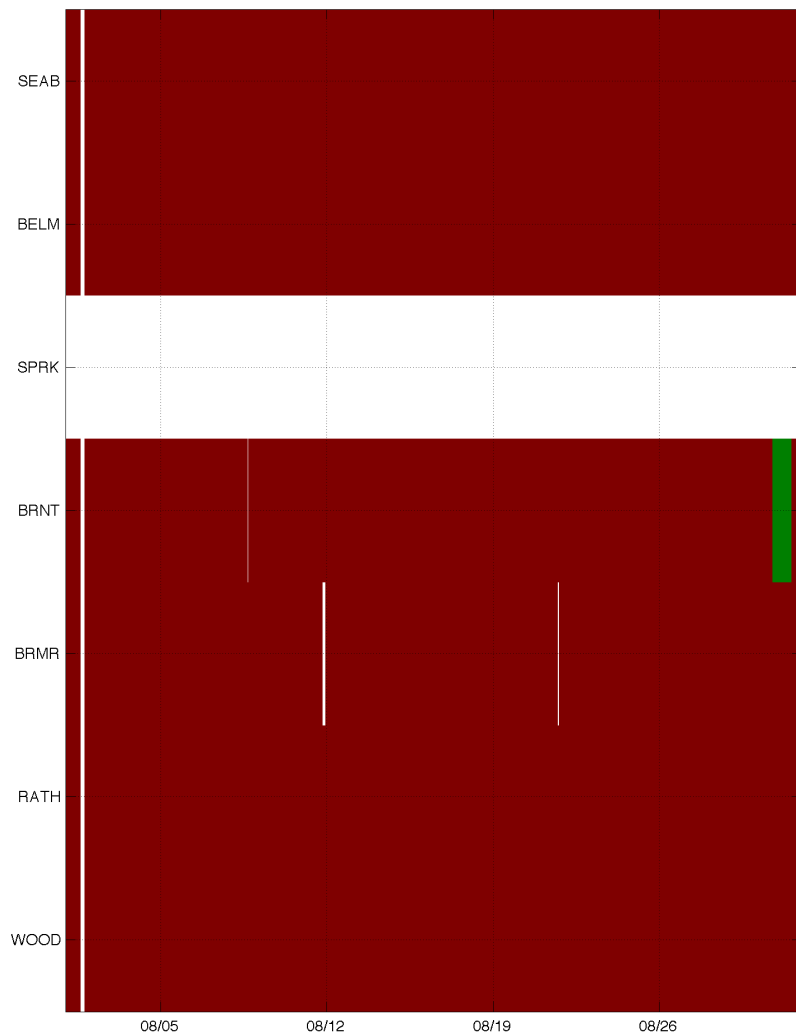


Radials in Totals during 7/2012

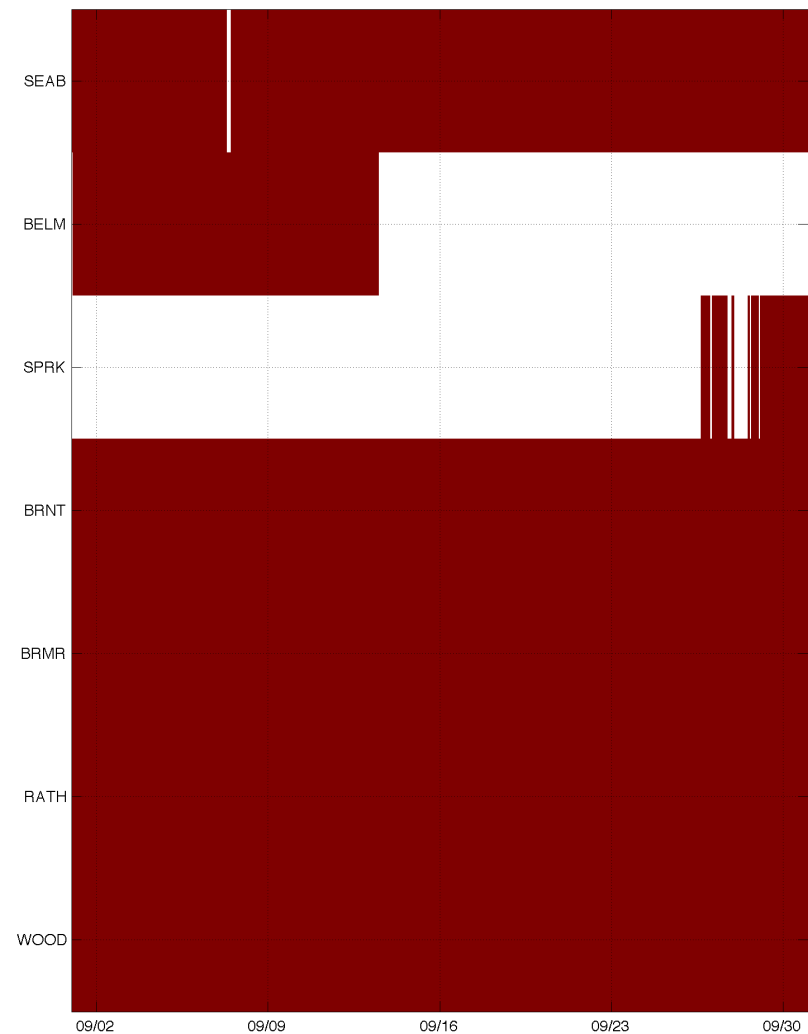




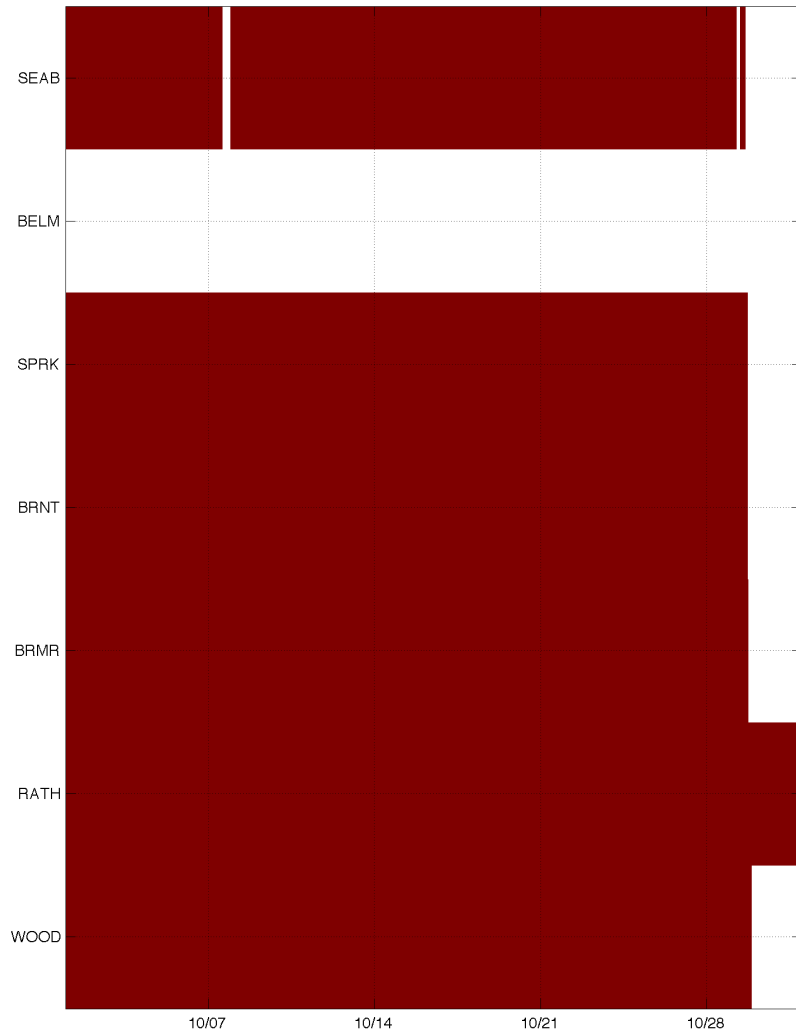
Radials in Totals during 8/2012



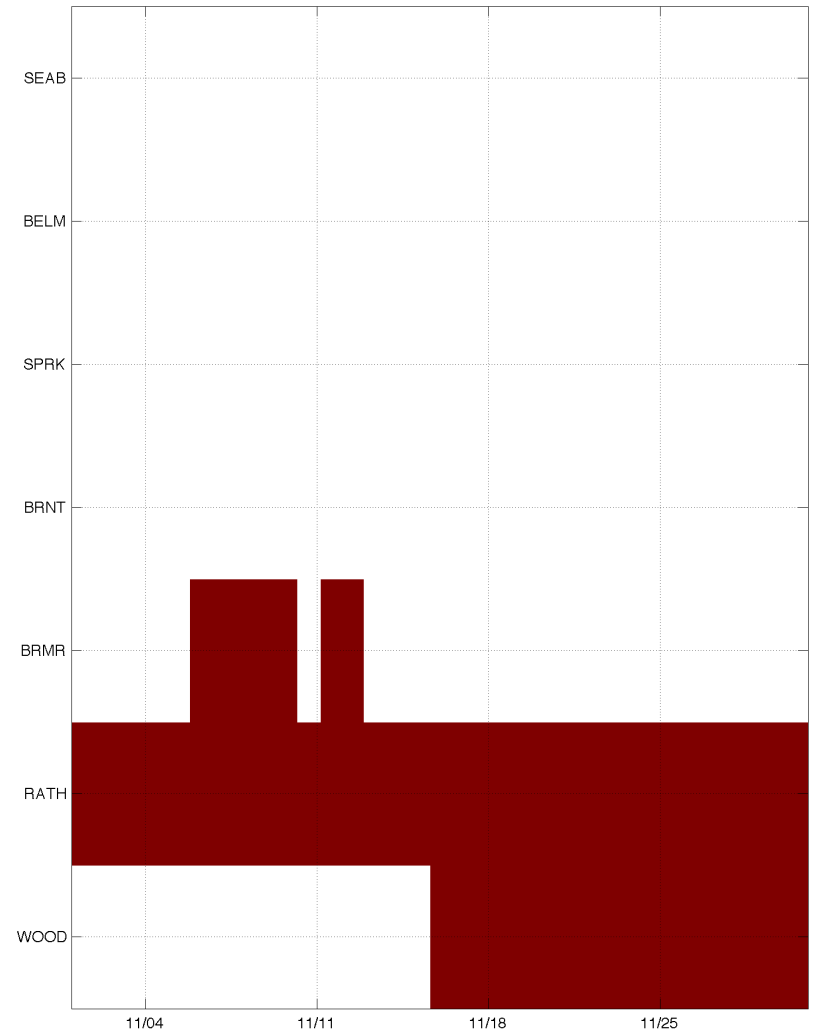
Radials in Totals during 9/2012



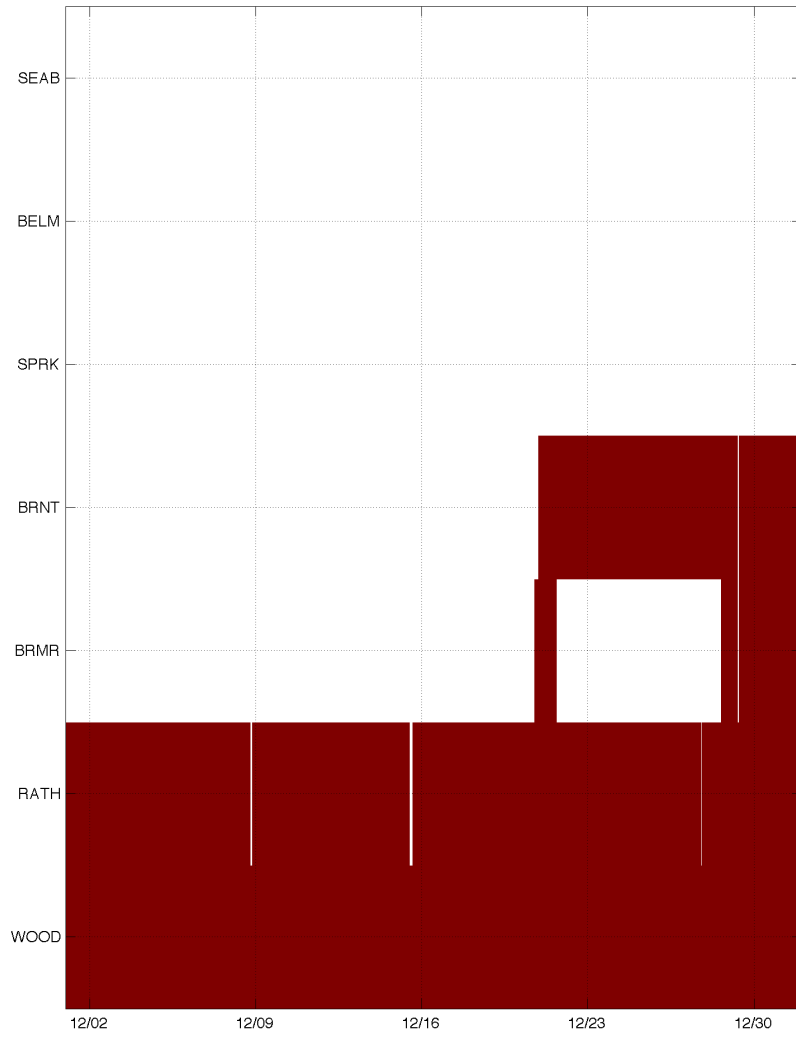
Radials in Totals during 10/2012



Radials in Totals during 11/2012



Radials in Totals during 12/2012



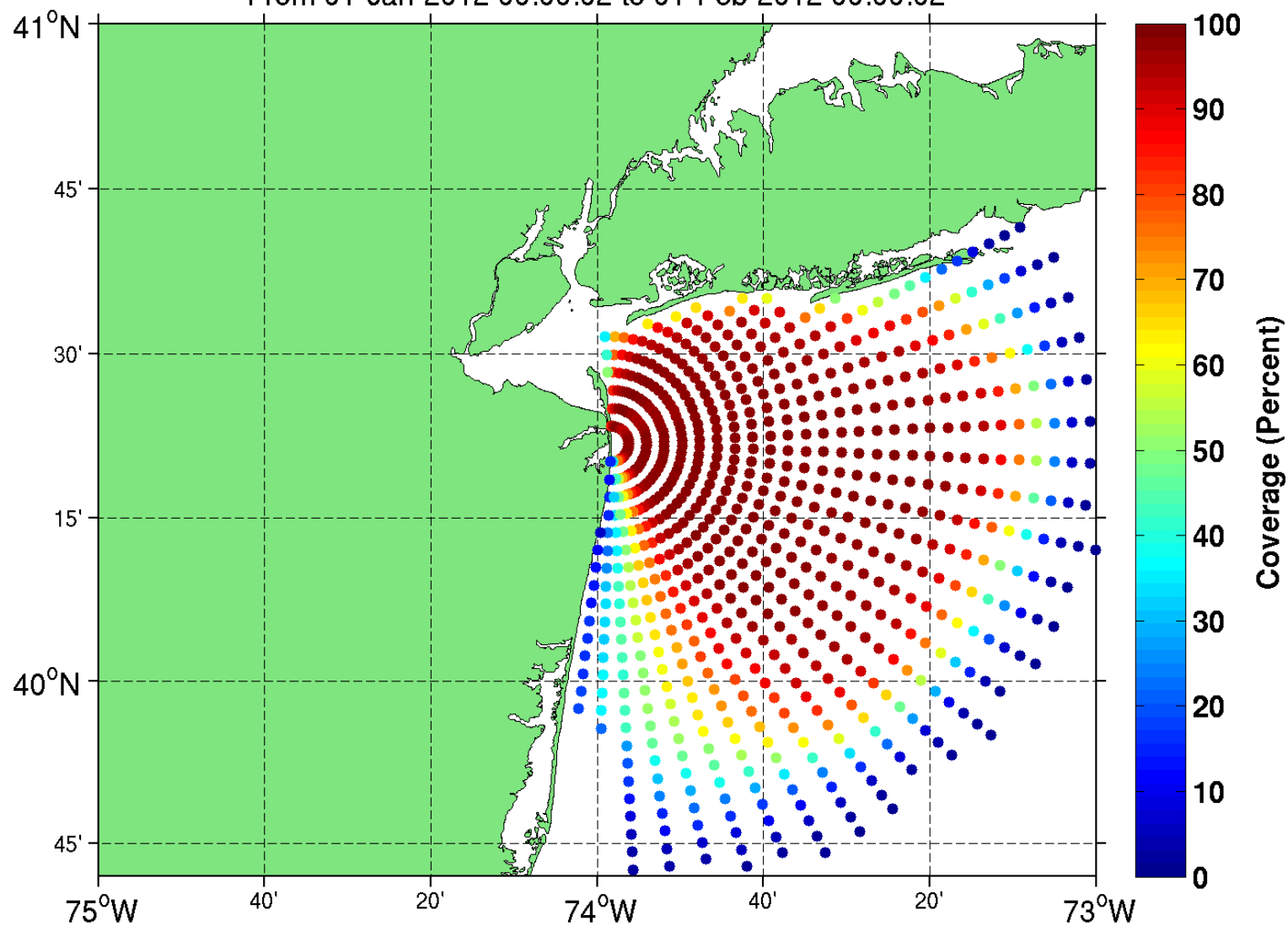
Section 06:

# BPU Monthly Radial Coverage Maps

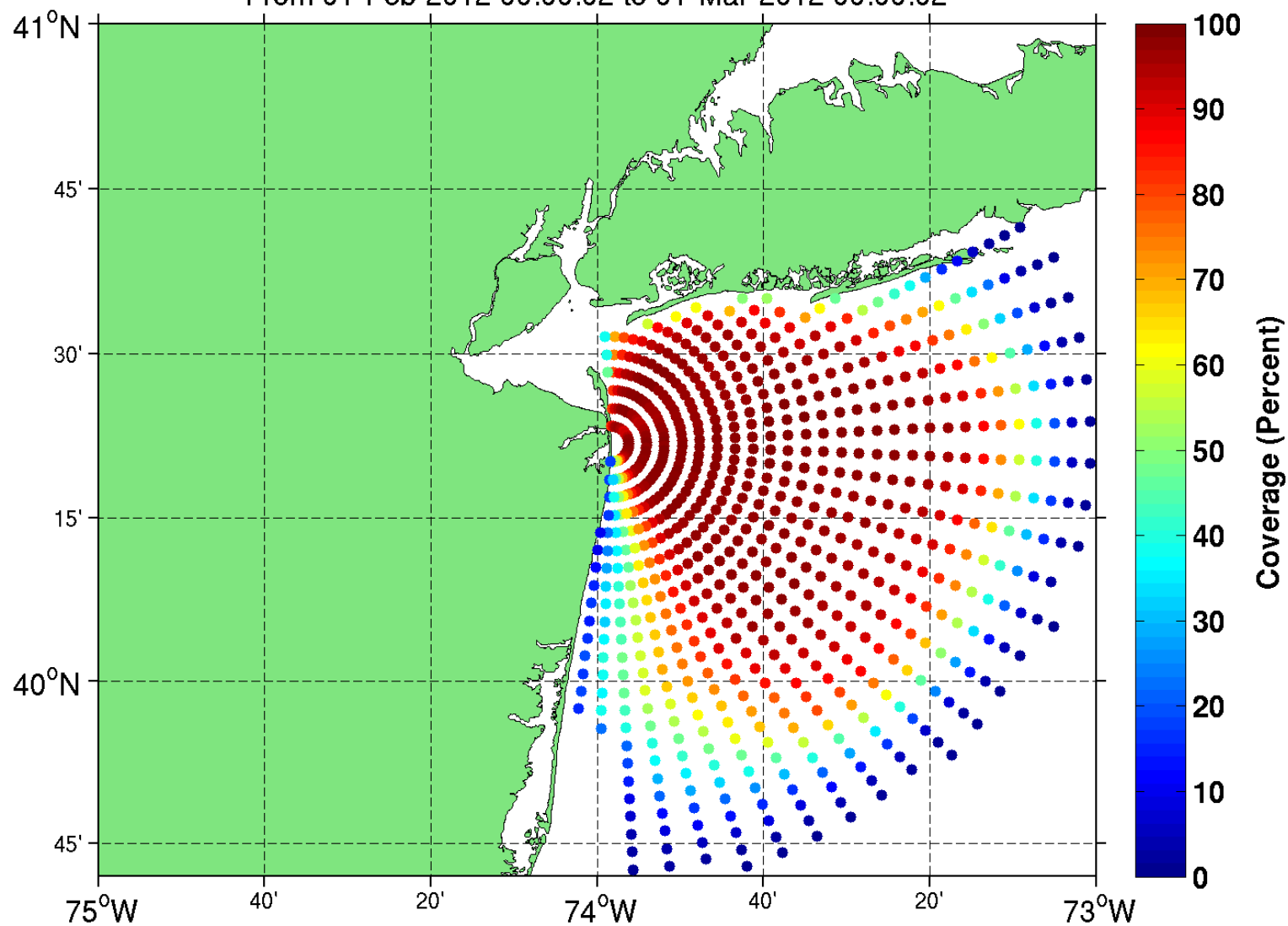
December 1, 2011 to December 31, 2012

**SEA BRIGHT  
IDEAL RADIALS**

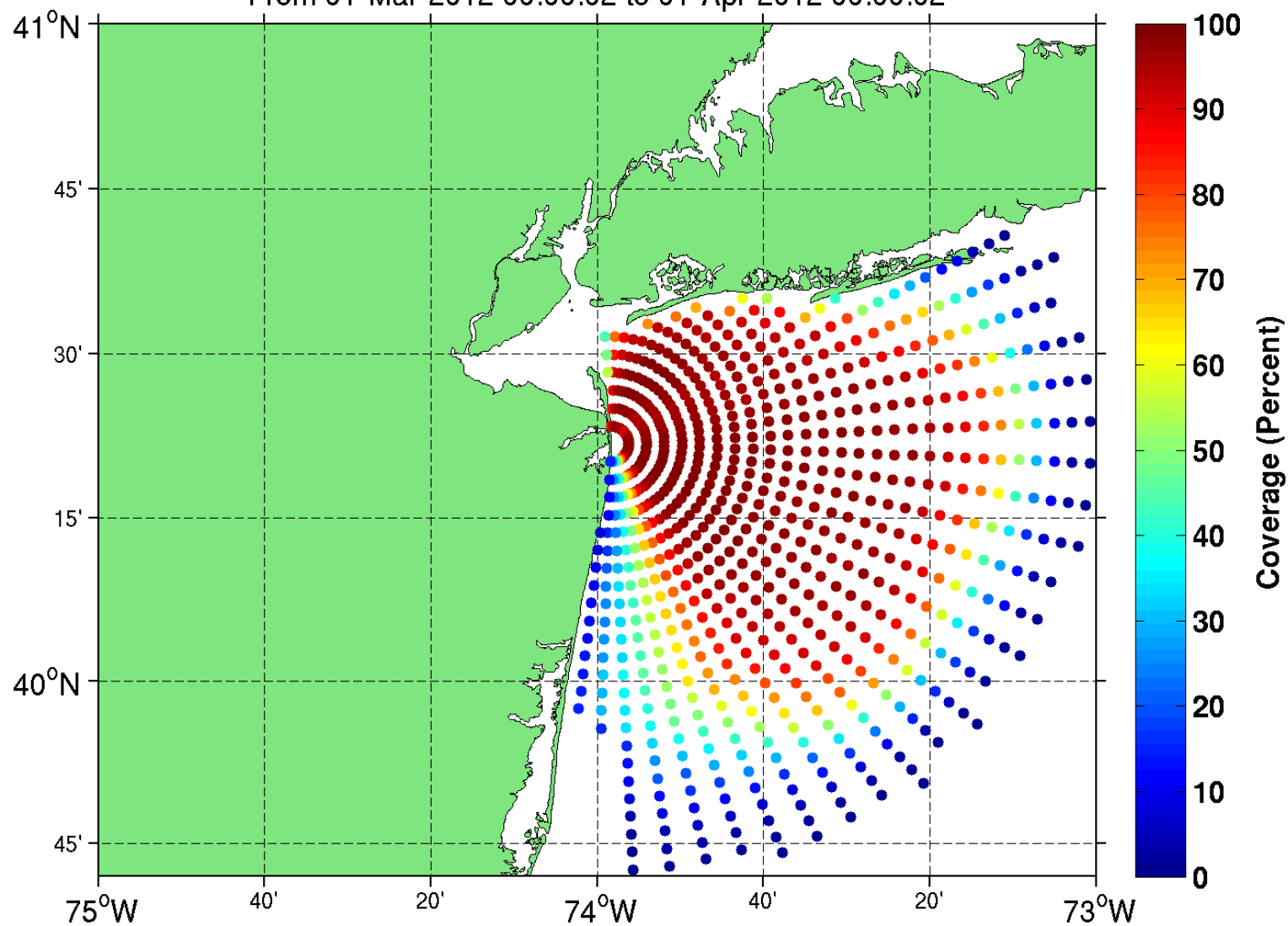
SEAB RDLi Coverage, 742 of 745 possible hourly maps  
From 01-Jan-2012 00:00:02 to 01-Feb-2012 00:00:02



SEAB RDLi Coverage, 697 of 697 possible hourly maps  
From 01-Feb-2012 00:00:02 to 01-Mar-2012 00:00:02

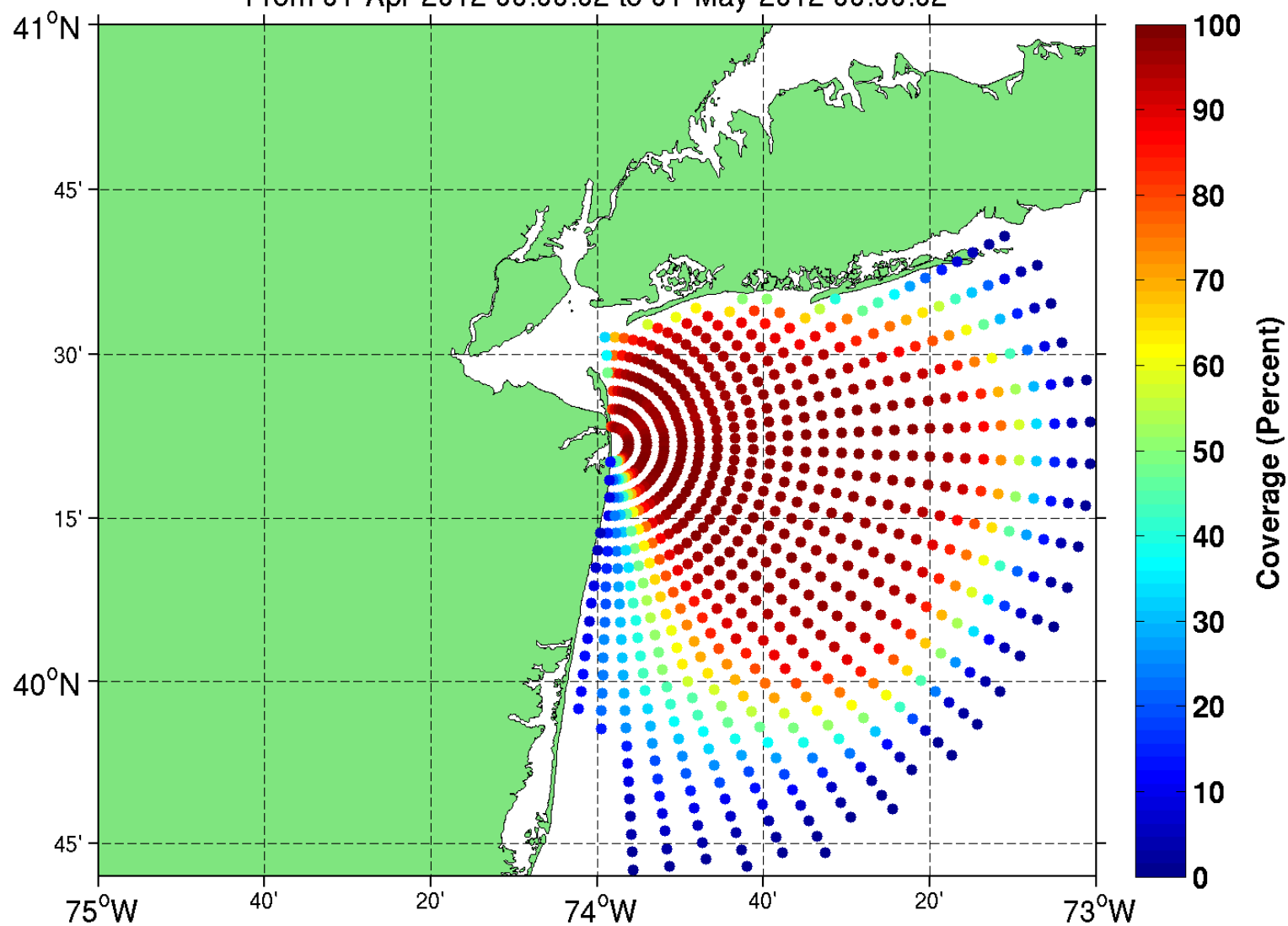


SEAB RDLi Coverage, 725 of 745 possible hourly maps  
From 01-Mar-2012 00:00:02 to 01-Apr-2012 00:00:02

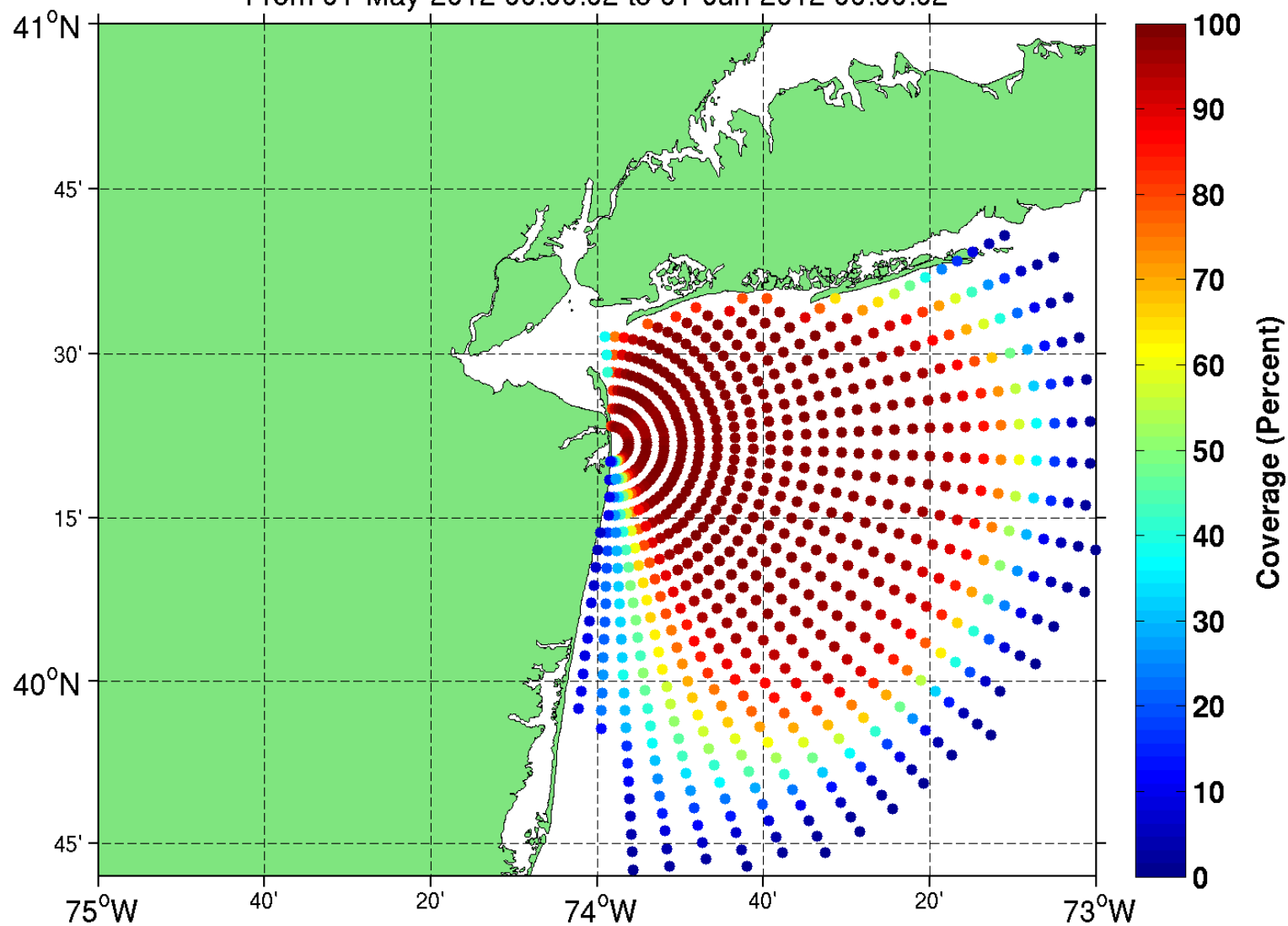




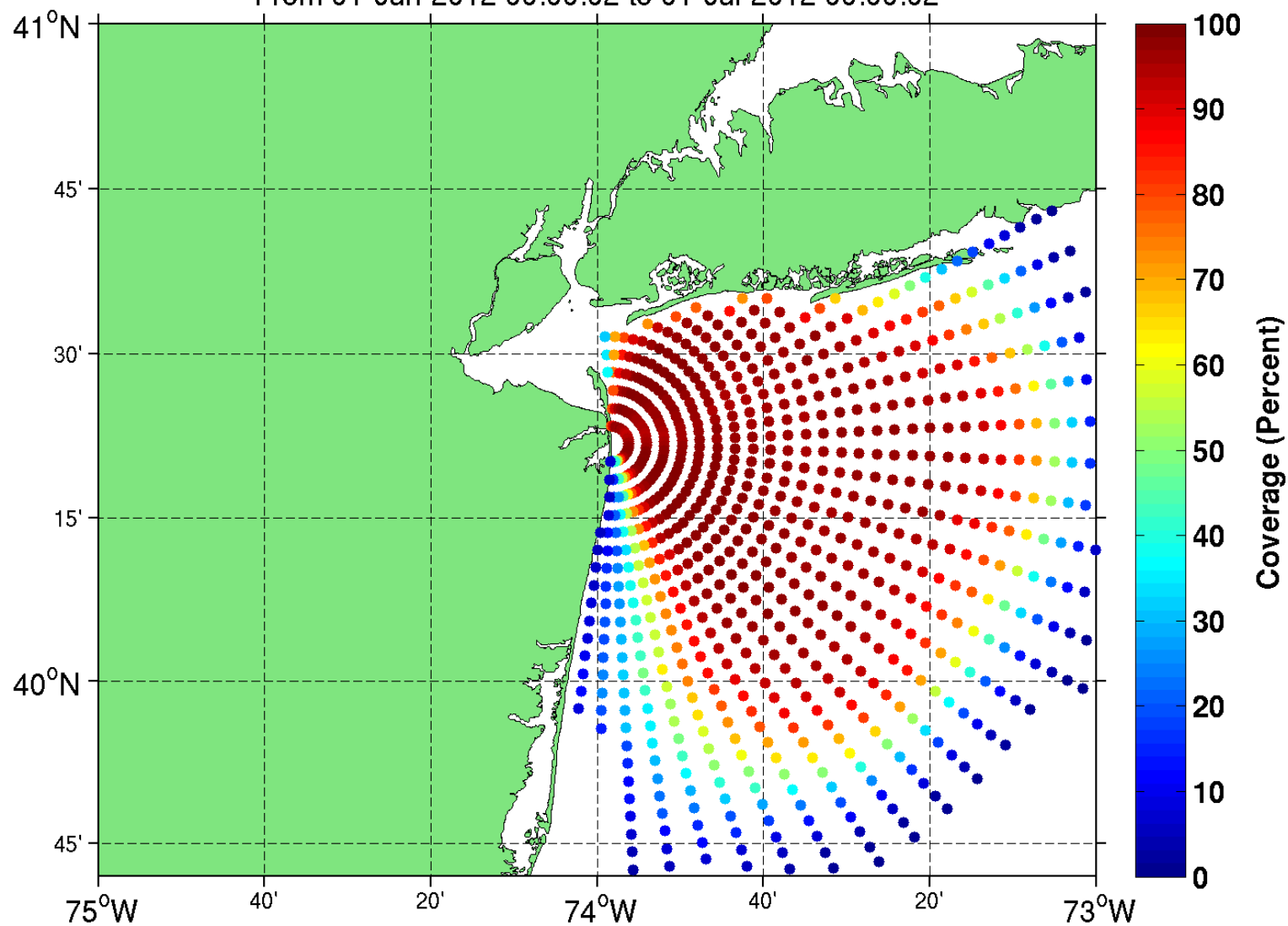
SEAB RDLi Coverage, 708 of 721 possible hourly maps  
From 01-Apr-2012 00:00:02 to 01-May-2012 00:00:02



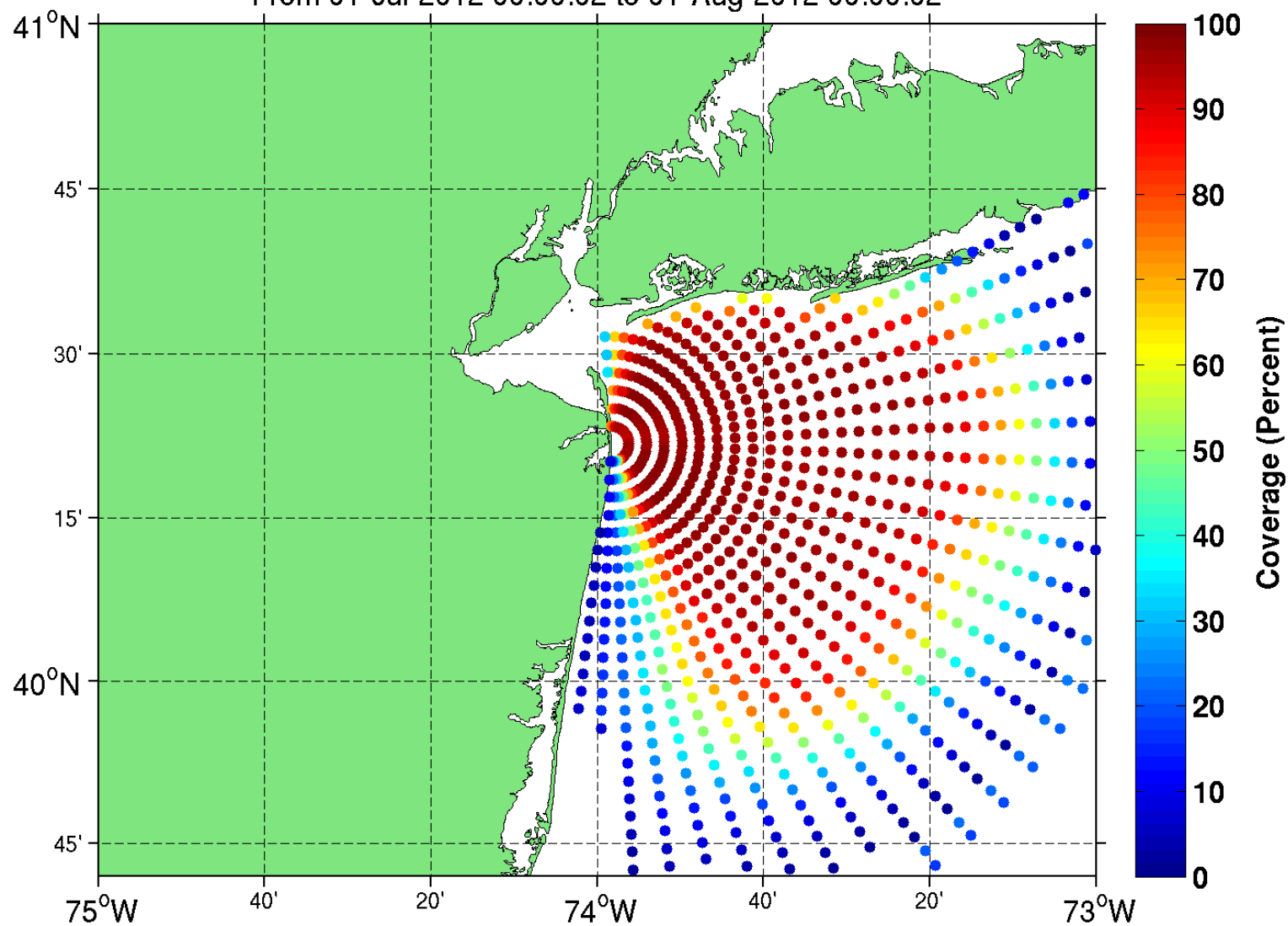
SEAB RDLi Coverage, 683 of 745 possible hourly maps  
From 01-May-2012 00:00:02 to 01-Jun-2012 00:00:02



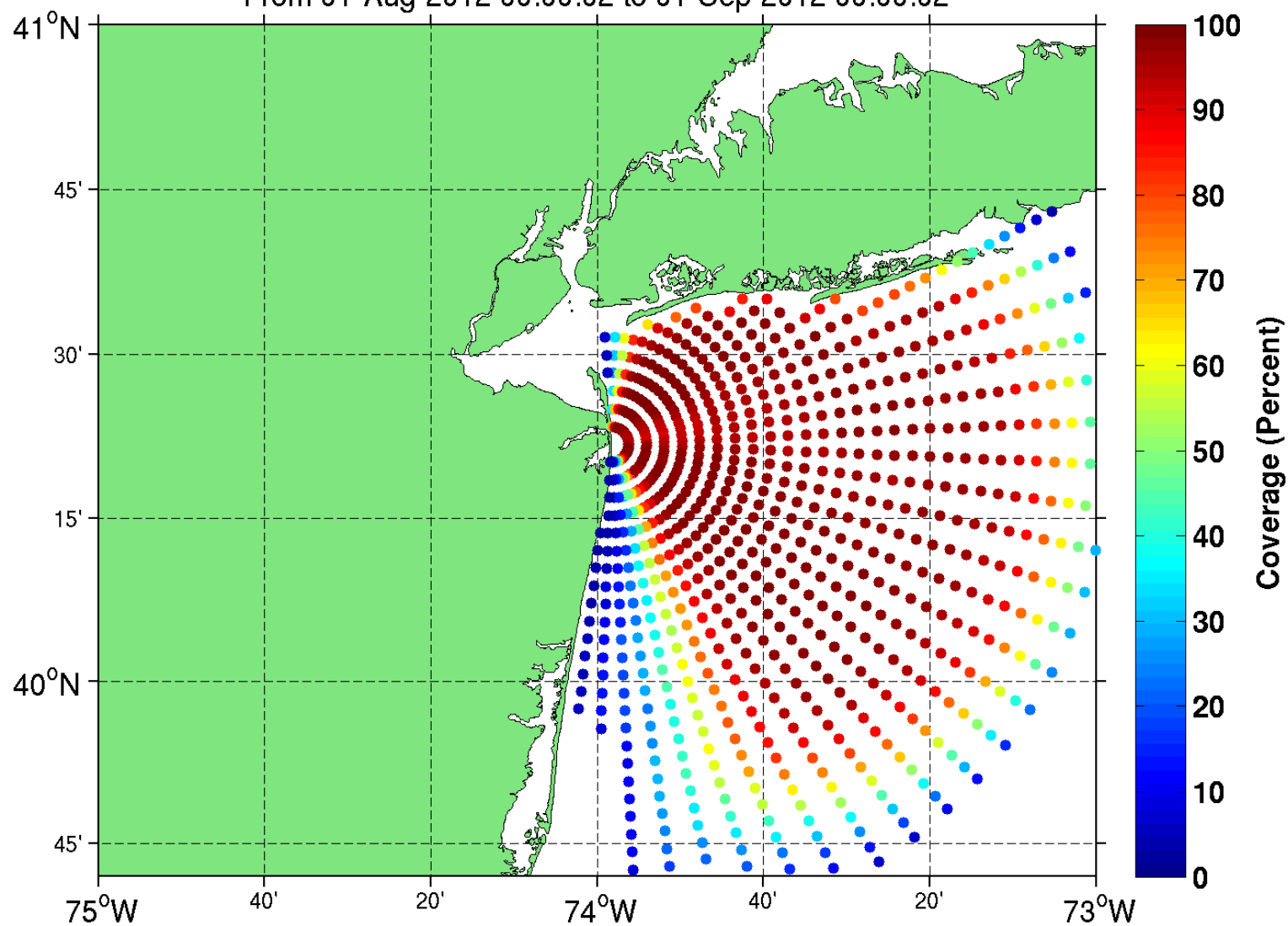
SEAB RDLi Coverage, 717 of 721 possible hourly maps  
From 01-Jun-2012 00:00:02 to 01-Jul-2012 00:00:02



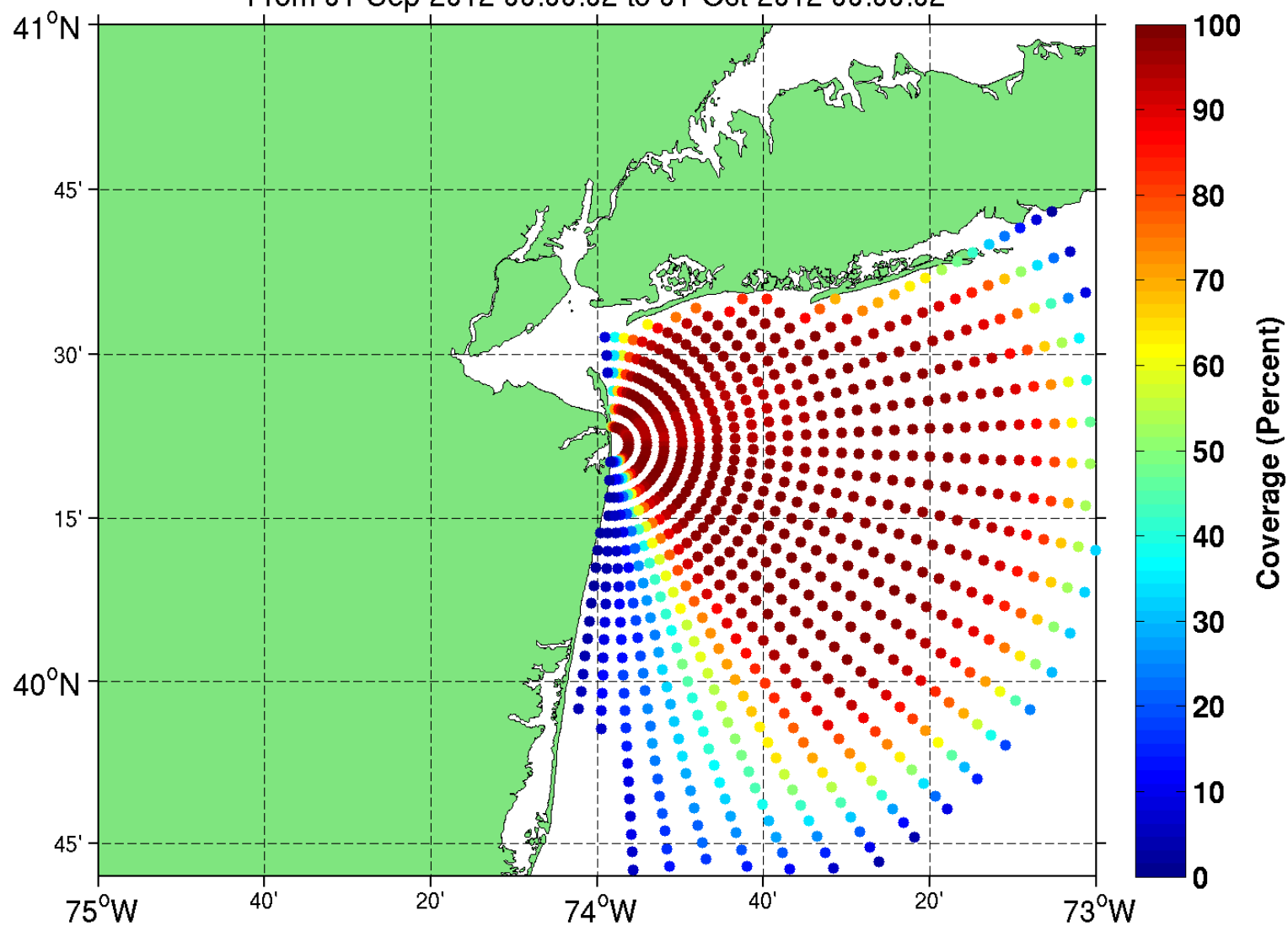
SEAB RDLi Coverage, 742 of 745 possible hourly maps  
From 01-Jul-2012 00:00:02 to 01-Aug-2012 00:00:02



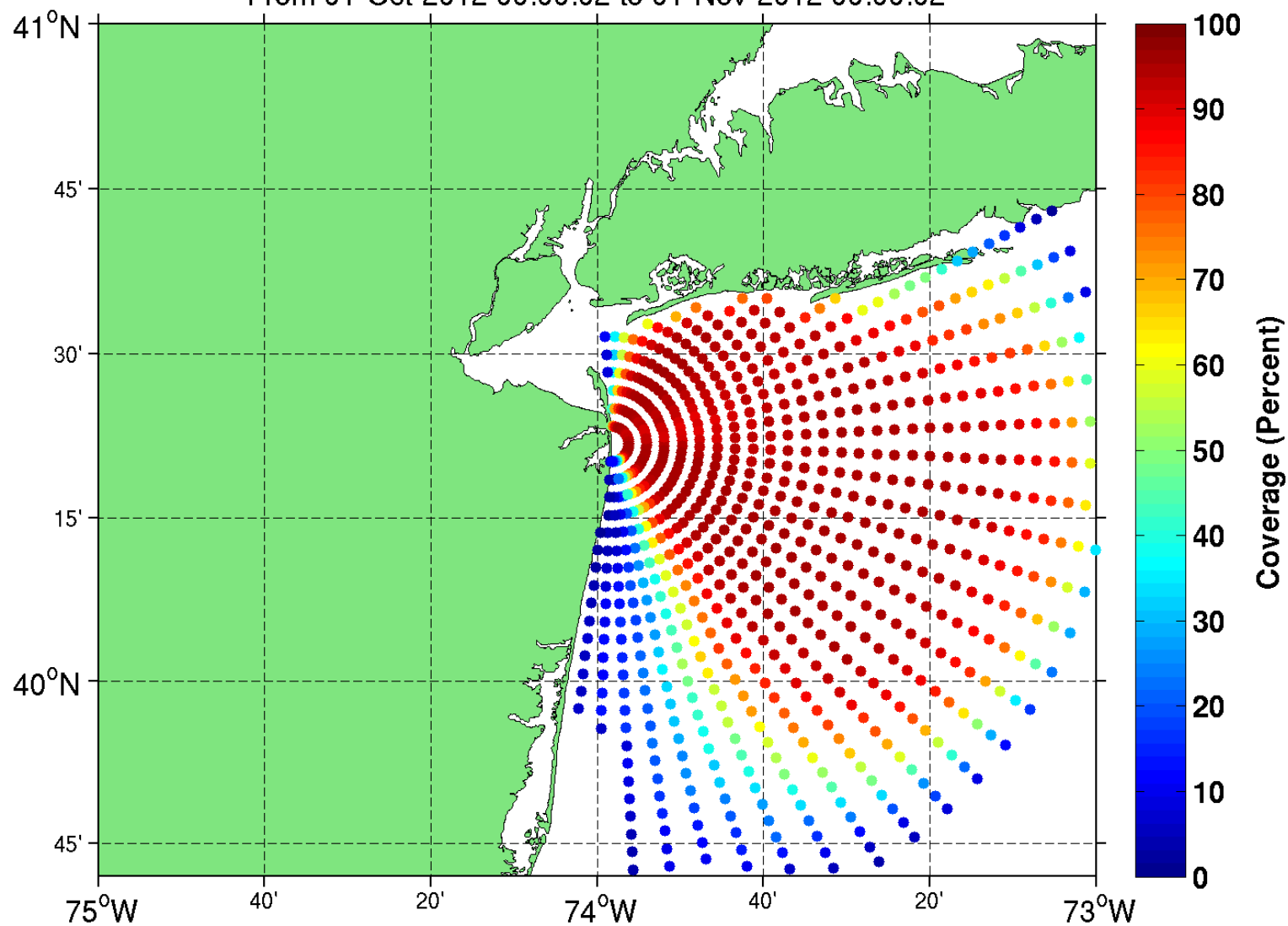
SEAB RDLi Coverage, 745 of 745 possible hourly maps  
From 01-Aug-2012 00:00:02 to 01-Sep-2012 00:00:02



SEAB RDLi Coverage, 717 of 721 possible hourly maps  
From 01-Sep-2012 00:00:02 to 01-Oct-2012 00:00:02



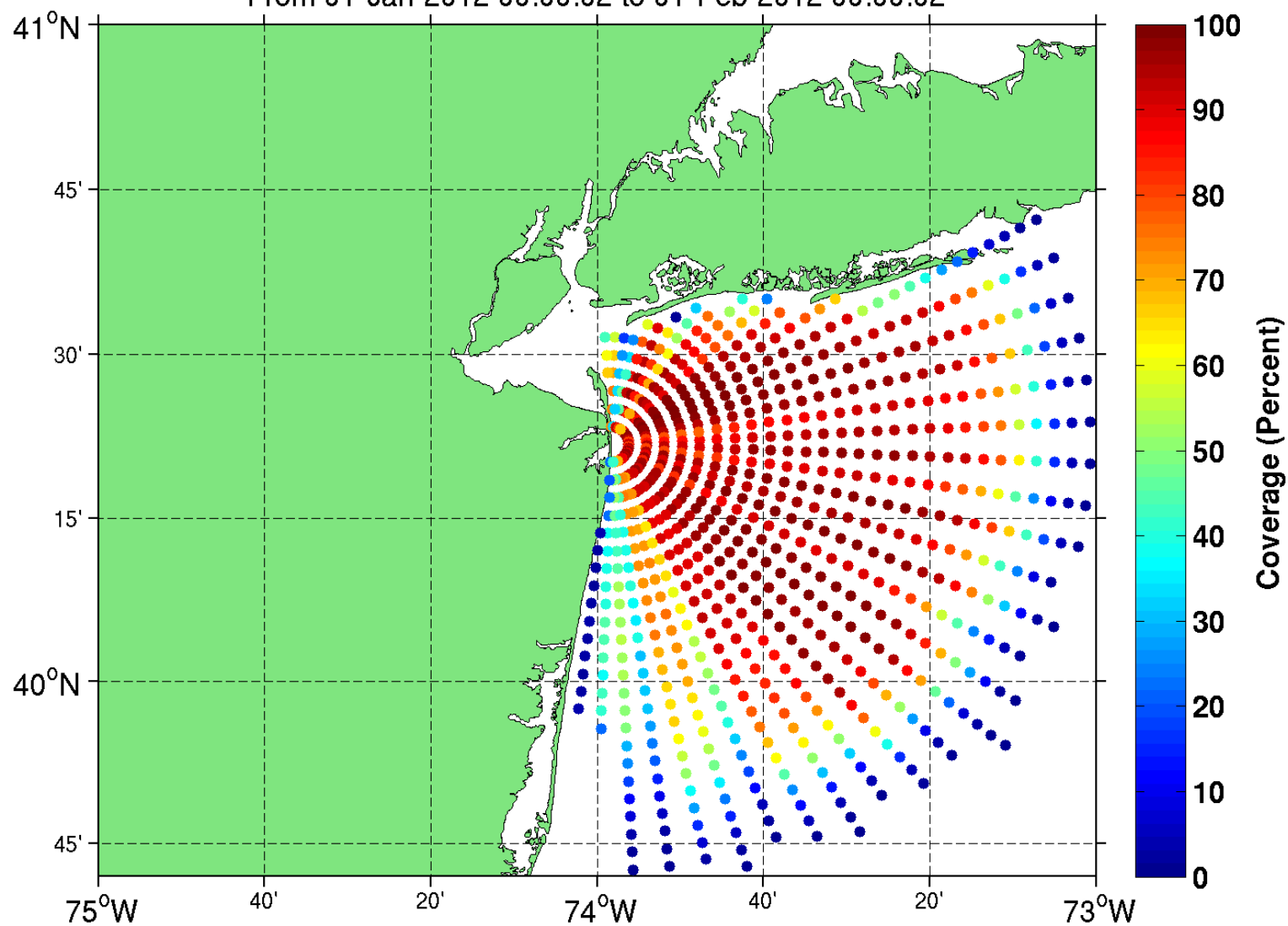
SEAB RDLi Coverage, 677 of 745 possible hourly maps  
From 01-Oct-2012 00:00:02 to 01-Nov-2012 00:00:02



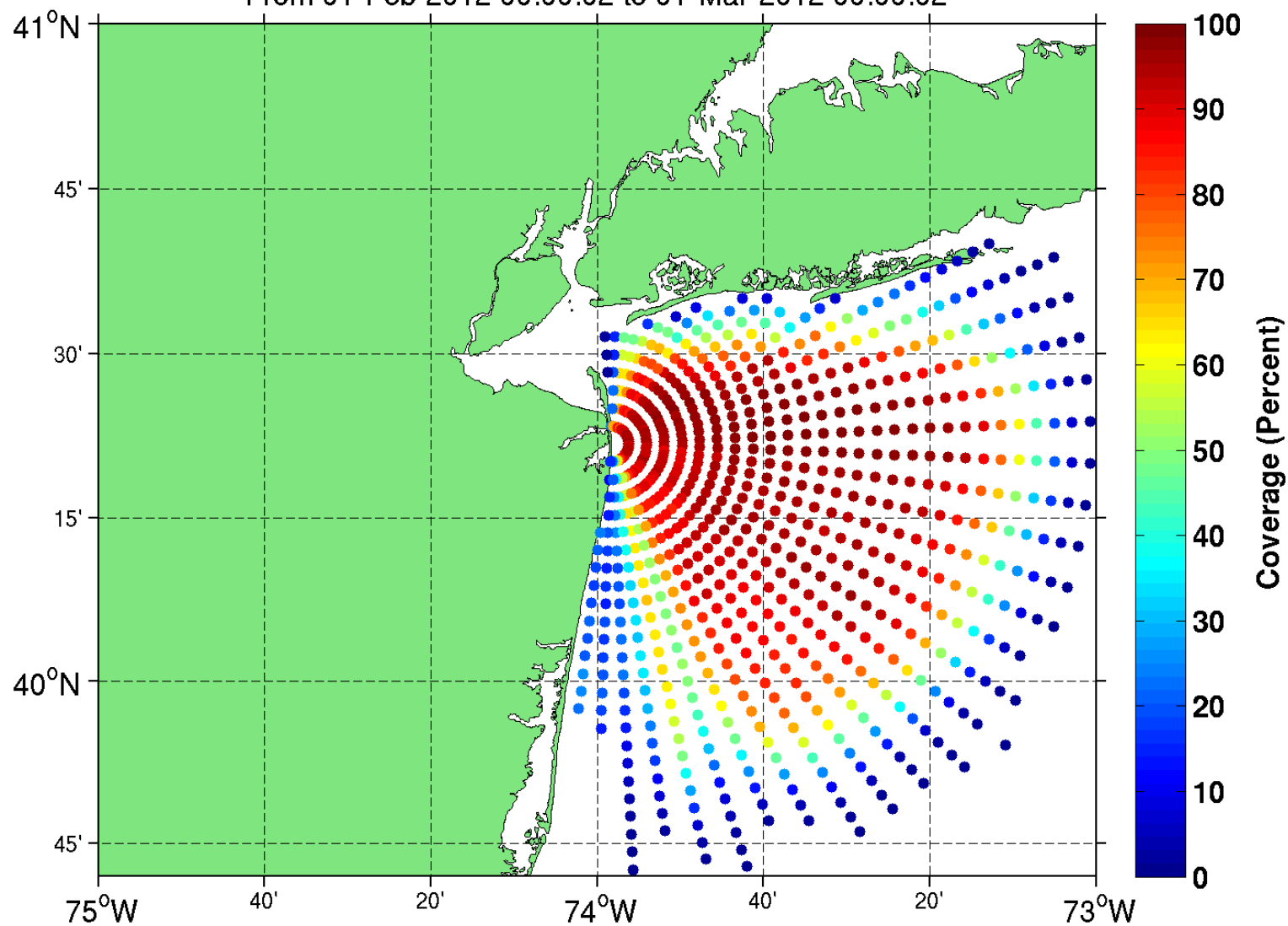
**SEA BRIGHT**  
**MEASURED RADIALS**



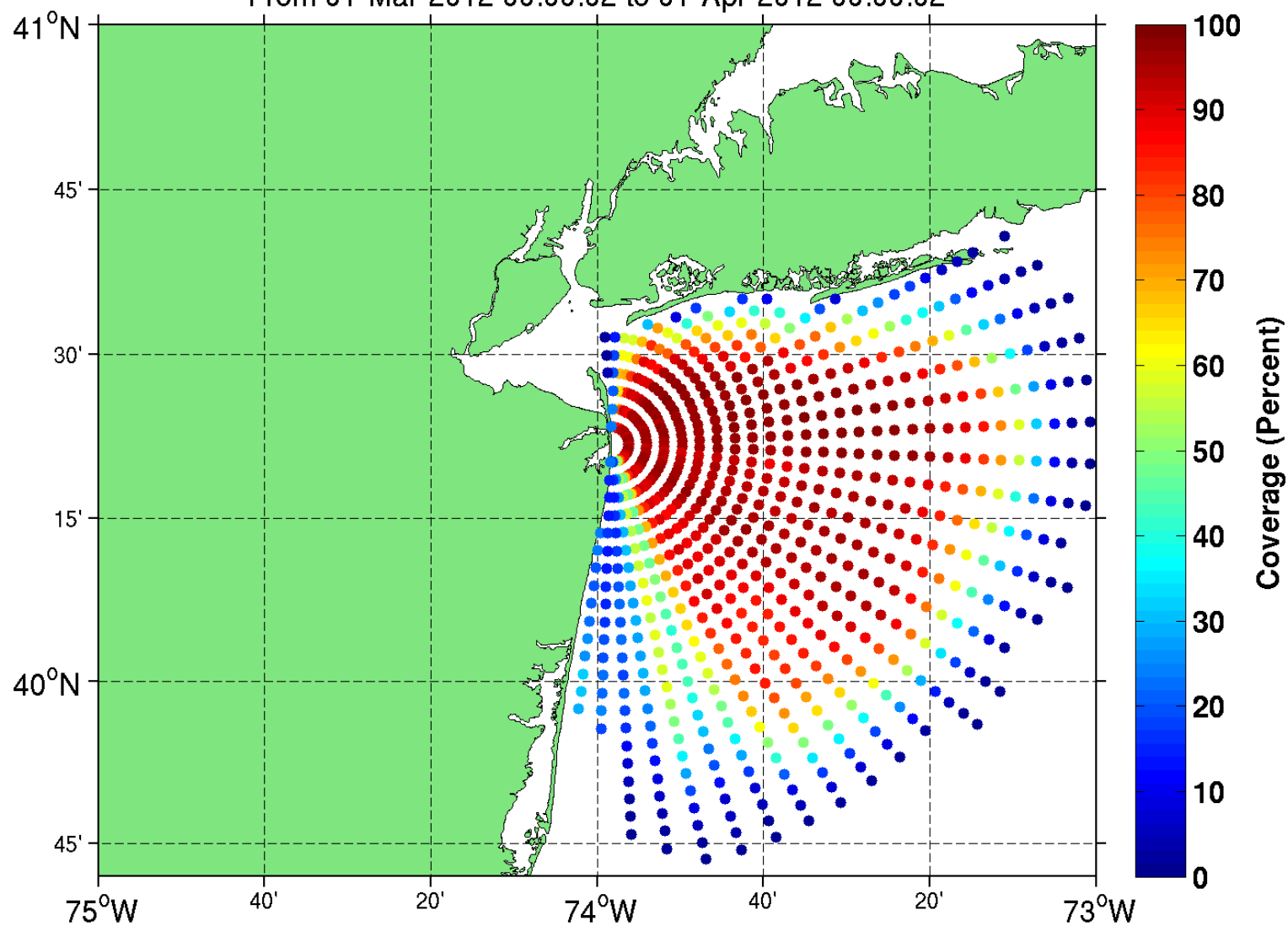
SEAB RDLm Coverage, 742 of 745 possible hourly maps  
From 01-Jan-2012 00:00:02 to 01-Feb-2012 00:00:02



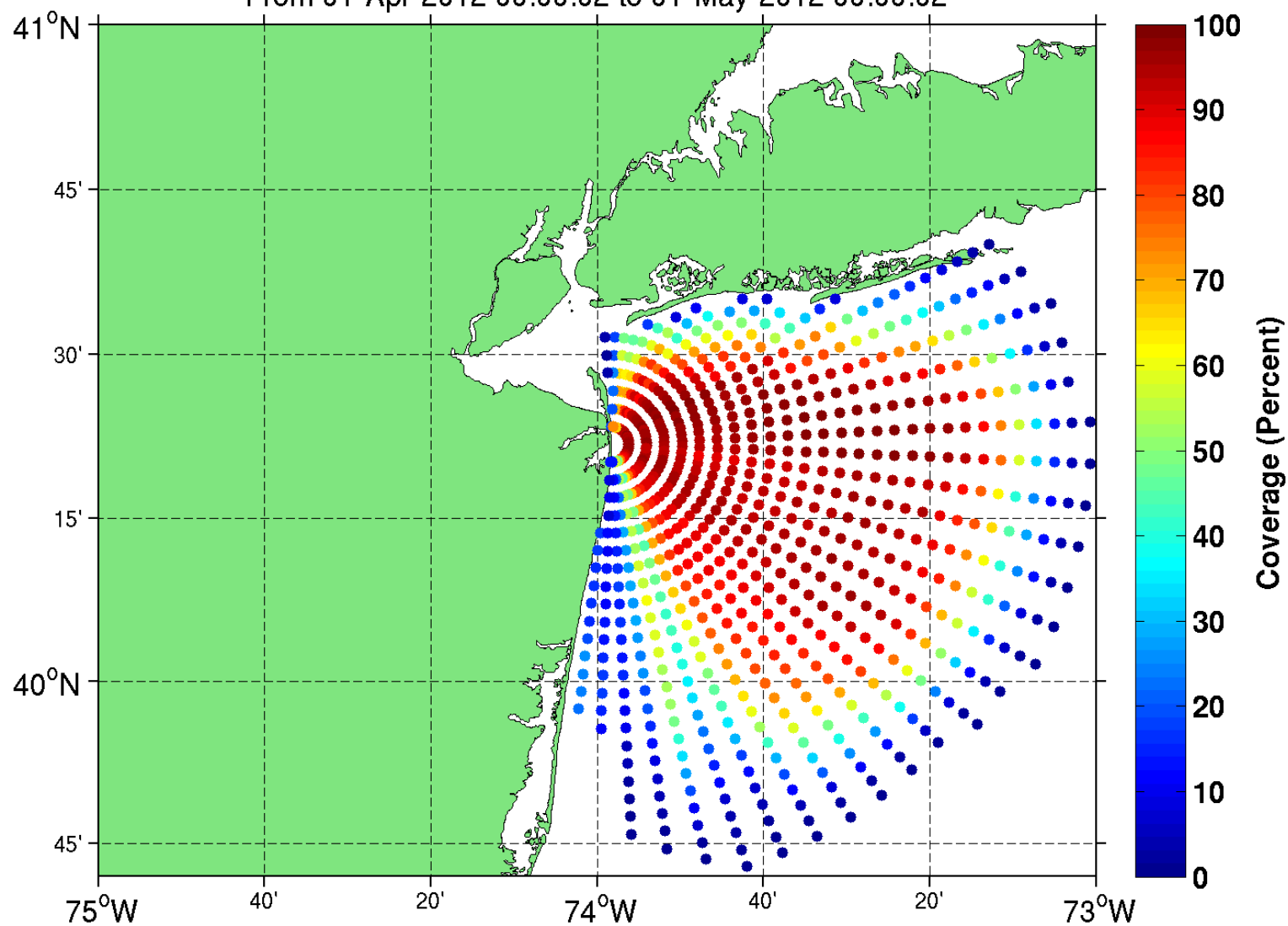
SEAB RDLm Coverage, 697 of 697 possible hourly maps  
From 01-Feb-2012 00:00:02 to 01-Mar-2012 00:00:02



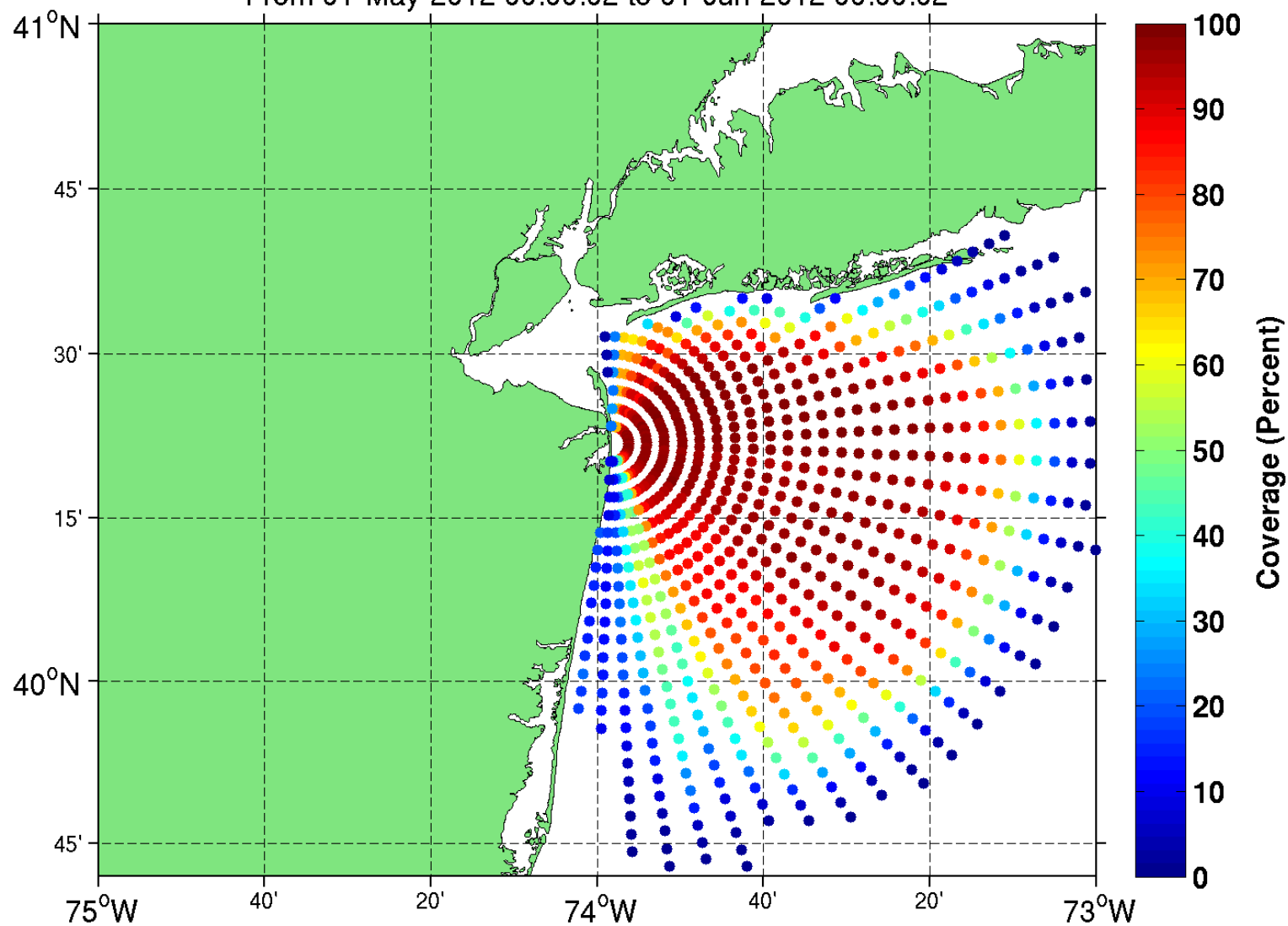
SEAB RDLm Coverage, 725 of 745 possible hourly maps  
From 01-Mar-2012 00:00:02 to 01-Apr-2012 00:00:02



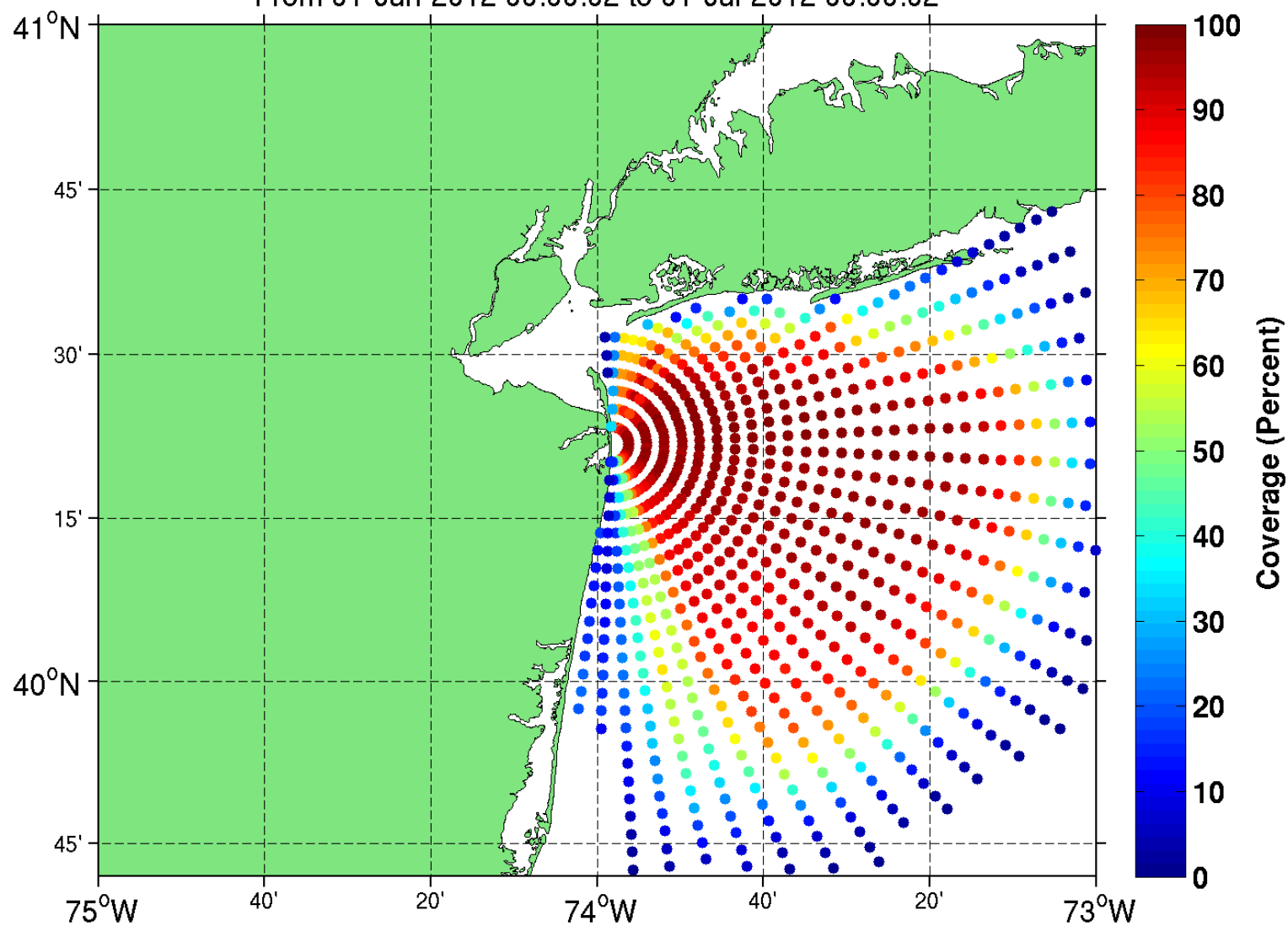
SEAB RDLm Coverage, 708 of 721 possible hourly maps  
From 01-Apr-2012 00:00:02 to 01-May-2012 00:00:02



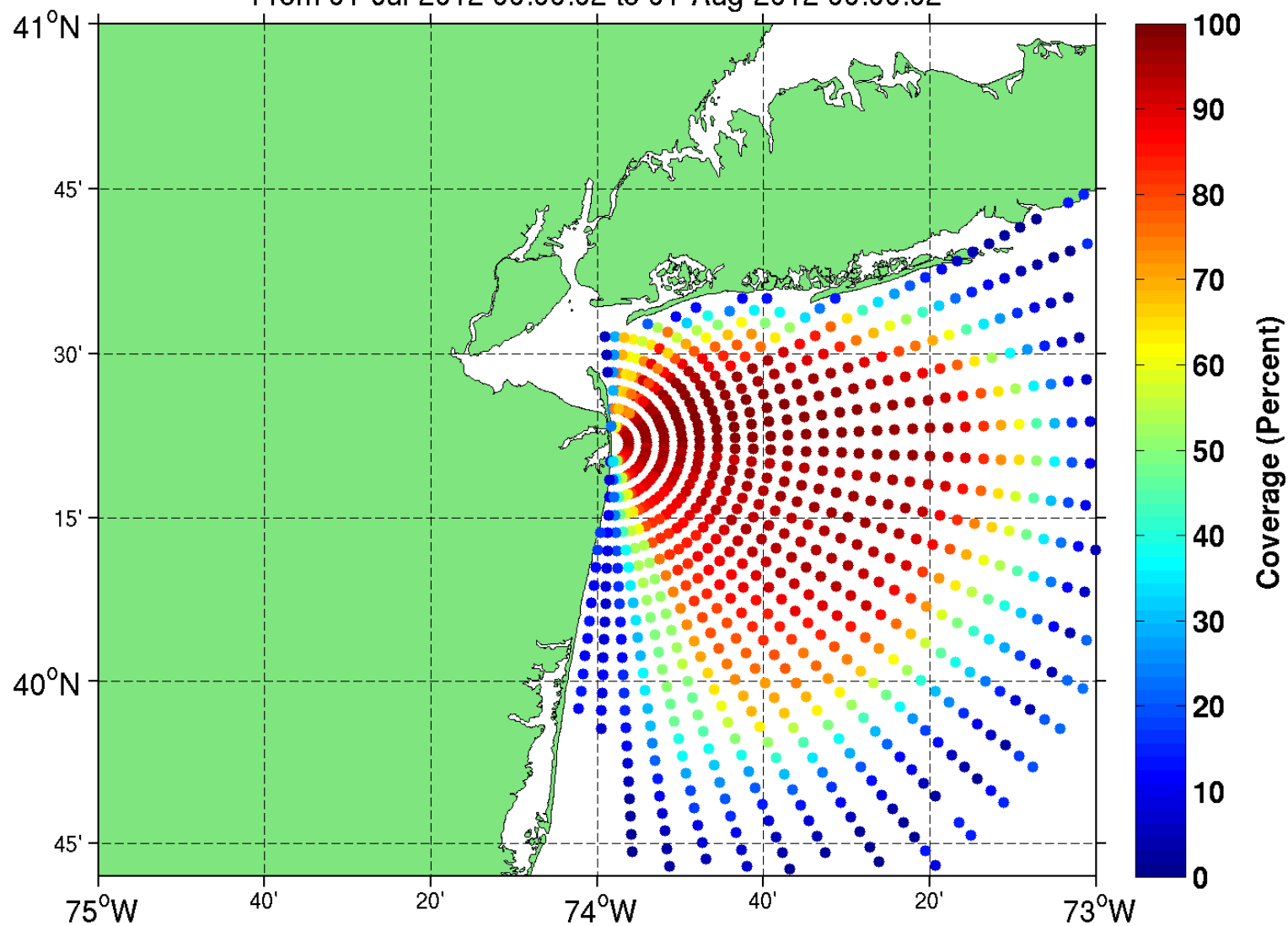
SEAB RDLm Coverage, 683 of 745 possible hourly maps  
From 01-May-2012 00:00:02 to 01-Jun-2012 00:00:02



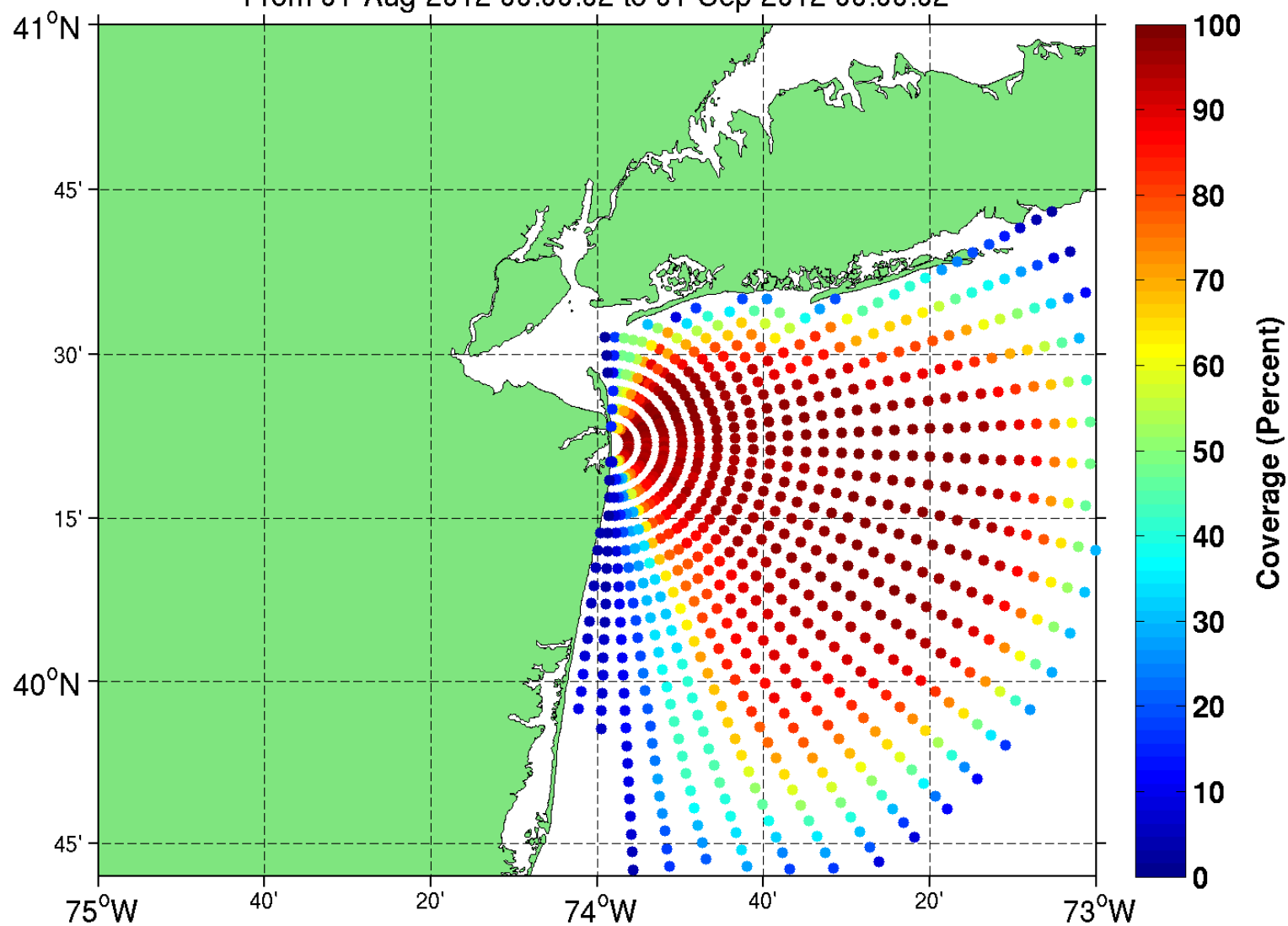
SEAB RDLm Coverage, 717 of 721 possible hourly maps  
From 01-Jun-2012 00:00:02 to 01-Jul-2012 00:00:02



SEAB RDLm Coverage, 742 of 745 possible hourly maps  
From 01-Jul-2012 00:00:02 to 01-Aug-2012 00:00:02

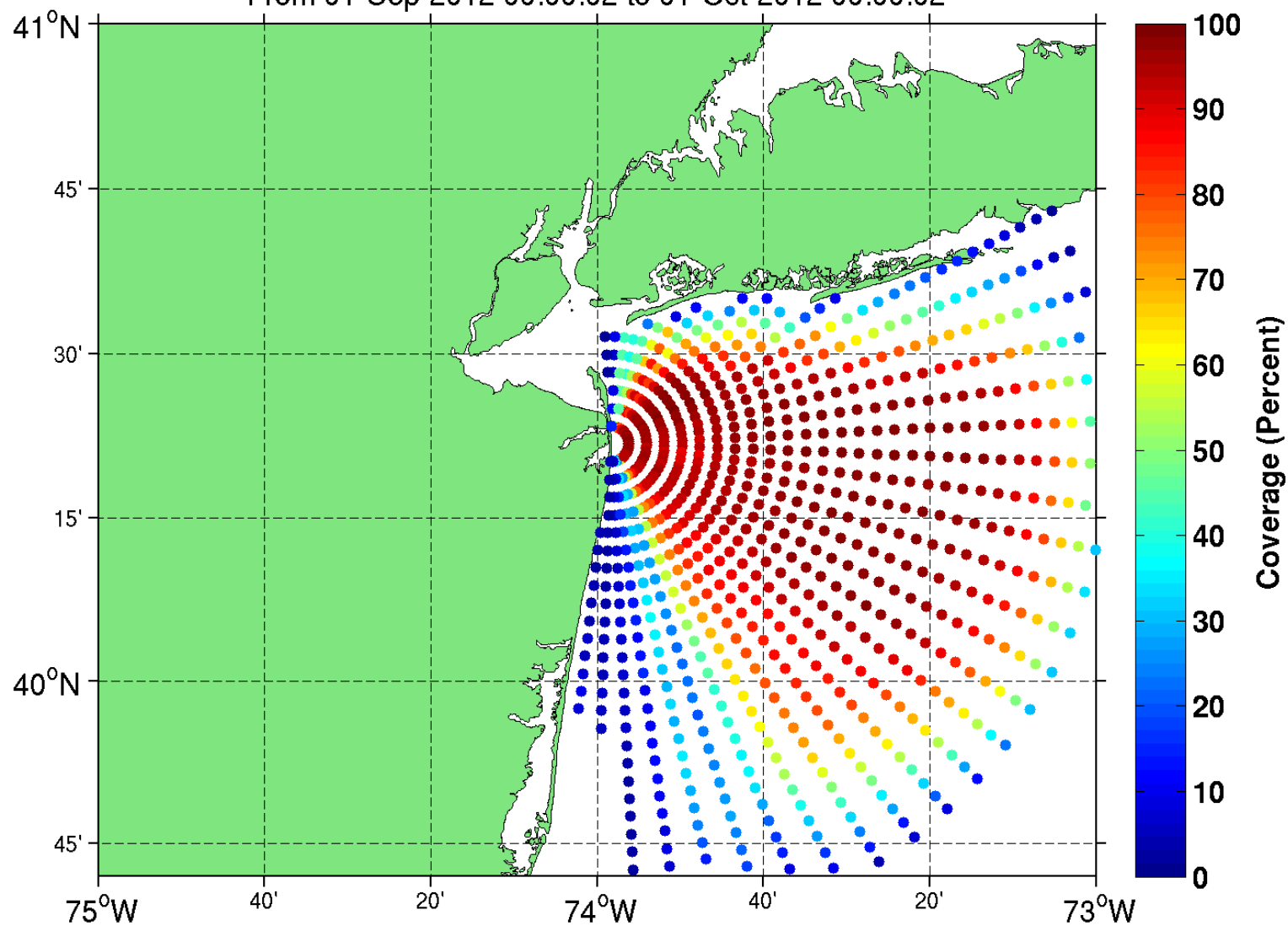


SEAB RDLm Coverage, 745 of 745 possible hourly maps  
From 01-Aug-2012 00:00:02 to 01-Sep-2012 00:00:02

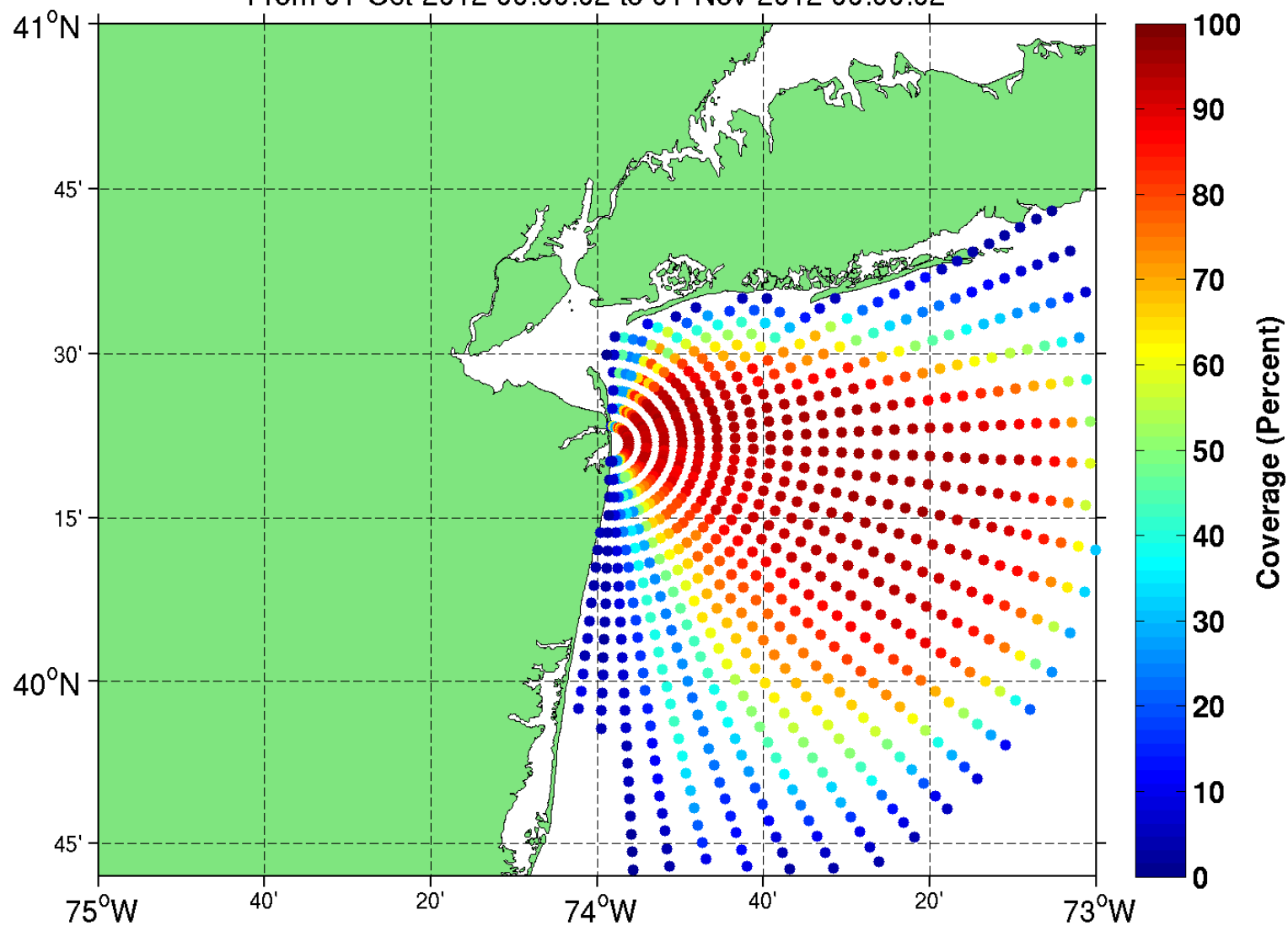




SEAB RDLm Coverage, 717 of 721 possible hourly maps  
From 01-Sep-2012 00:00:02 to 01-Oct-2012 00:00:02



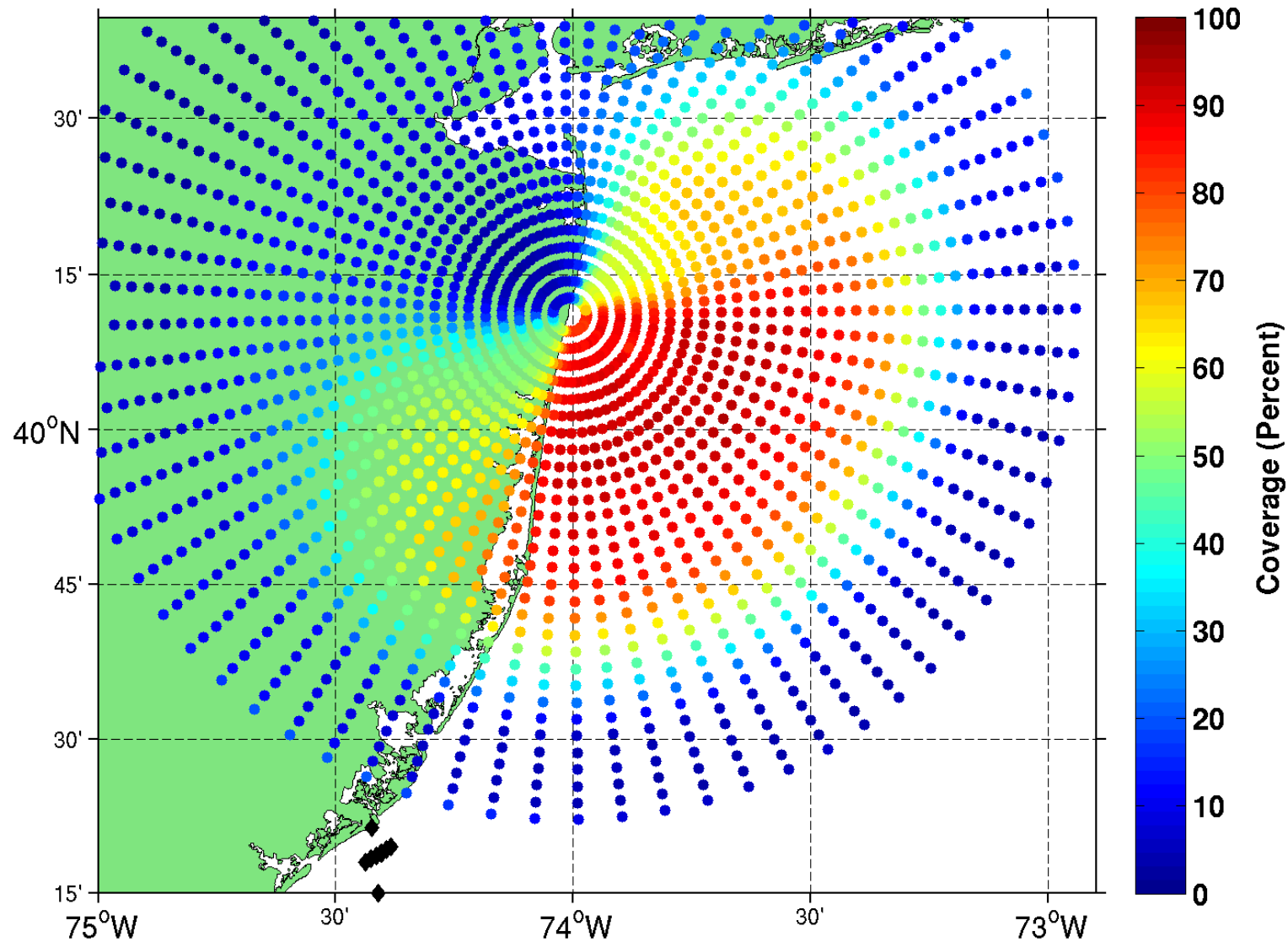
SEAB RDLm Coverage, 678 of 745 possible hourly maps  
From 01-Oct-2012 00:00:02 to 01-Nov-2012 00:00:02



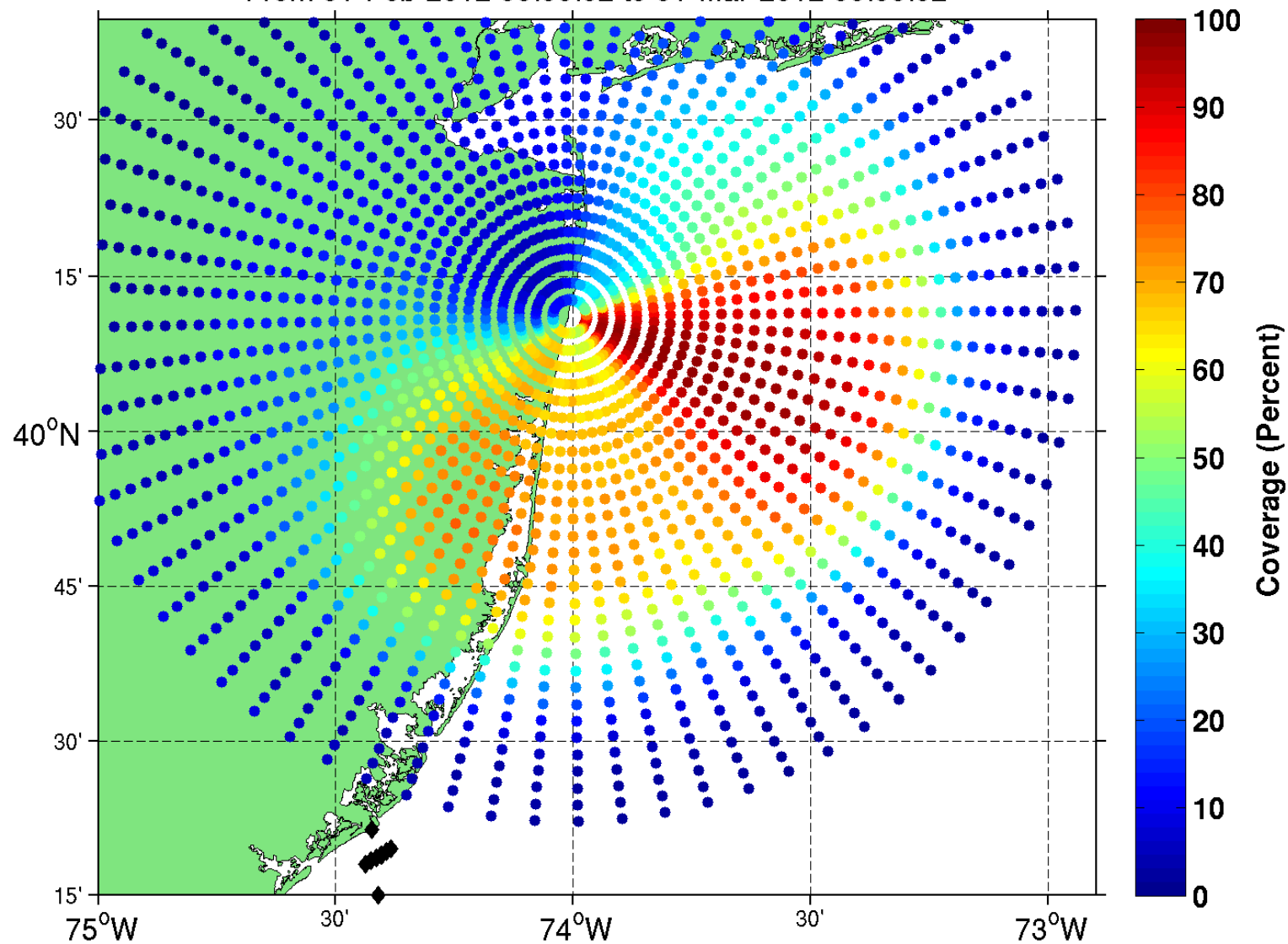
# **BELMAR**

## **IDEAL RADIALS**

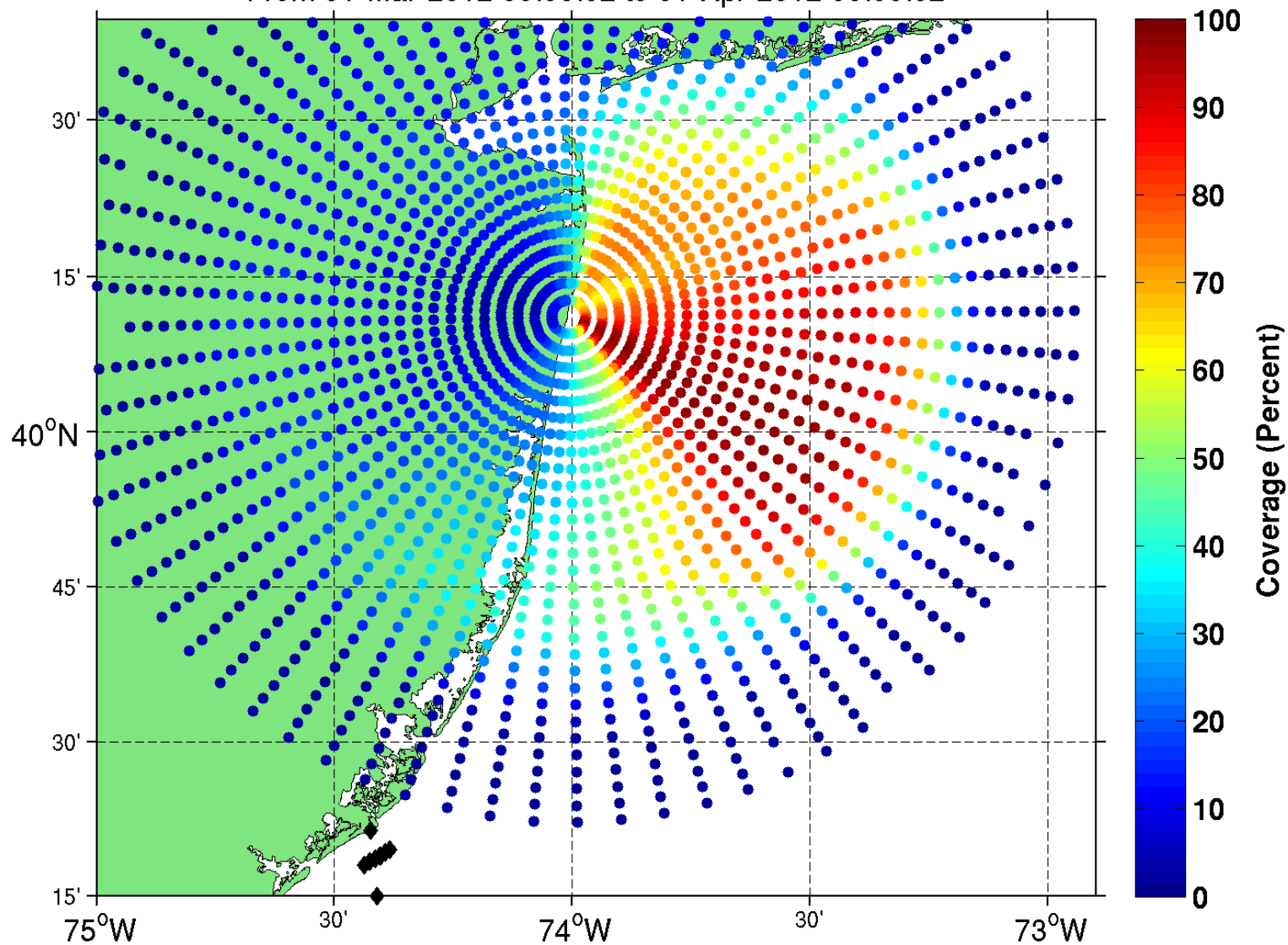
BELM RDLi Coverage, 745 of 745 possible hourly maps  
From 01-Jan-2012 00:00:02 to 01-Feb-2012 00:00:02



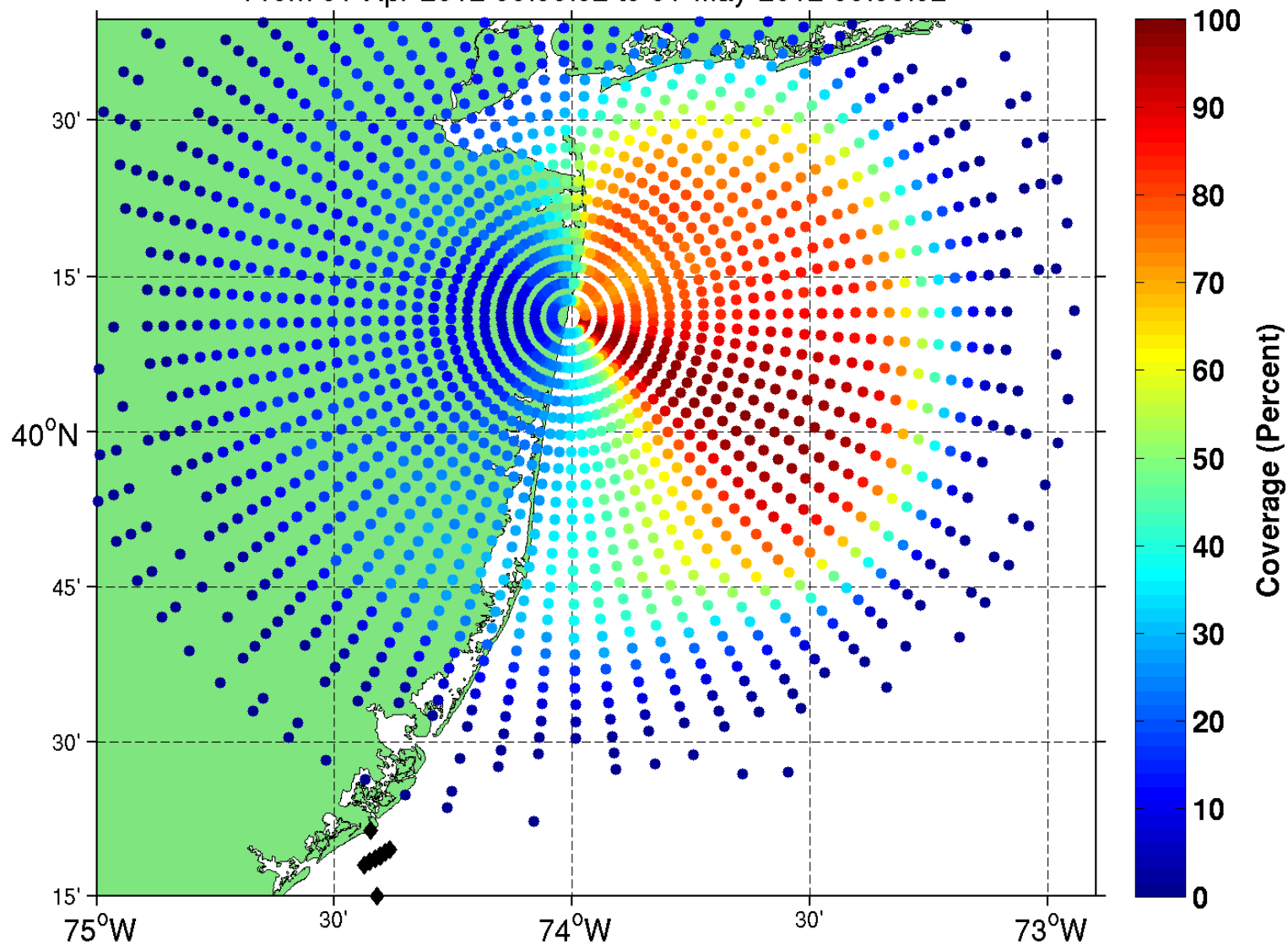
BELM RDLi Coverage, 677 of 697 possible hourly maps  
From 01-Feb-2012 00:00:02 to 01-Mar-2012 00:00:02



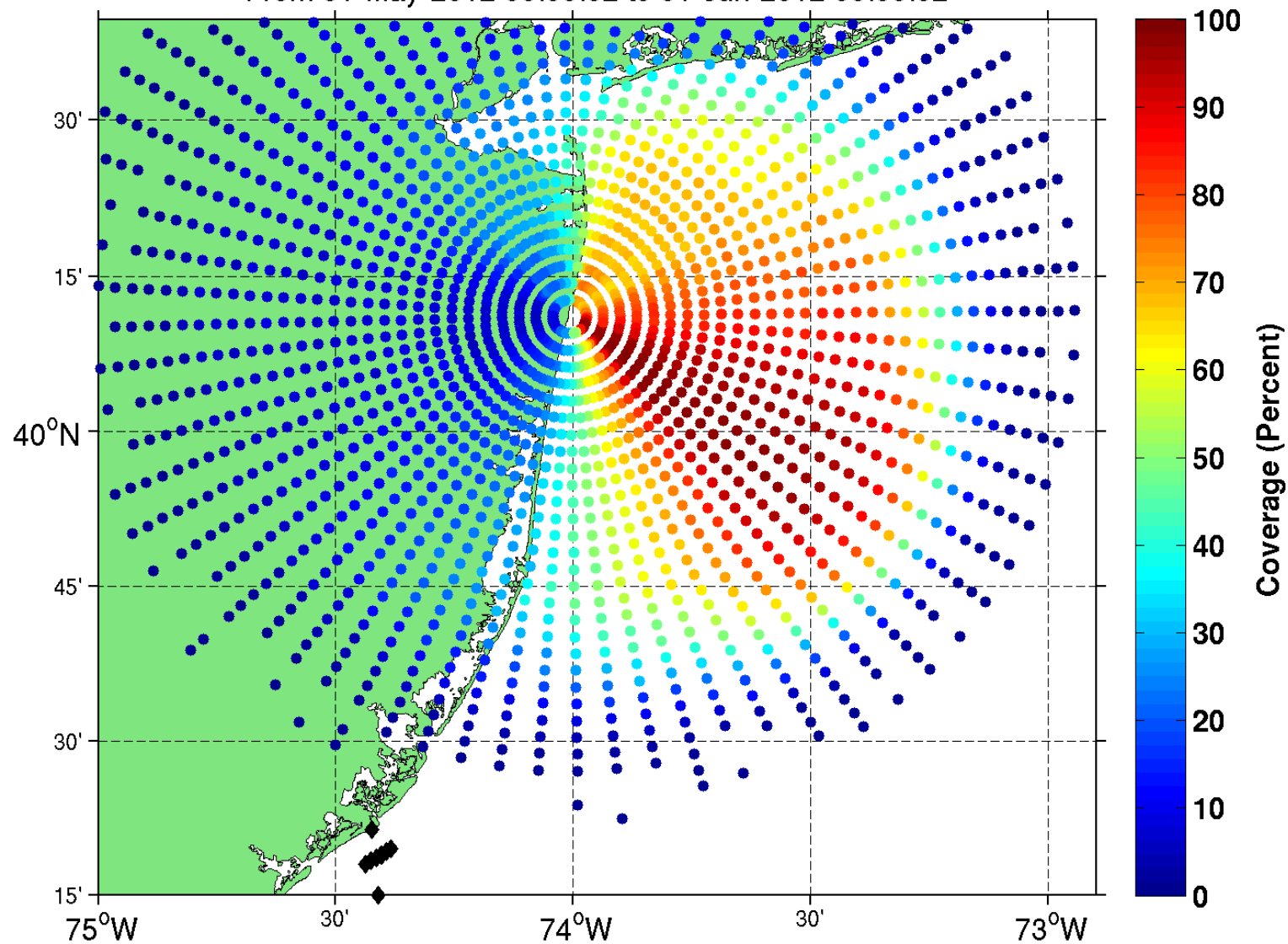
BELM RDLi Coverage, 647 of 745 possible hourly maps  
From 01-Mar-2012 00:00:02 to 01-Apr-2012 00:00:02



BELM RDLi Coverage, 701 of 721 possible hourly maps  
From 01-Apr-2012 00:00:02 to 01-May-2012 00:00:02

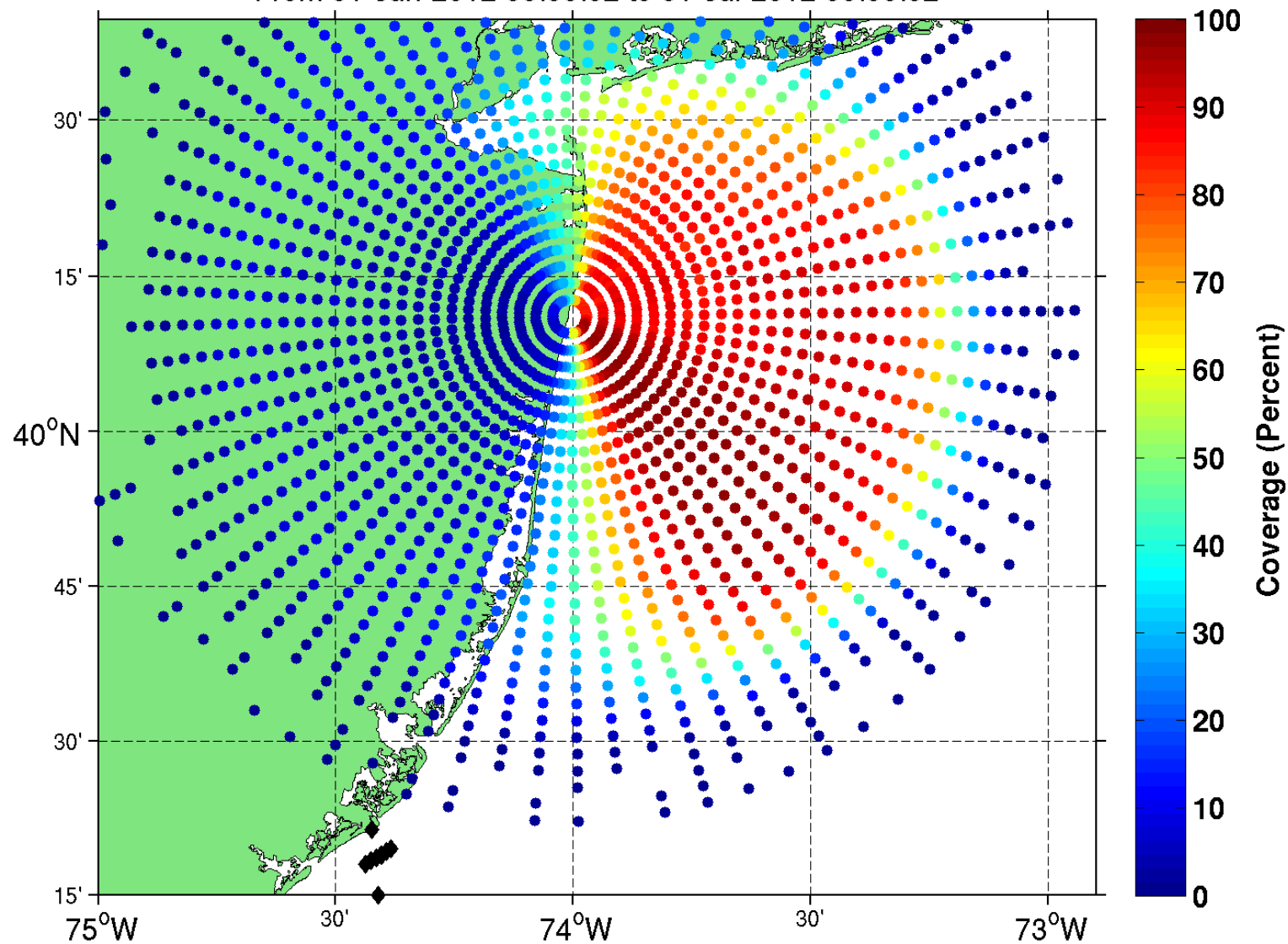


BELM RDLi Coverage, 743 of 745 possible hourly maps  
From 01-May-2012 00:00:02 to 01-Jun-2012 00:00:02

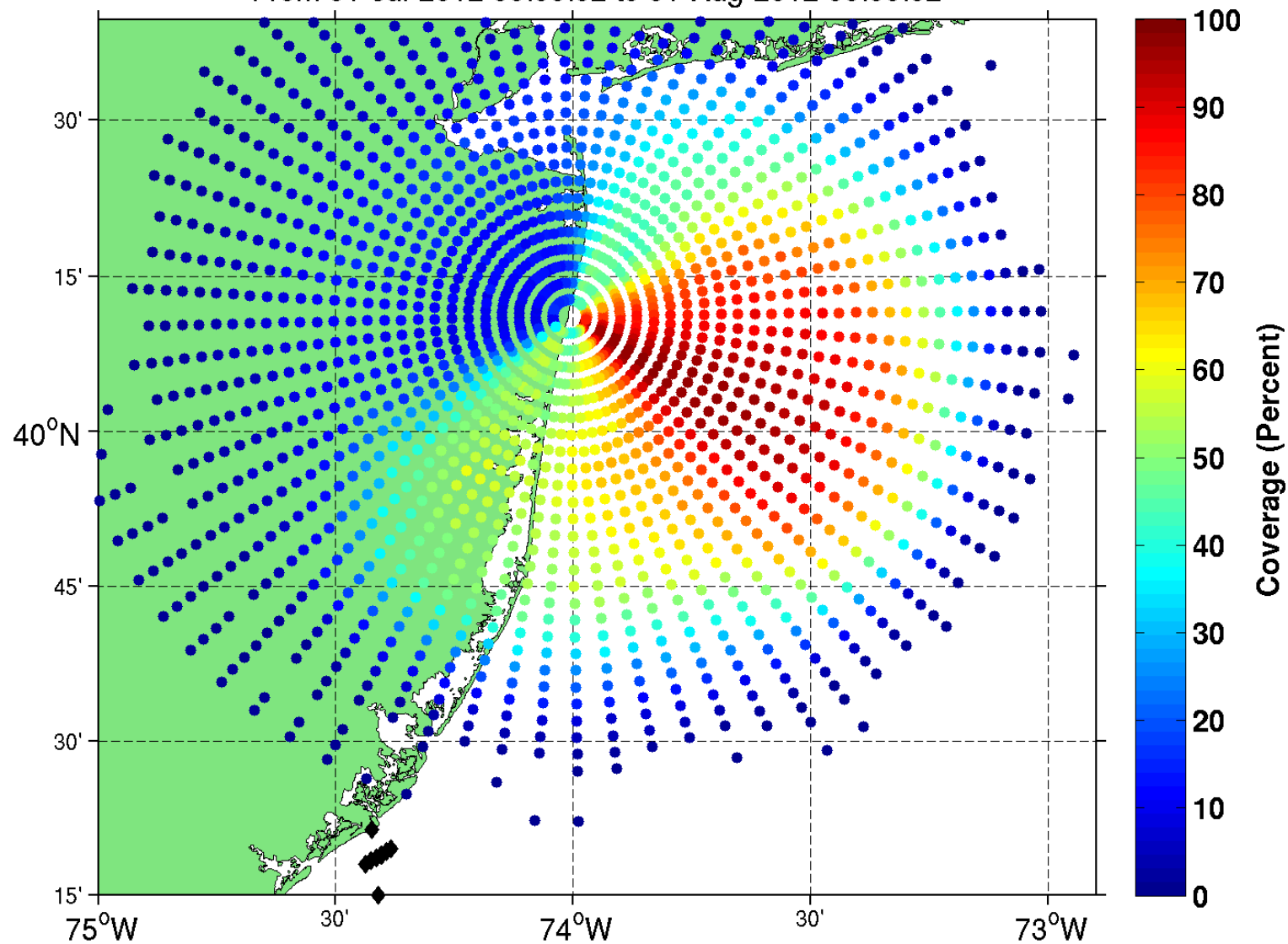




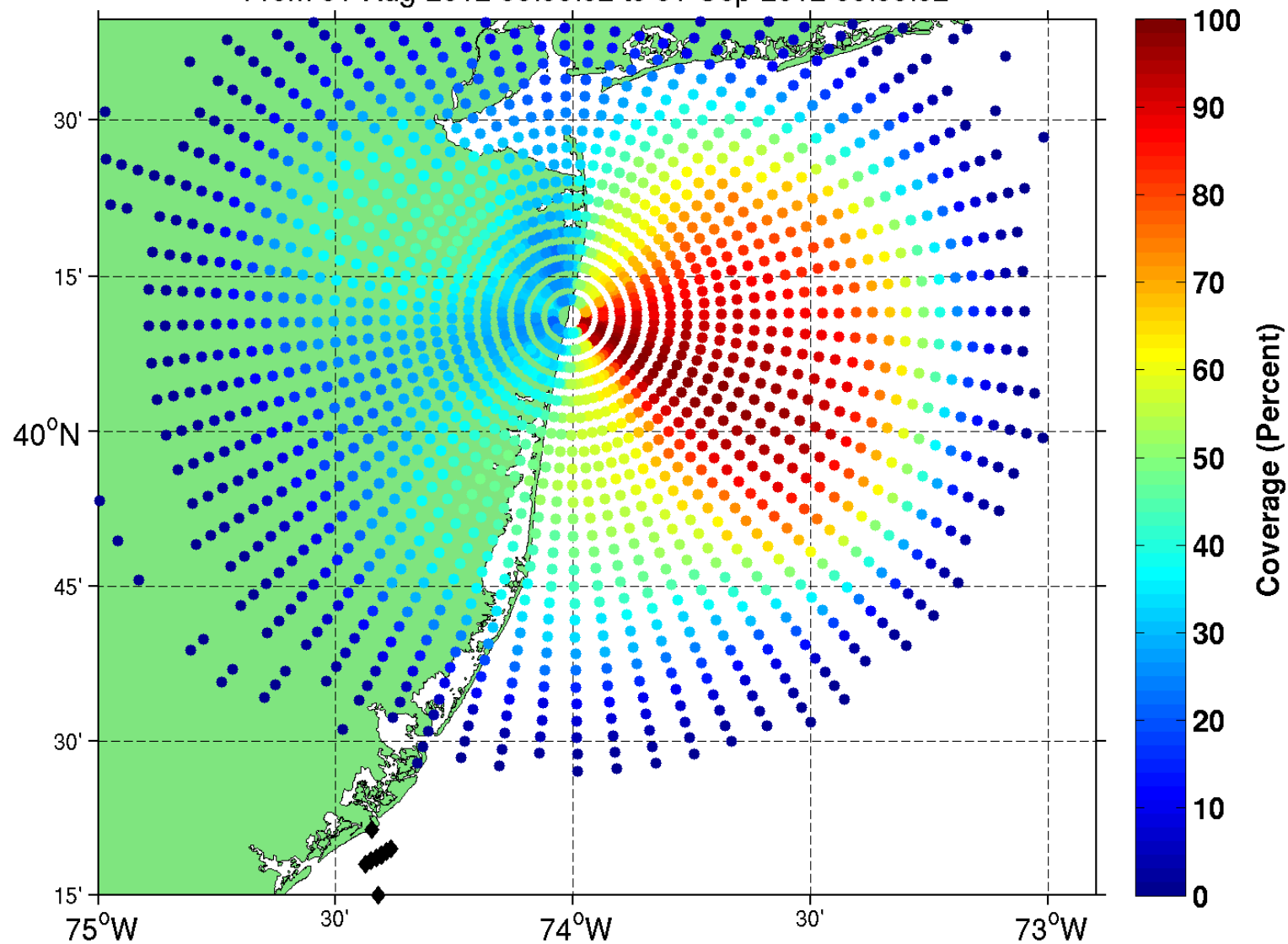
BELM RDLi Coverage, 508 of 721 possible hourly maps  
From 01-Jun-2012 00:00:02 to 01-Jul-2012 00:00:02



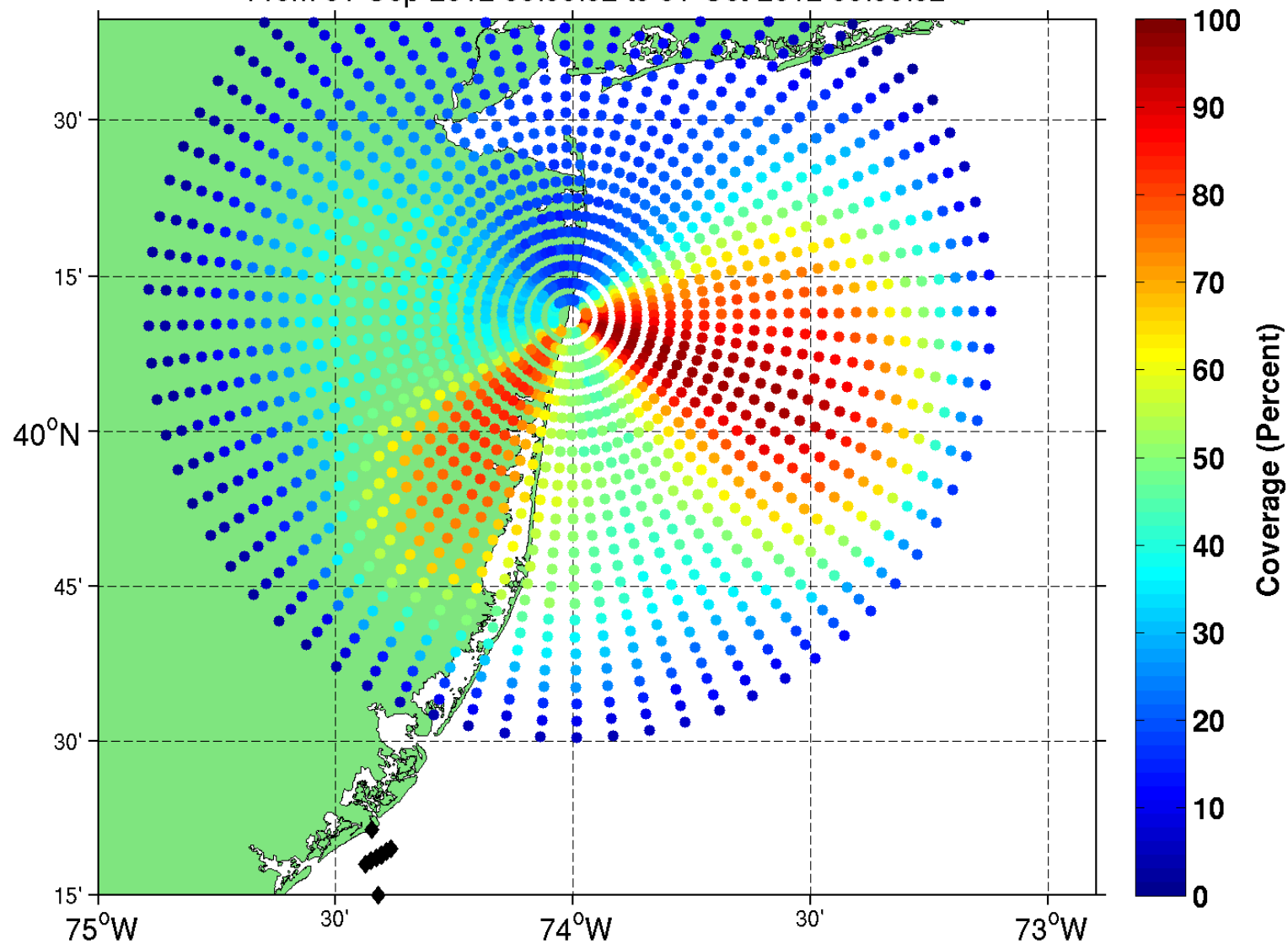
BELM RDLi Coverage, 684 of 745 possible hourly maps  
From 01-Jul-2012 00:00:02 to 01-Aug-2012 00:00:02



BELM RDLi Coverage, 744 of 745 possible hourly maps  
From 01-Aug-2012 00:00:02 to 01-Sep-2012 00:00:02

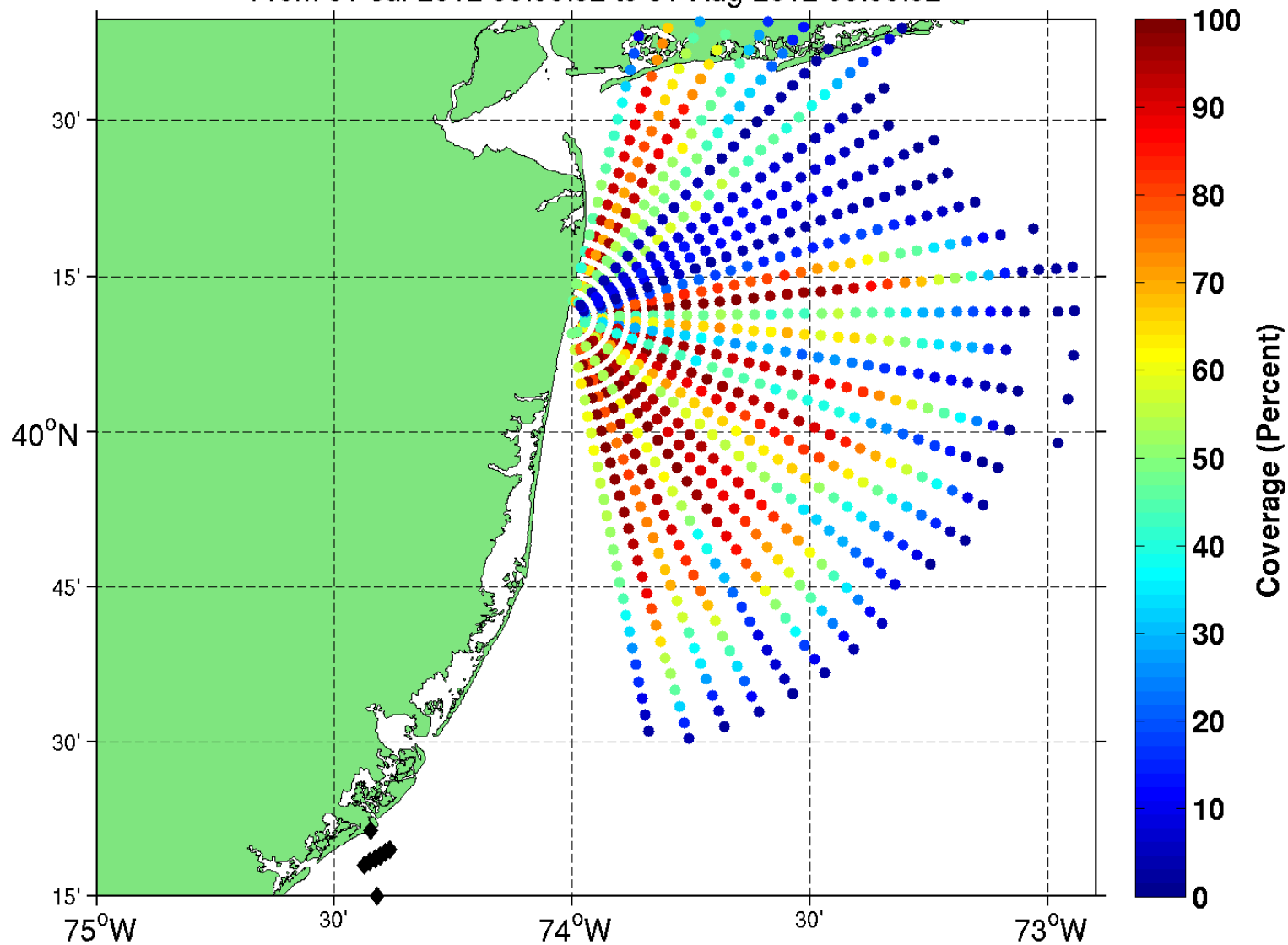


BELM RDLi Coverage, 470 of 721 possible hourly maps  
From 01-Sep-2012 00:00:02 to 01-Oct-2012 00:00:02

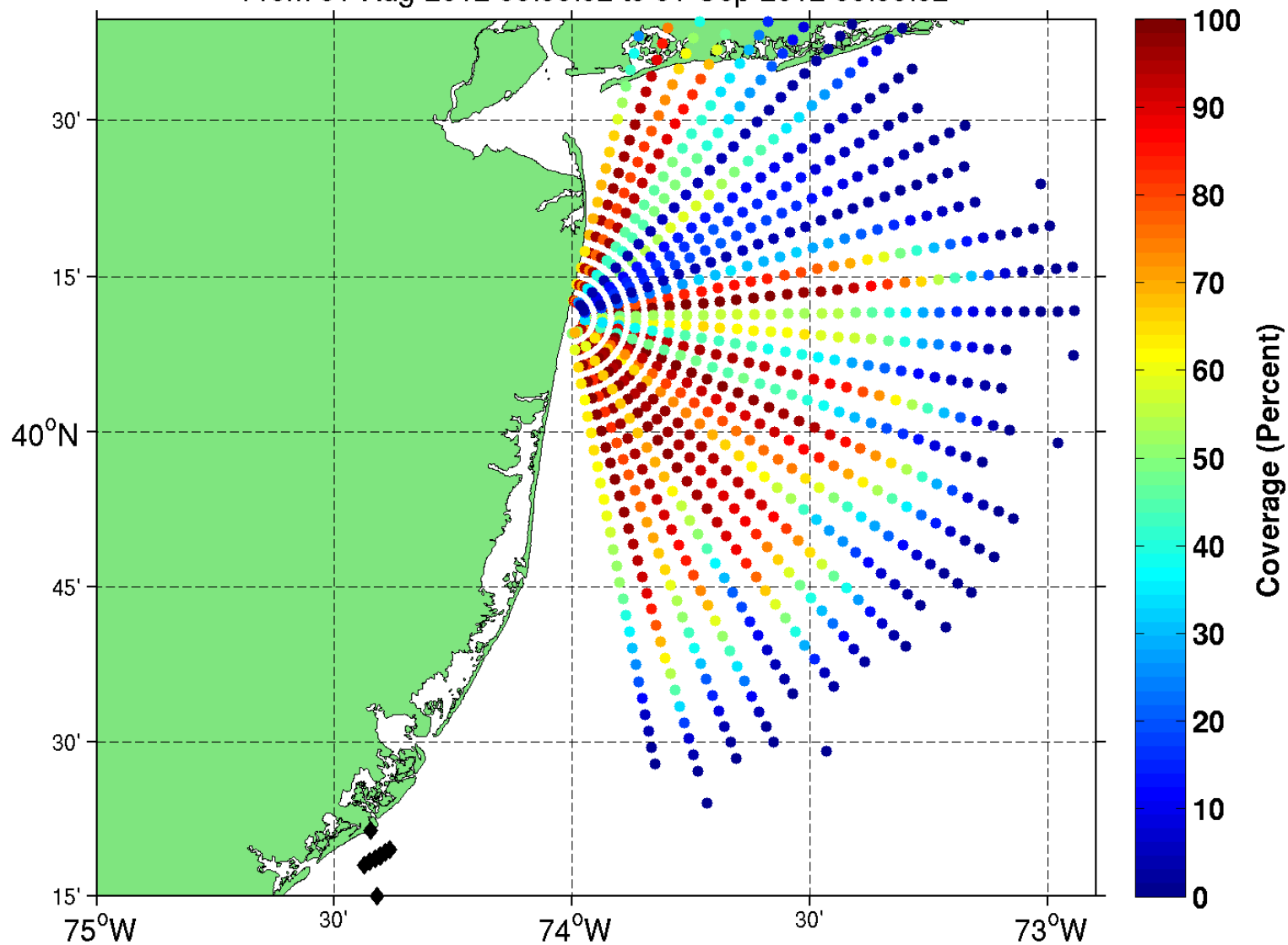


# **BELMAR MEASURED RADIALS**

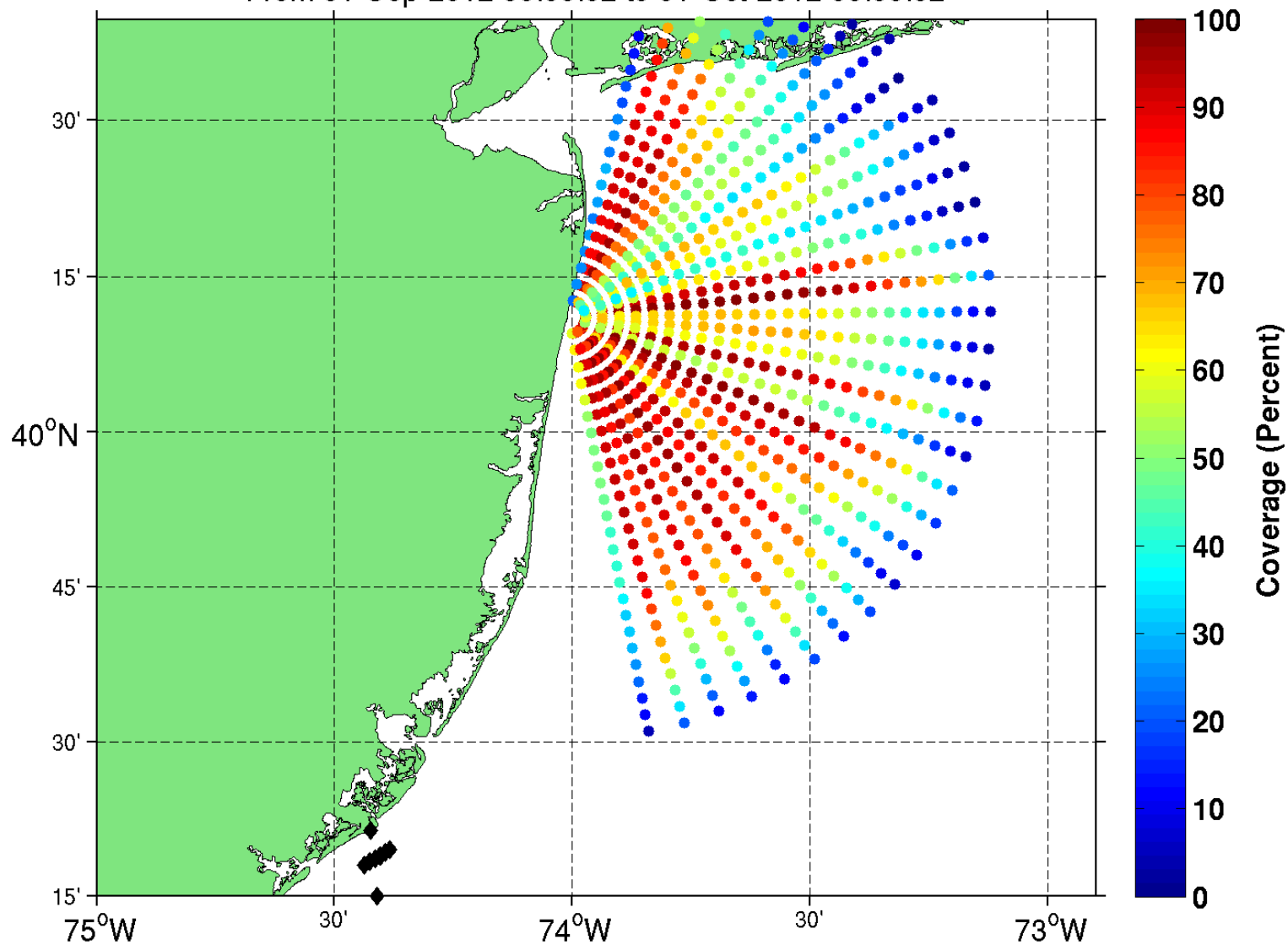
BELM RDLm Coverage, 196 of 745 possible hourly maps  
From 01-Jul-2012 00:00:02 to 01-Aug-2012 00:00:02



BELM RDLm Coverage, 744 of 745 possible hourly maps  
From 01-Aug-2012 00:00:02 to 01-Sep-2012 00:00:02



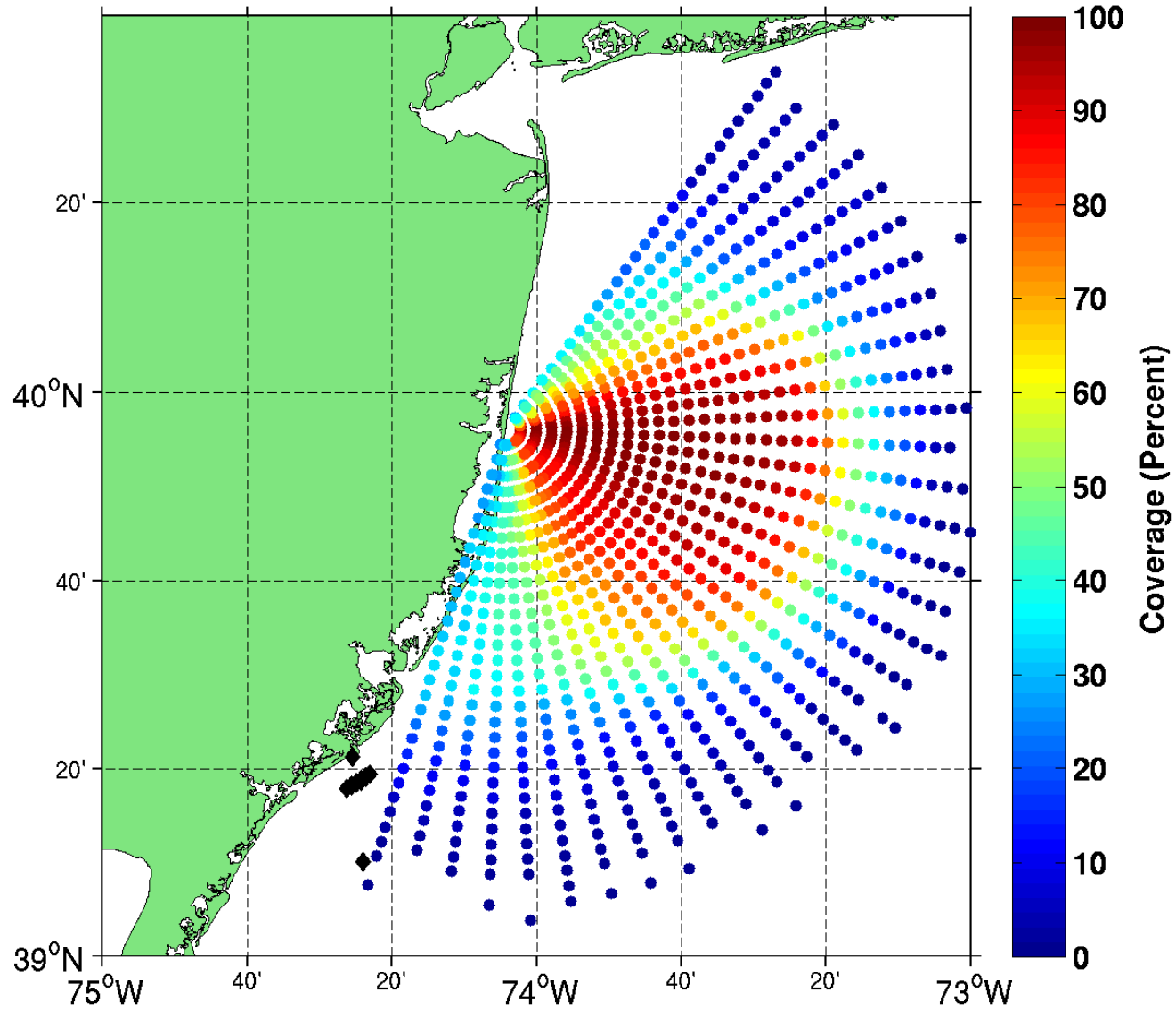
BELM RDLm Coverage, 470 of 721 possible hourly maps  
From 01-Sep-2012 00:00:02 to 01-Oct-2012 00:00:02



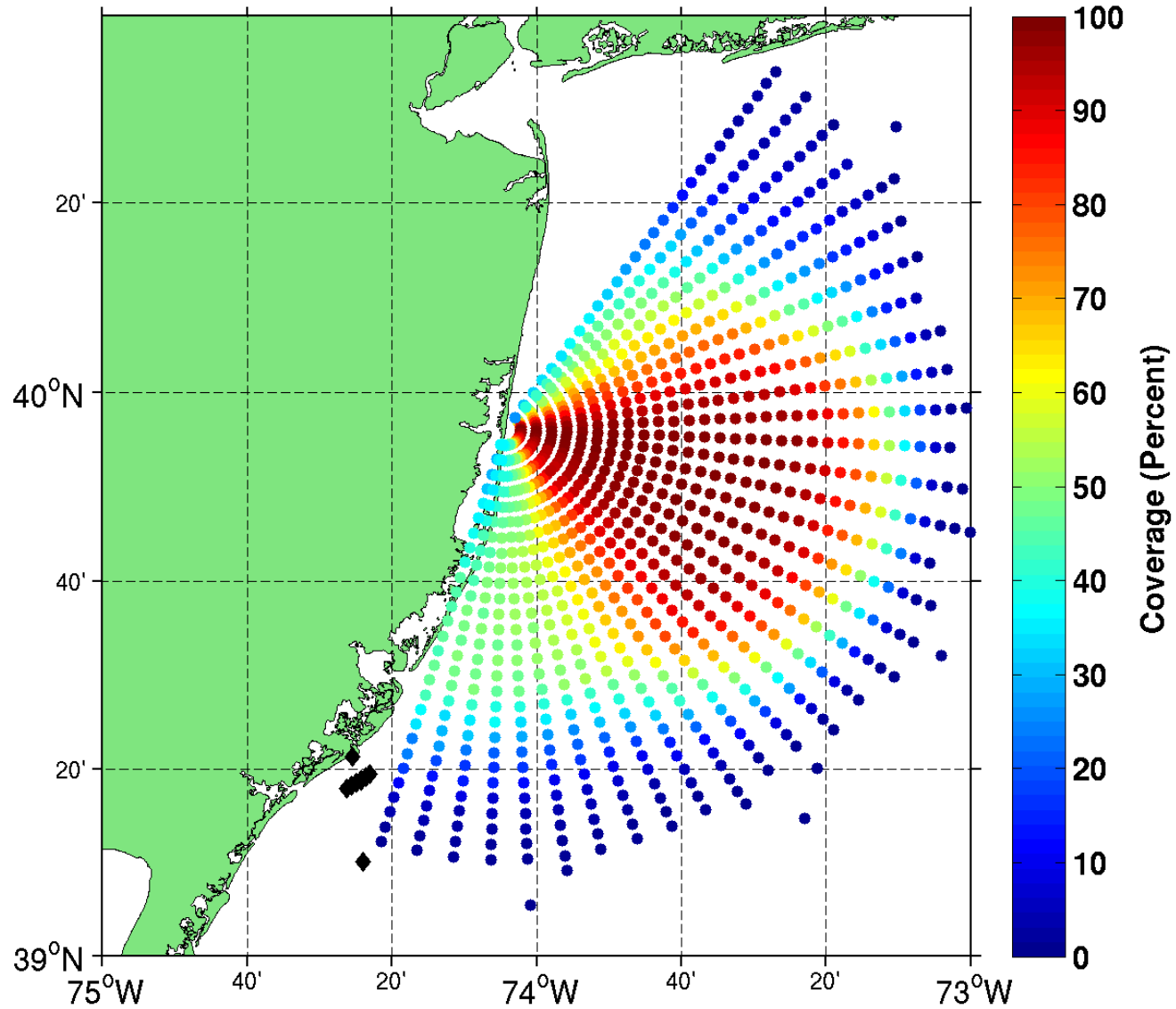


# **SEASIDE PARK IDEAL RADIALS**

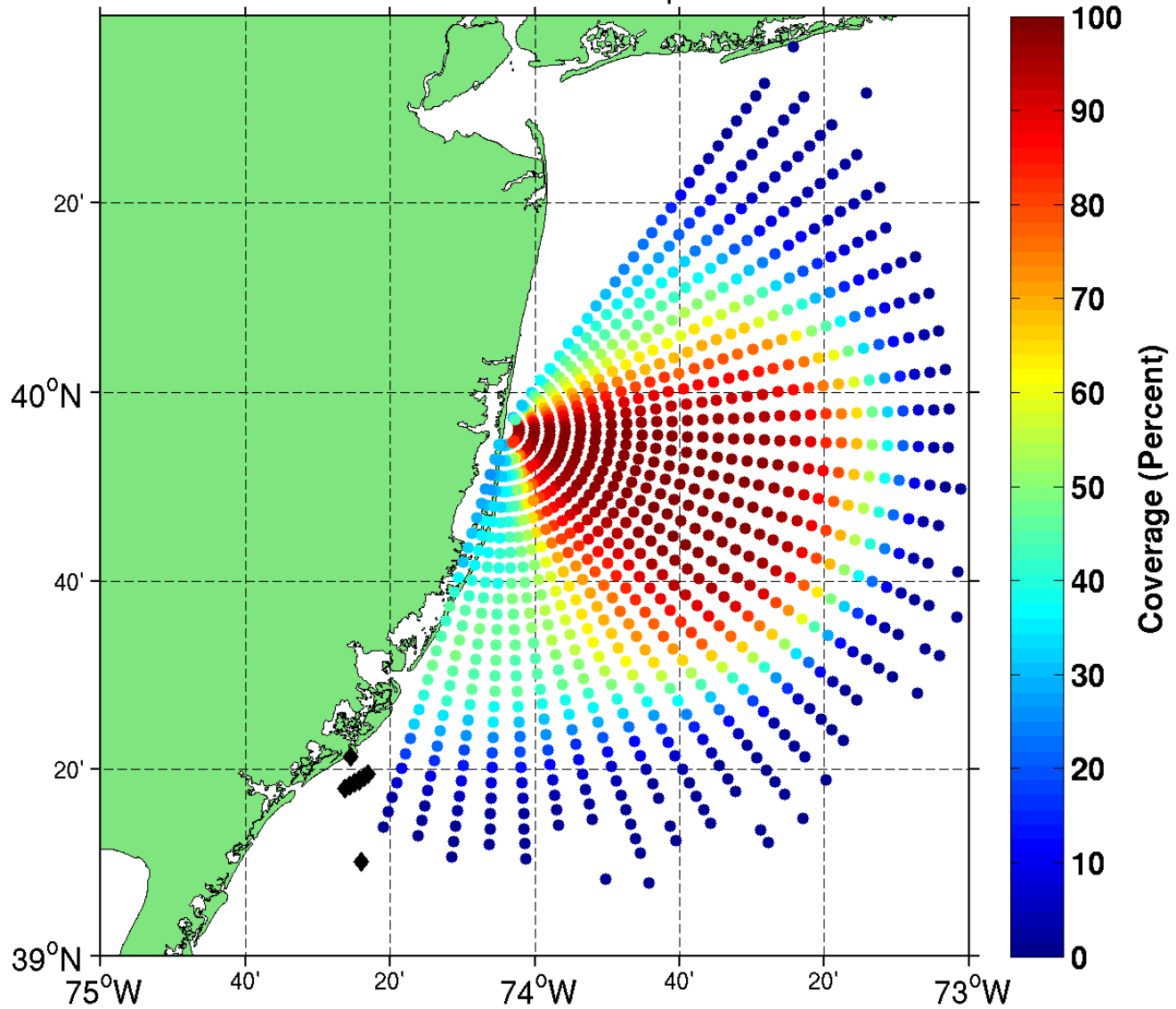
SPRK RDLi Coverage, 745 of 745 possible hourly maps  
From 01-Jan-2012 00:00:02 to 01-Feb-2012 00:00:02



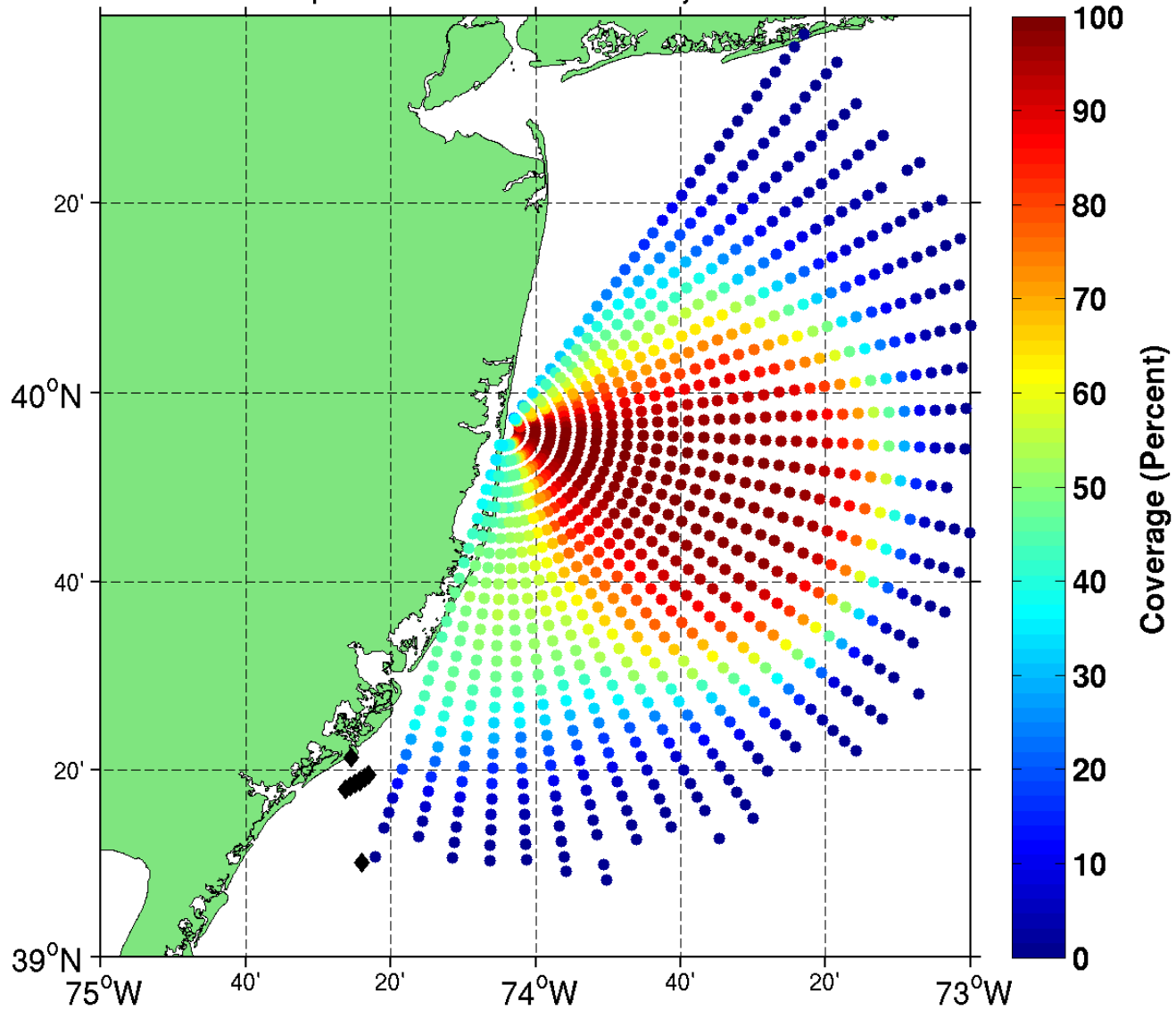
SPRK RDLi Coverage, 697 of 697 possible hourly maps  
From 01-Feb-2012 00:00:02 to 01-Mar-2012 00:00:02



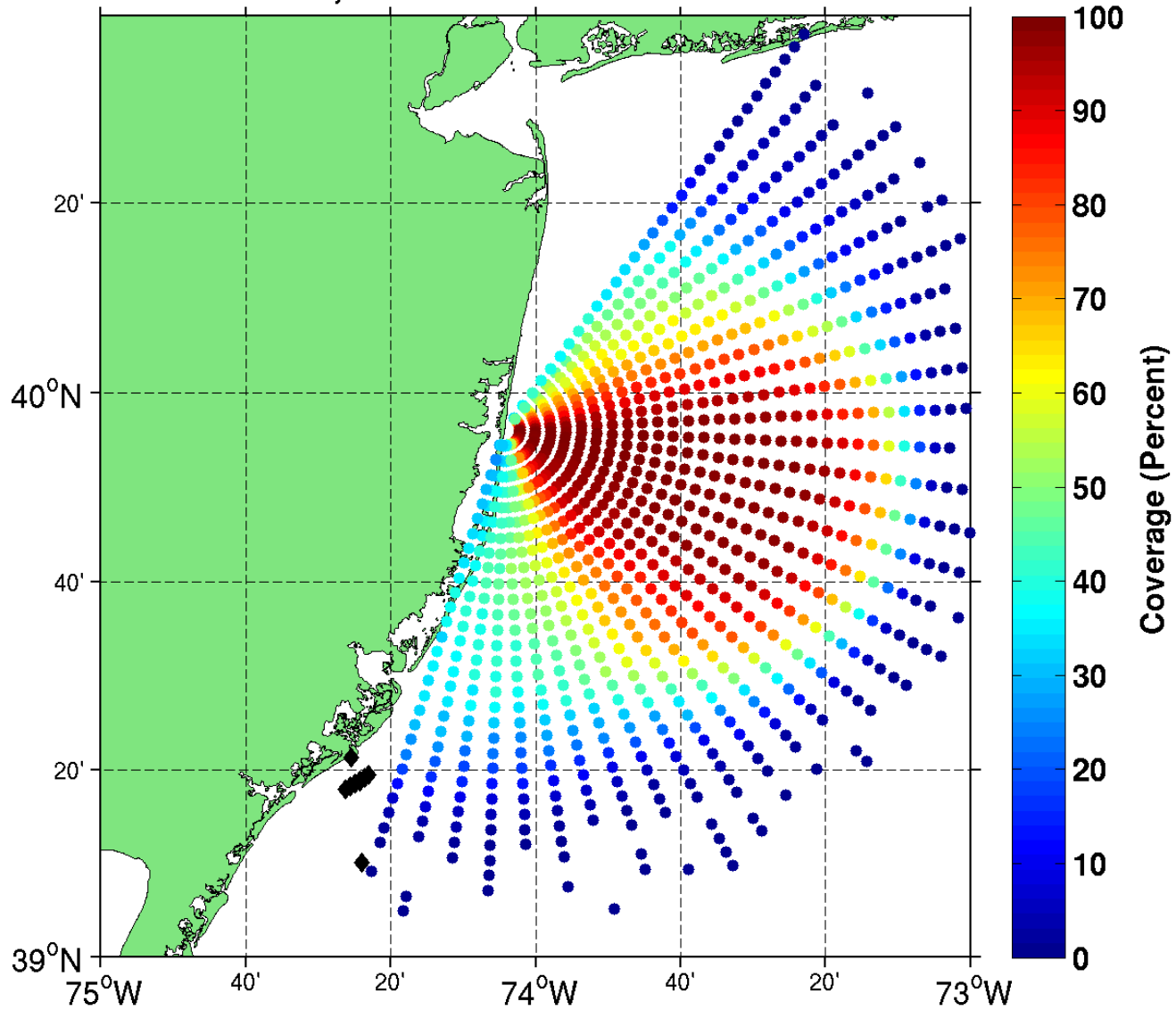
SPRK RDLi Coverage, 745 of 745 possible hourly maps  
From 01-Mar-2012 00:00:02 to 01-Apr-2012 00:00:02



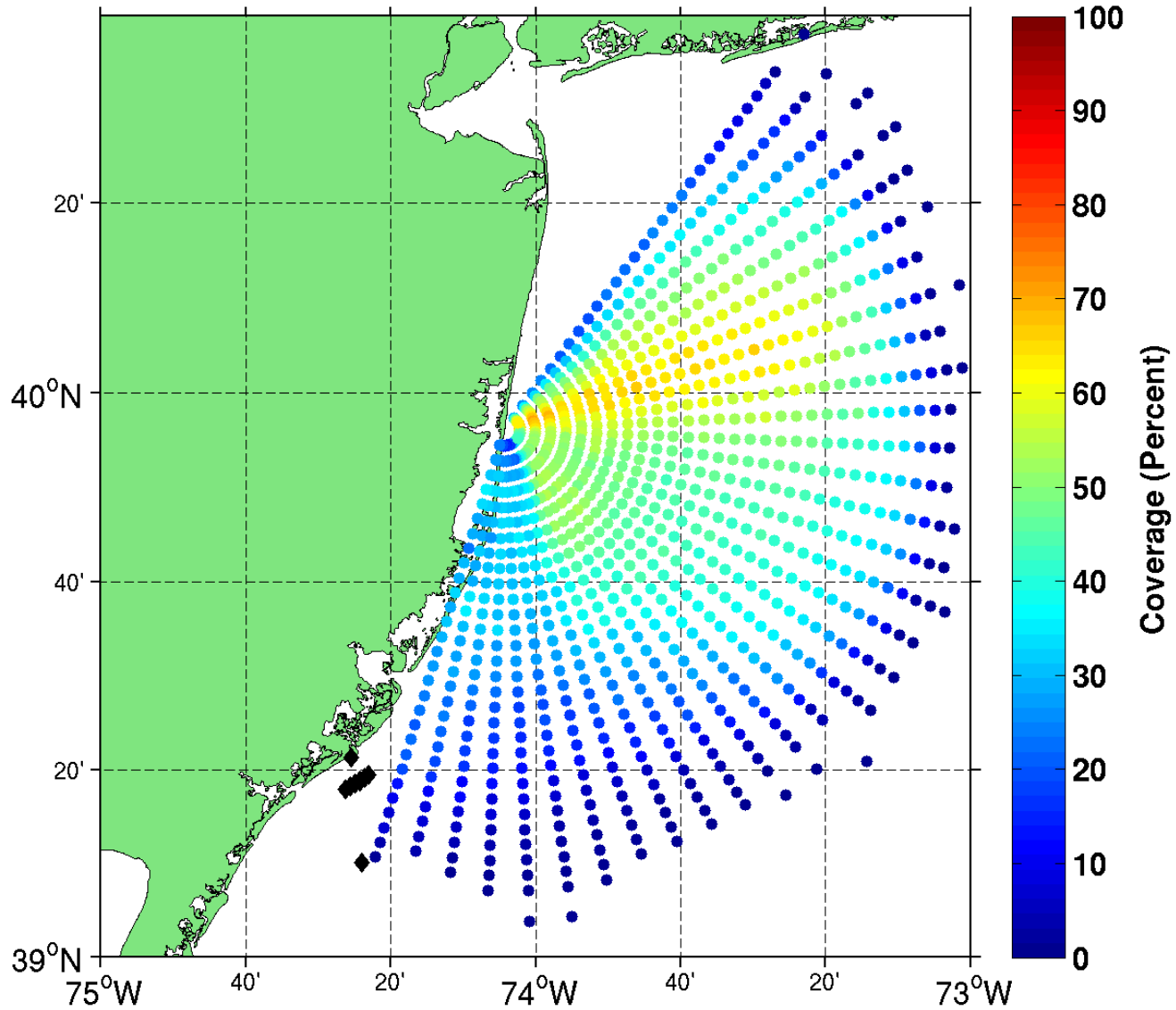
SPRK RDLi Coverage, 721 of 721 possible hourly maps  
From 01-Apr-2012 00:00:02 to 01-May-2012 00:00:02



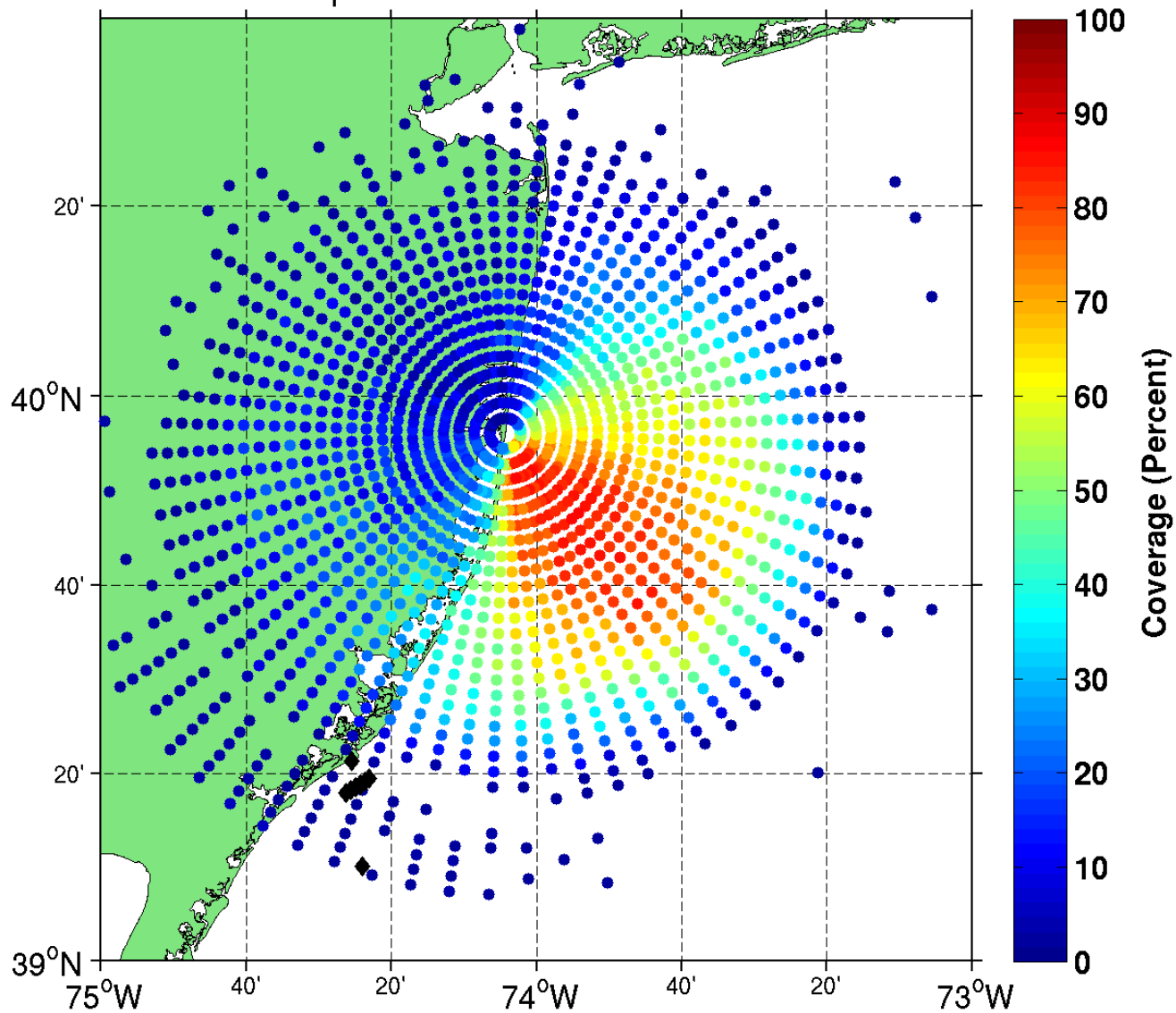
SPRK RDLi Coverage, 745 of 745 possible hourly maps  
From 01-May-2012 00:00:02 to 01-Jun-2012 00:00:02



SPRK RDLi Coverage, 414 of 721 possible hourly maps  
From 01-Jun-2012 00:00:02 to 01-Jul-2012 00:00:02

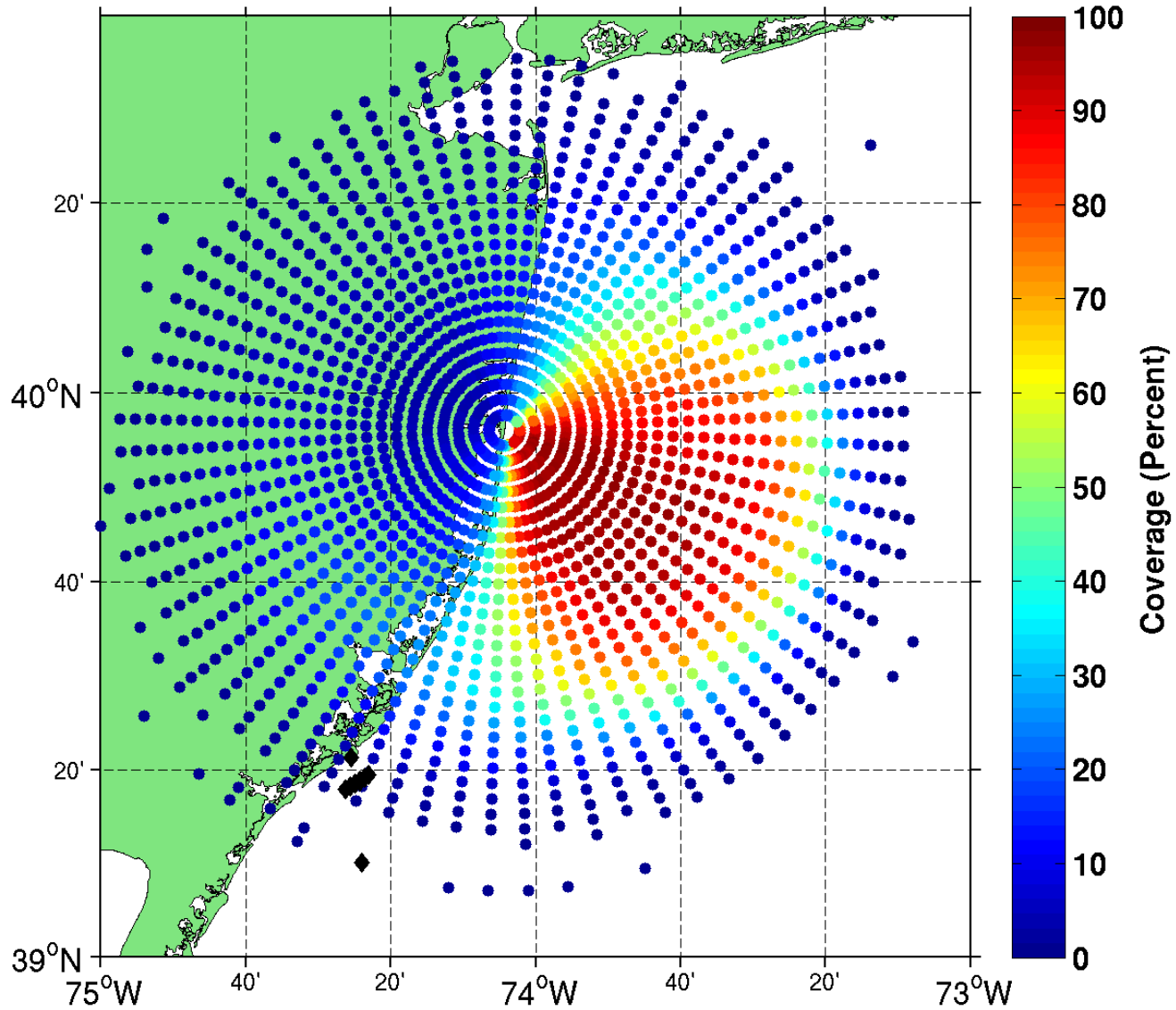


SPRK RDLi Coverage, 84 of 721 possible hourly maps  
From 01-Sep-2012 00:00:02 to 01-Oct-2012 00:00:02



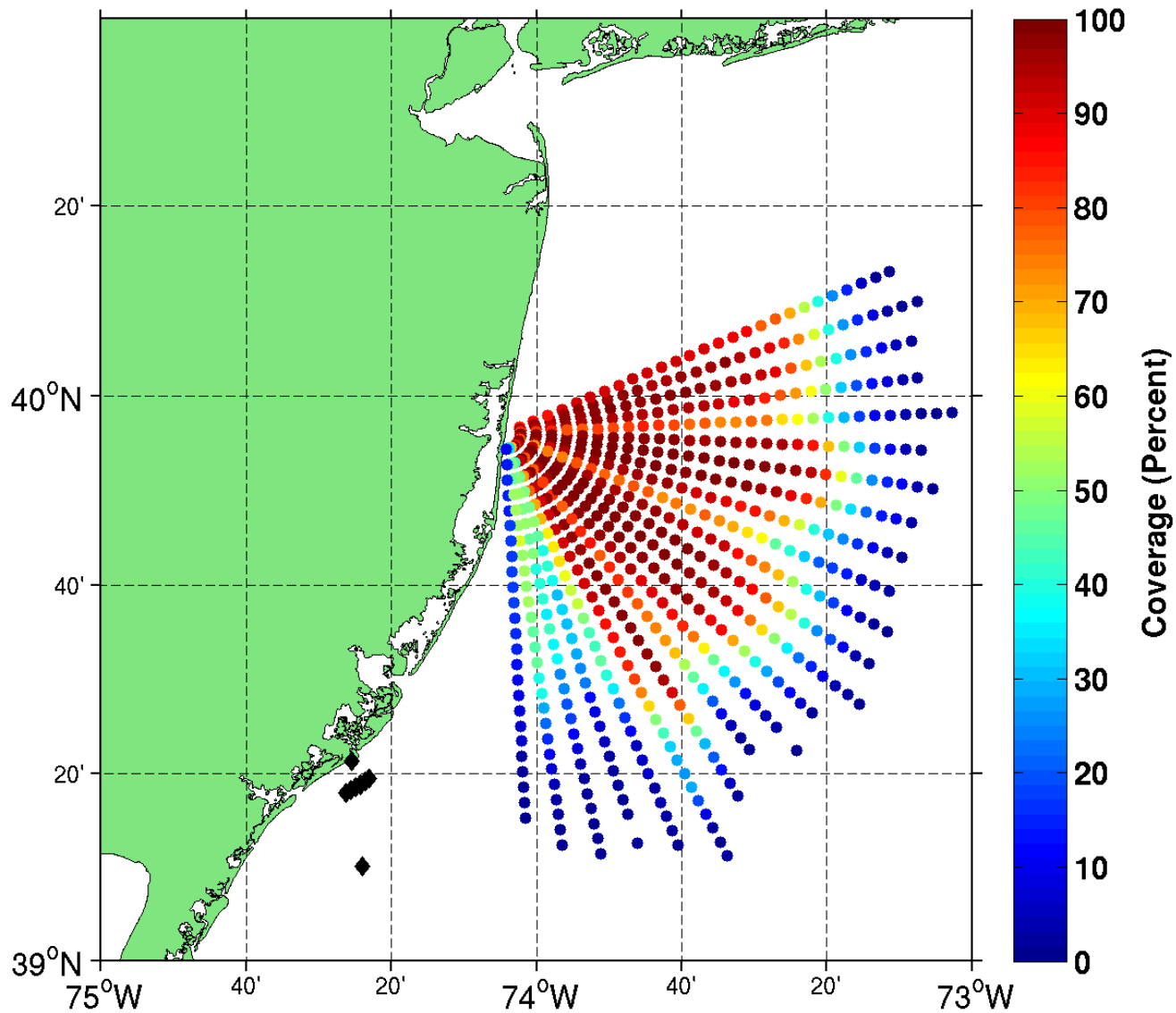


SPRK RDLi Coverage, 690 of 745 possible hourly maps  
From 01-Oct-2012 00:00:02 to 01-Nov-2012 00:00:02

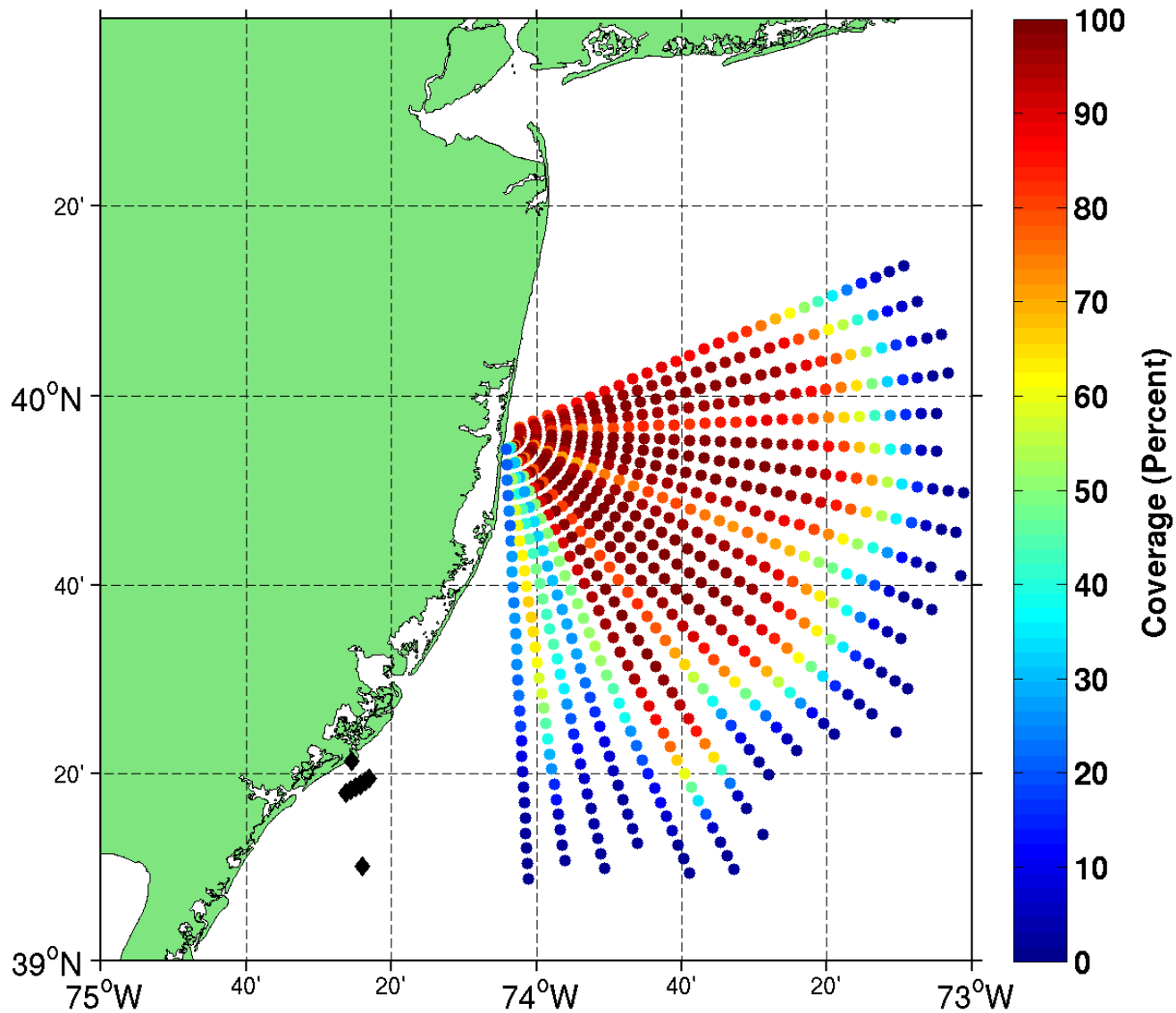


# **SEASIDE PARK MEASURED RADIALS**

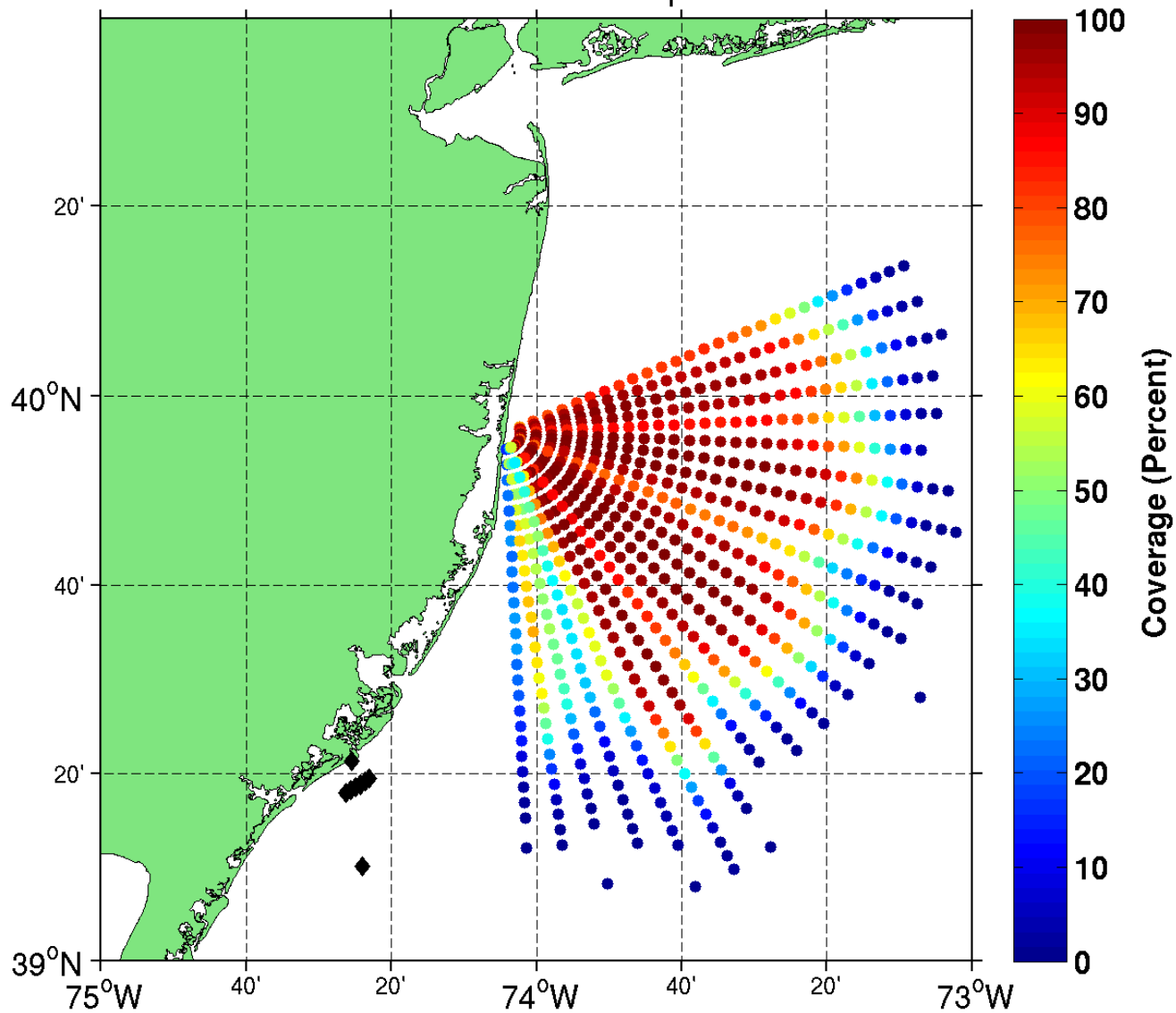
SPRK RDLm Coverage, 249 of 745 possible hourly maps  
From 01-Jan-2012 00:00:02 to 01-Feb-2012 00:00:02



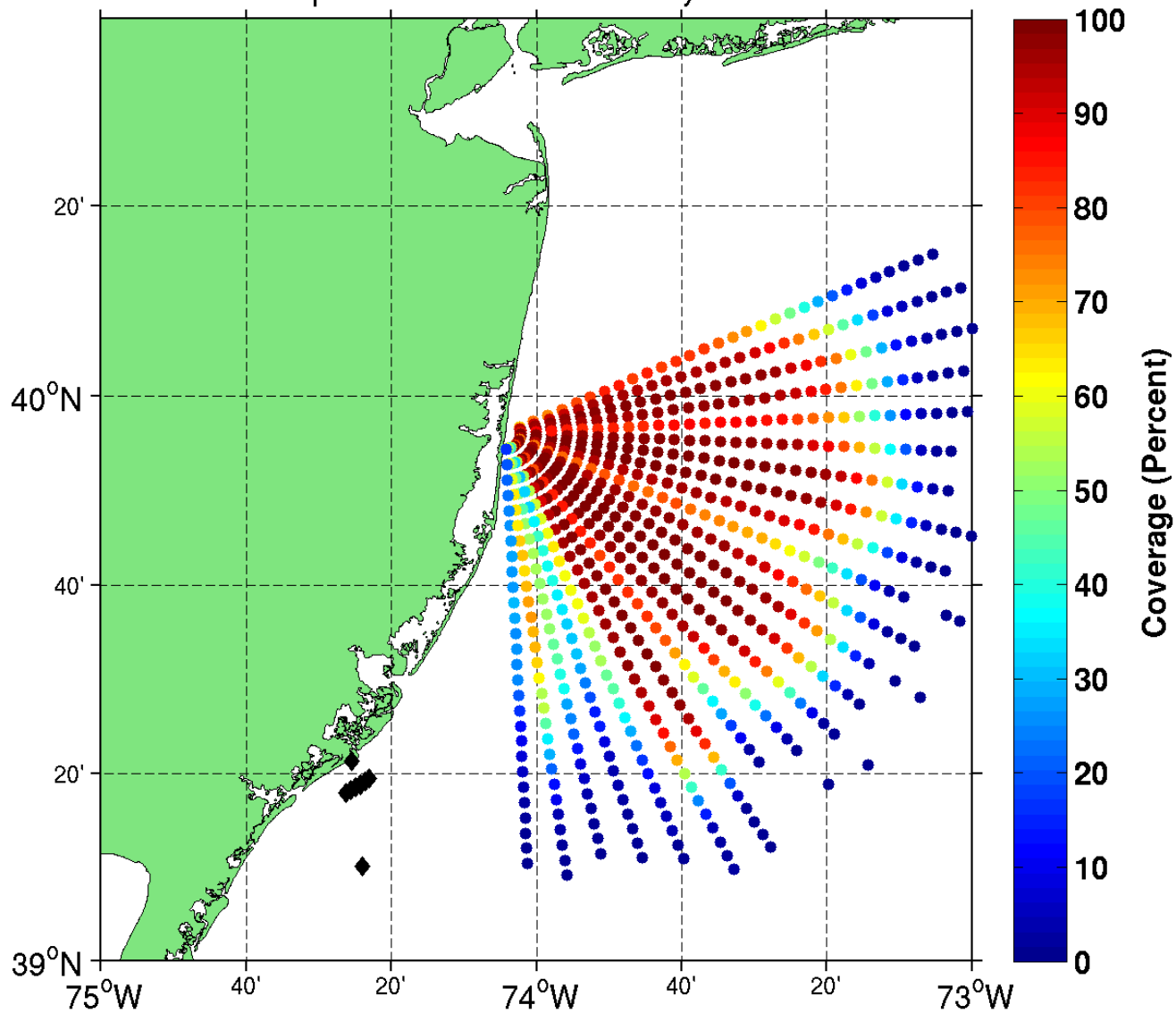
SPRK RDLm Coverage, 697 of 697 possible hourly maps  
From 01-Feb-2012 00:00:02 to 01-Mar-2012 00:00:02



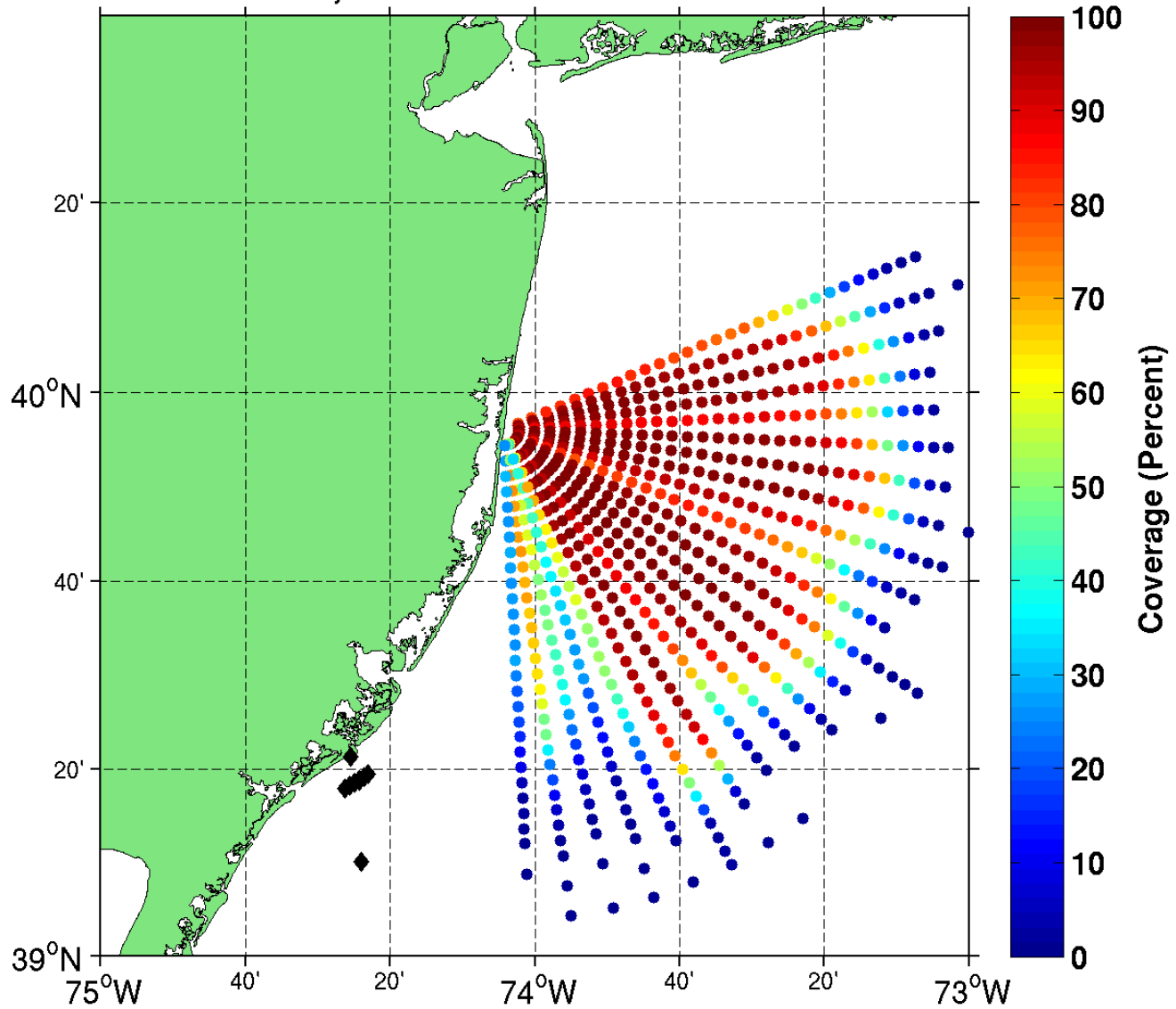
SPRK RDLm Coverage, 745 of 745 possible hourly maps  
From 01-Mar-2012 00:00:02 to 01-Apr-2012 00:00:02



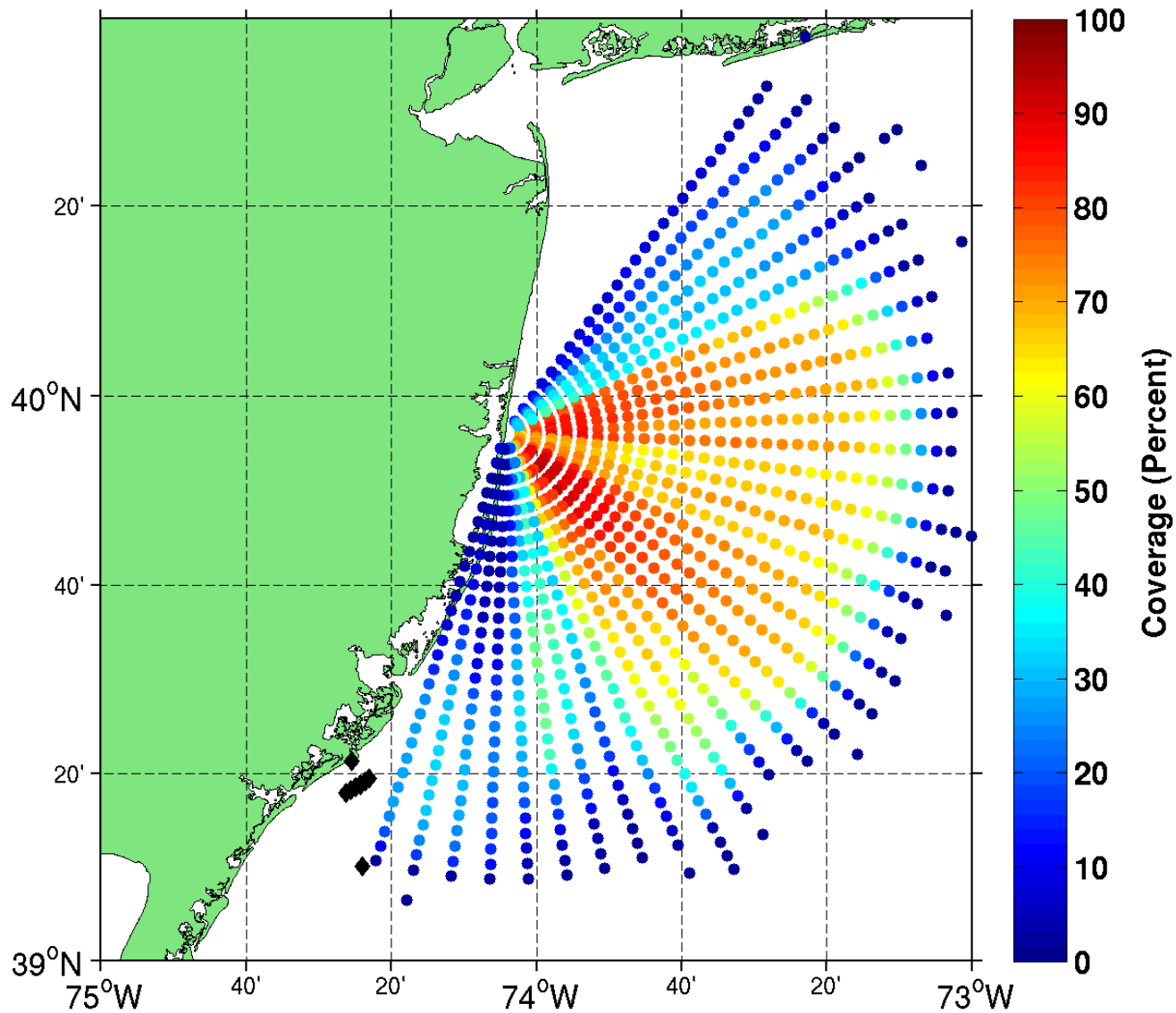
SPRK RDLm Coverage, 721 of 721 possible hourly maps  
From 01-Apr-2012 00:00:02 to 01-May-2012 00:00:02



SPRK RDLm Coverage, 745 of 745 possible hourly maps  
From 01-May-2012 00:00:02 to 01-Jun-2012 00:00:02

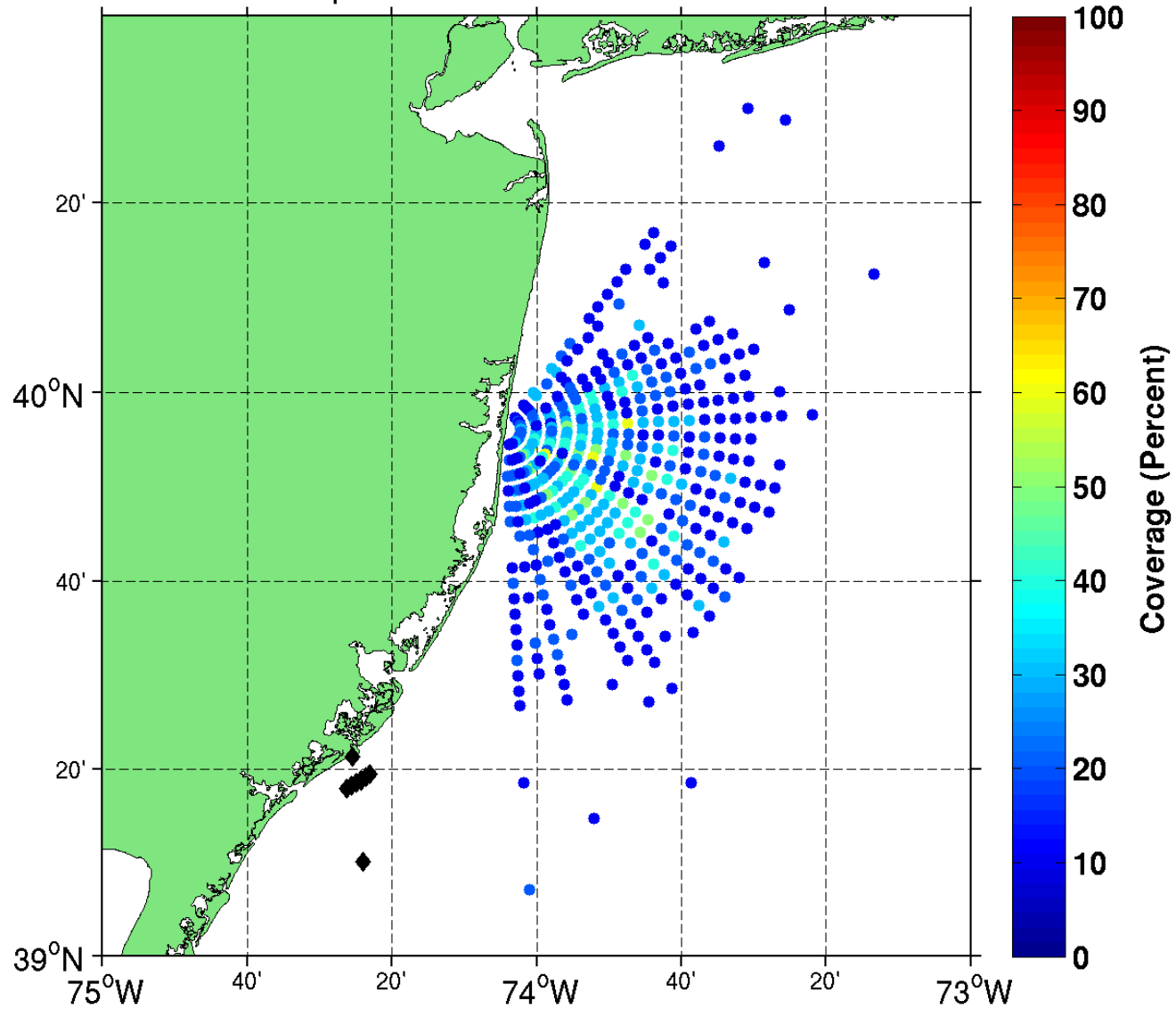


SPRK RDLm Coverage, 415 of 721 possible hourly maps  
From 01-Jun-2012 00:00:02 to 01-Jul-2012 00:00:02

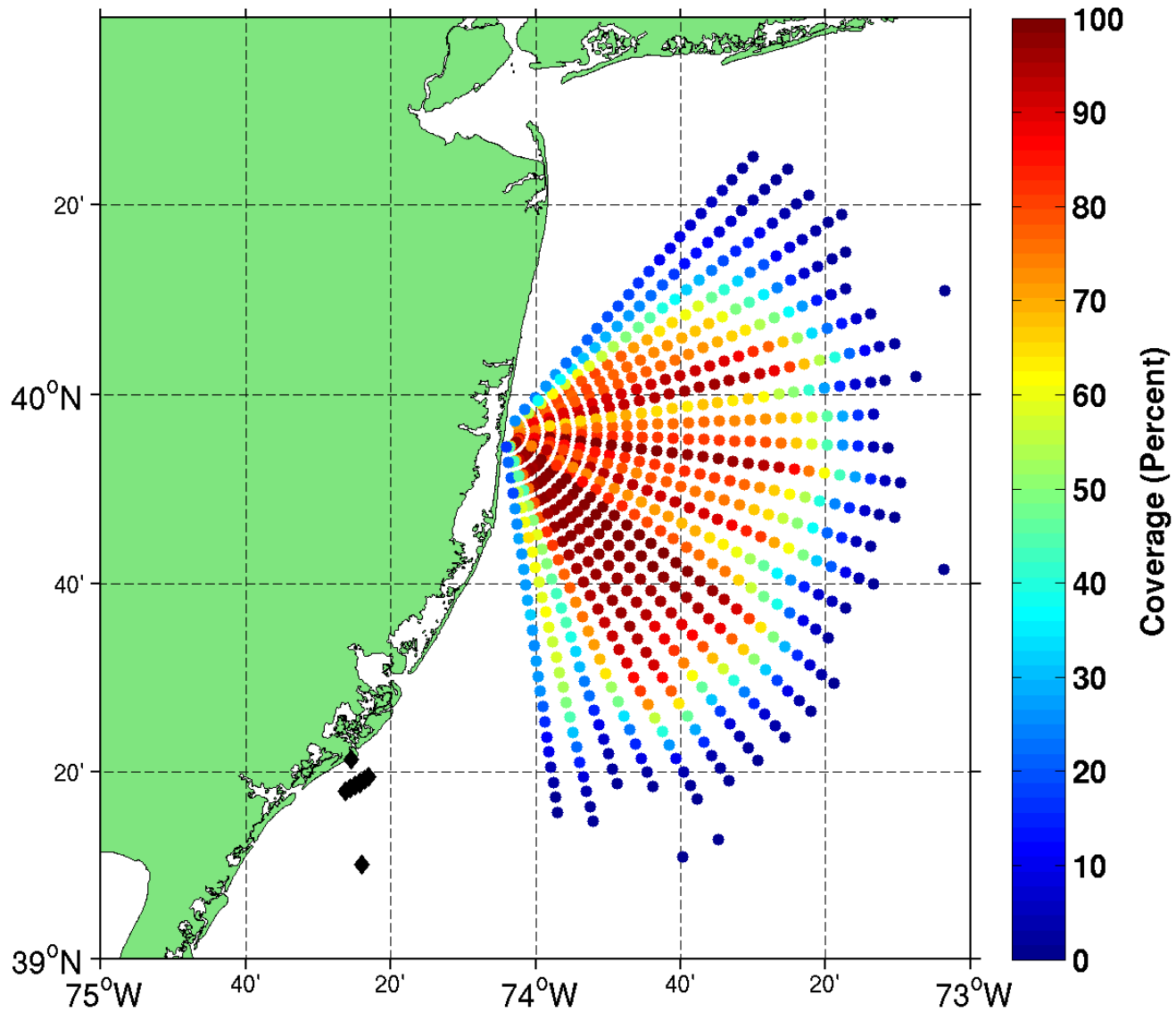




SPRK RDLm Coverage, 10 of 721 possible hourly maps  
From 01-Sep-2012 00:00:02 to 01-Oct-2012 00:00:02



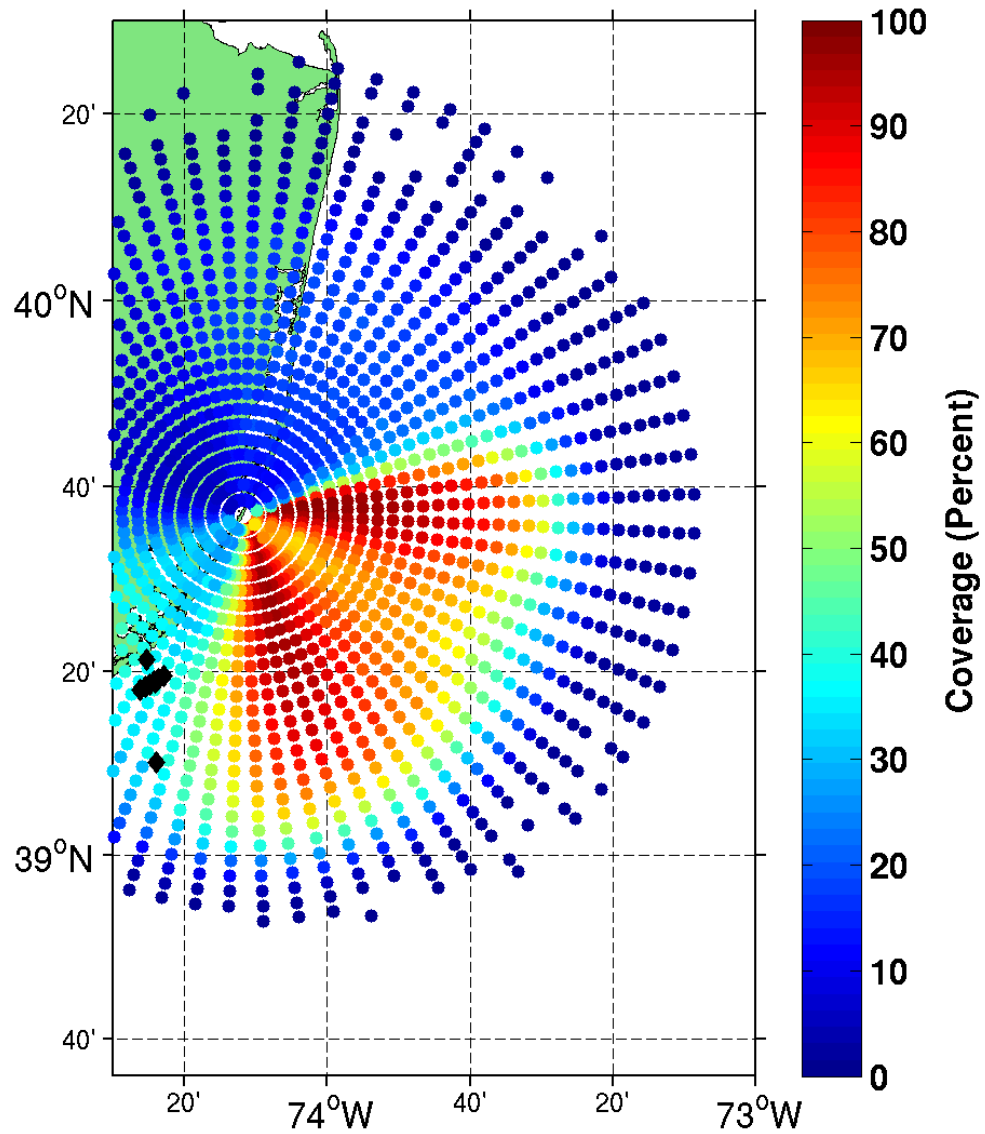
SPRK RDLm Coverage, 510 of 745 possible hourly maps  
From 01-Oct-2012 00:00:02 to 01-Nov-2012 00:00:02



# **BRANT BEACH IDEAL RADIALS**

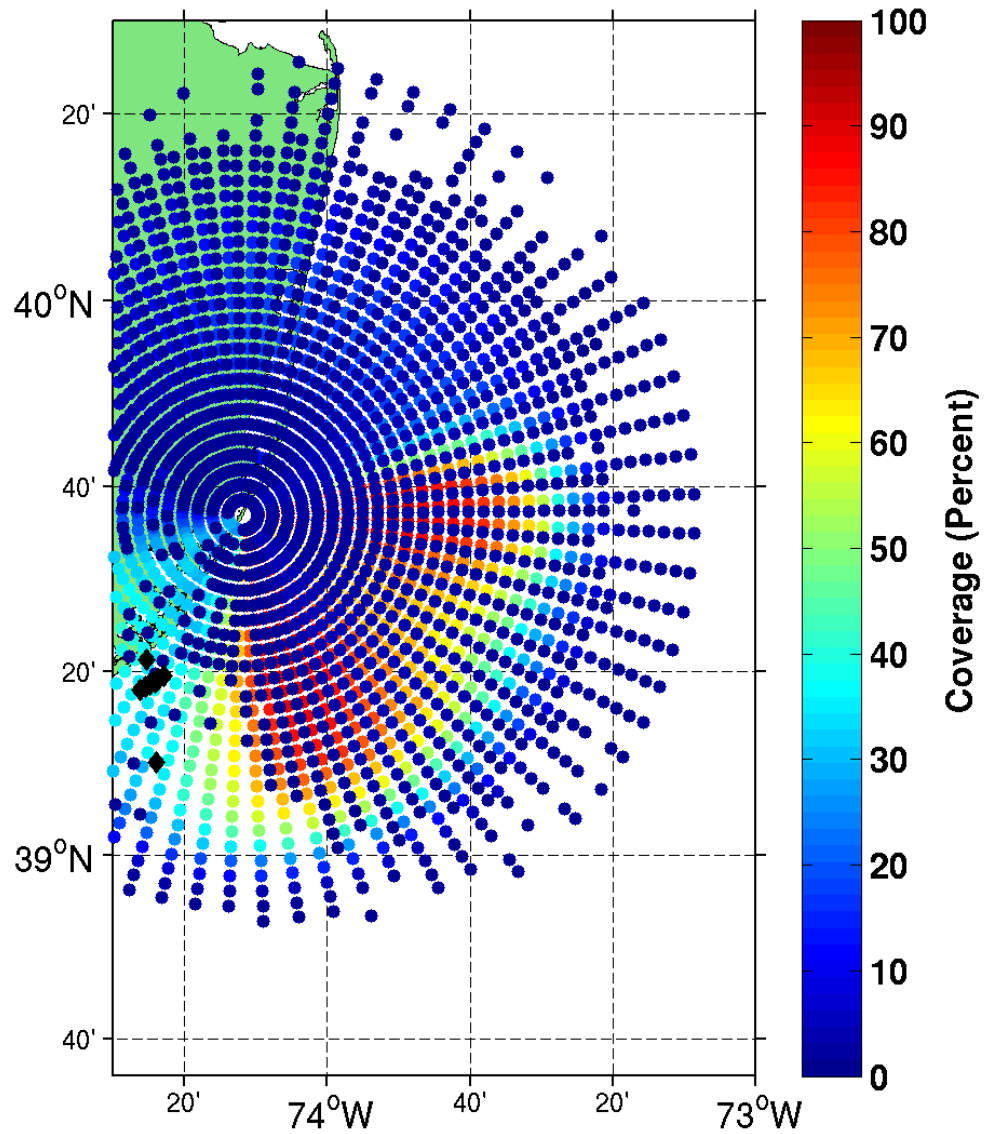
BRNT RDLi Coverage, 716 of 716 possible hourly maps

From 01-Jan-2012 00:00:02 to 30-Jan-2012 19:00:02

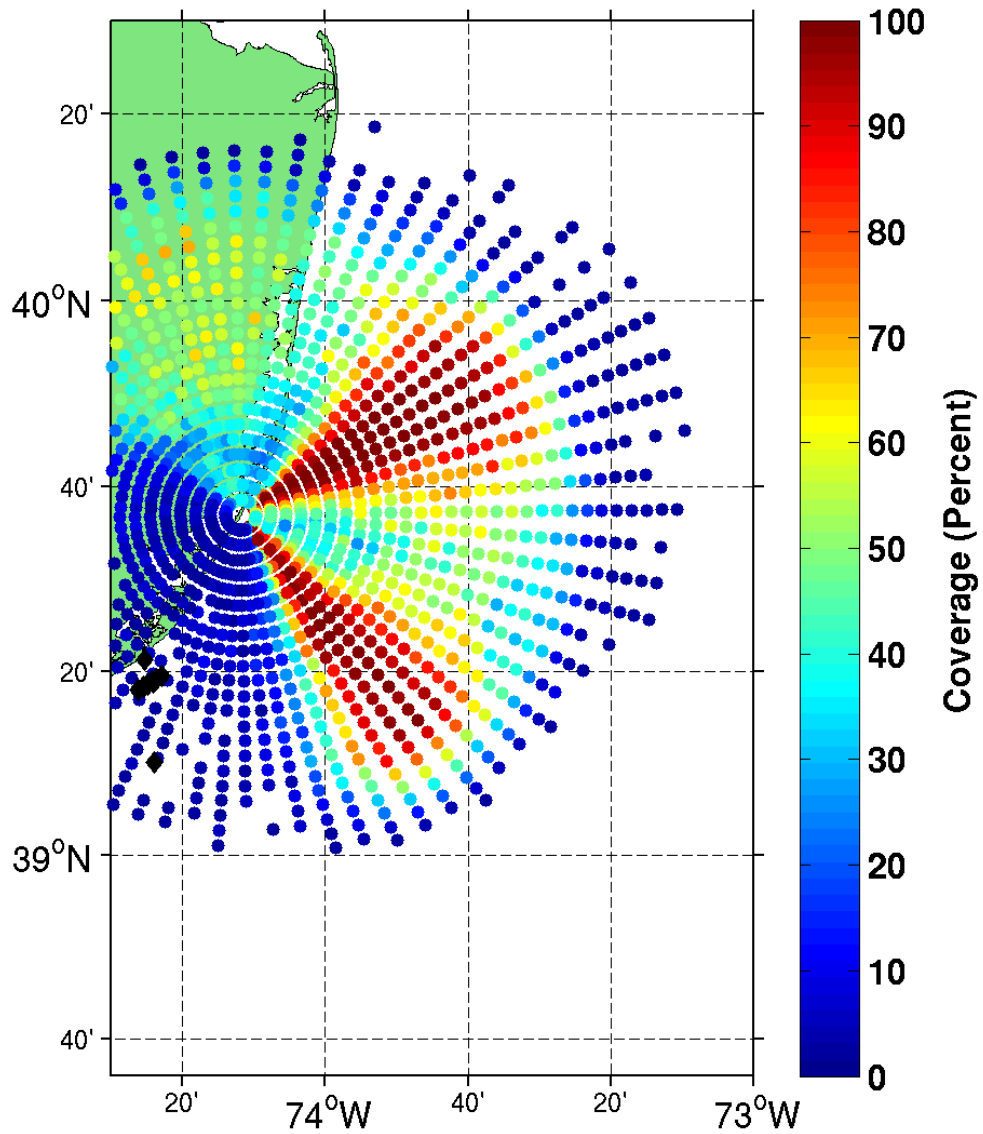


BRNT RDLi Coverage, 744 of 745 possible hourly maps

From 01-Jan-2012 00:00:02 to 01-Feb-2012 00:00:02

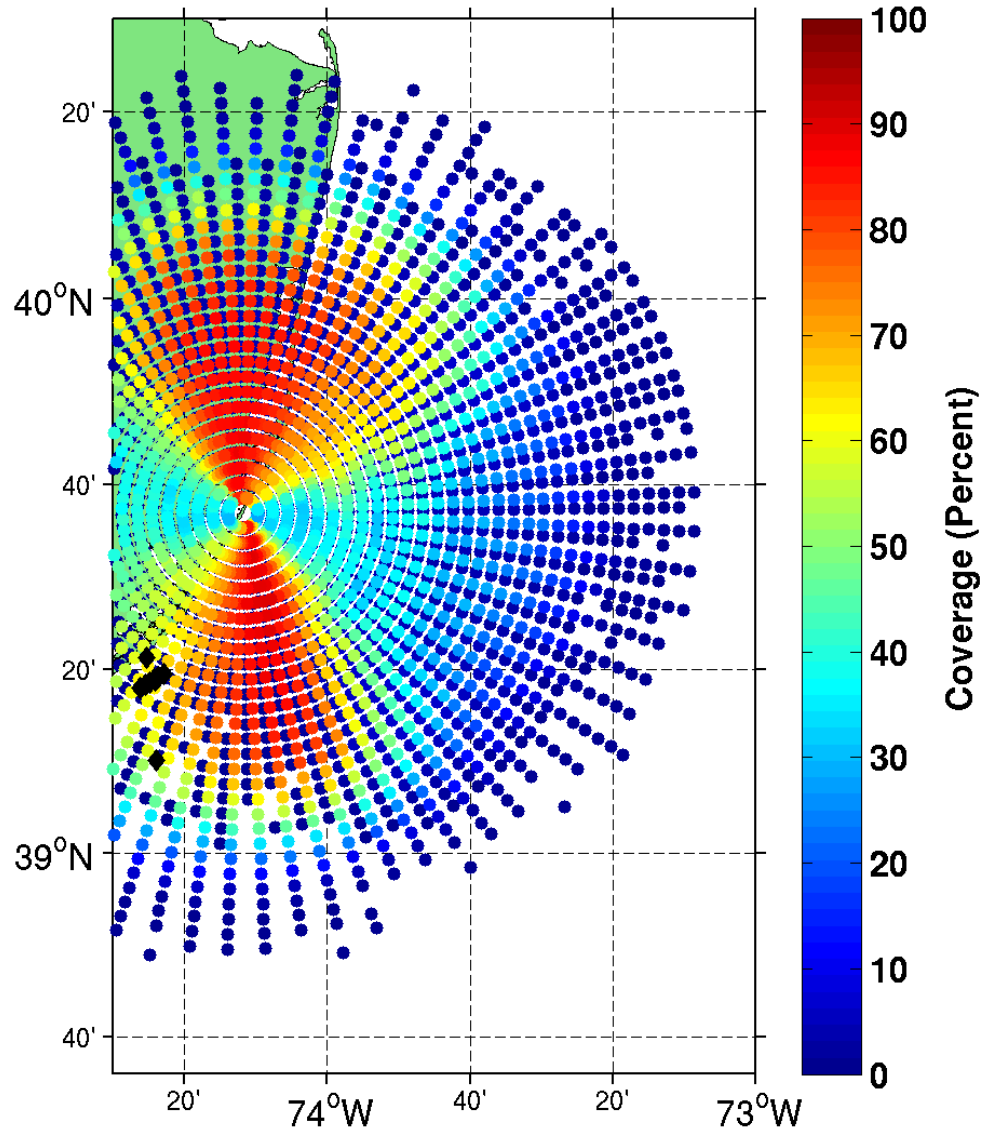


BRNT RDLi Coverage, 70 of 74 possible hourly maps  
From 30-Jan-2012 20:00:02 to 02-Feb-2012 21:00:02

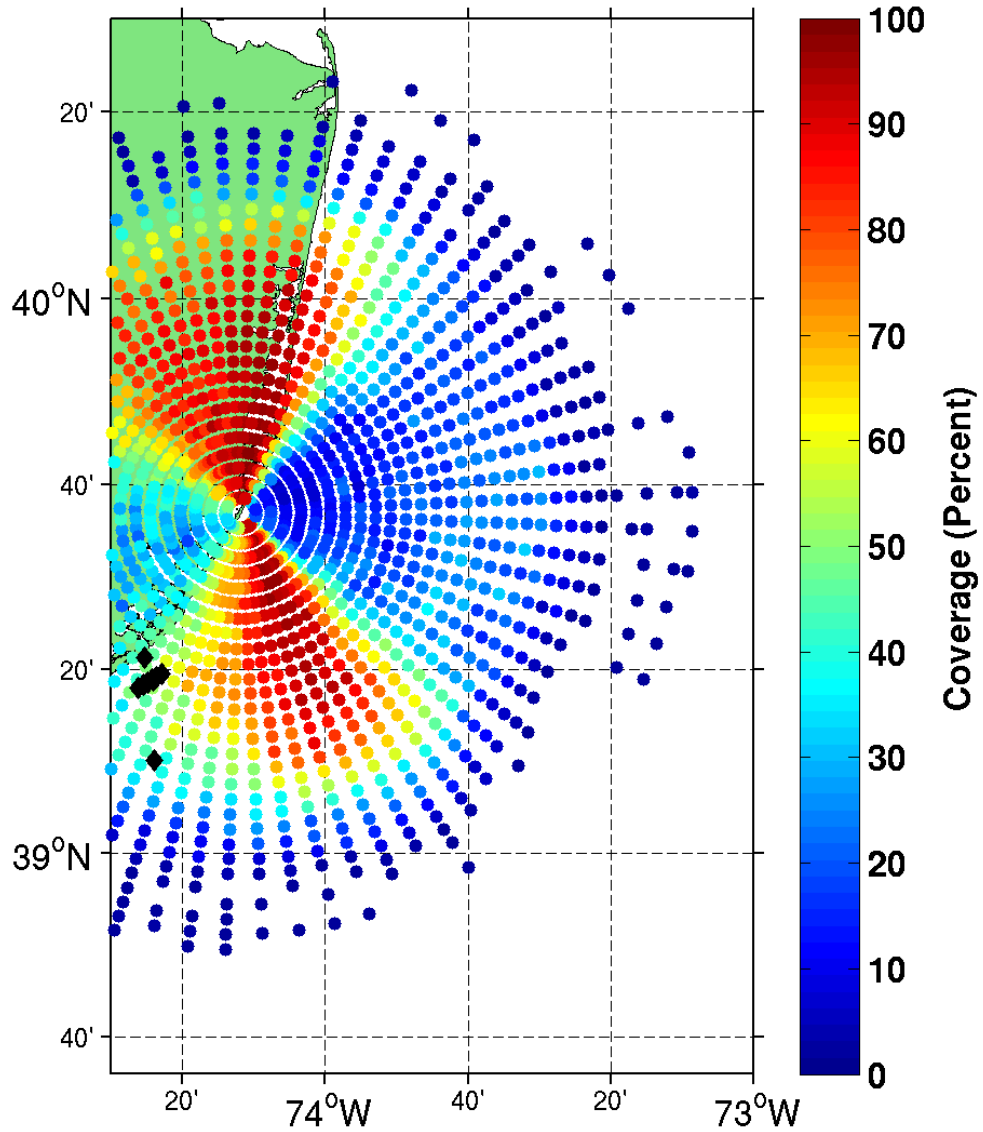


BRNT RDLi Coverage, 694 of 697 possible hourly maps

From 01-Feb-2012 00:00:02 to 01-Mar-2012 00:00:02



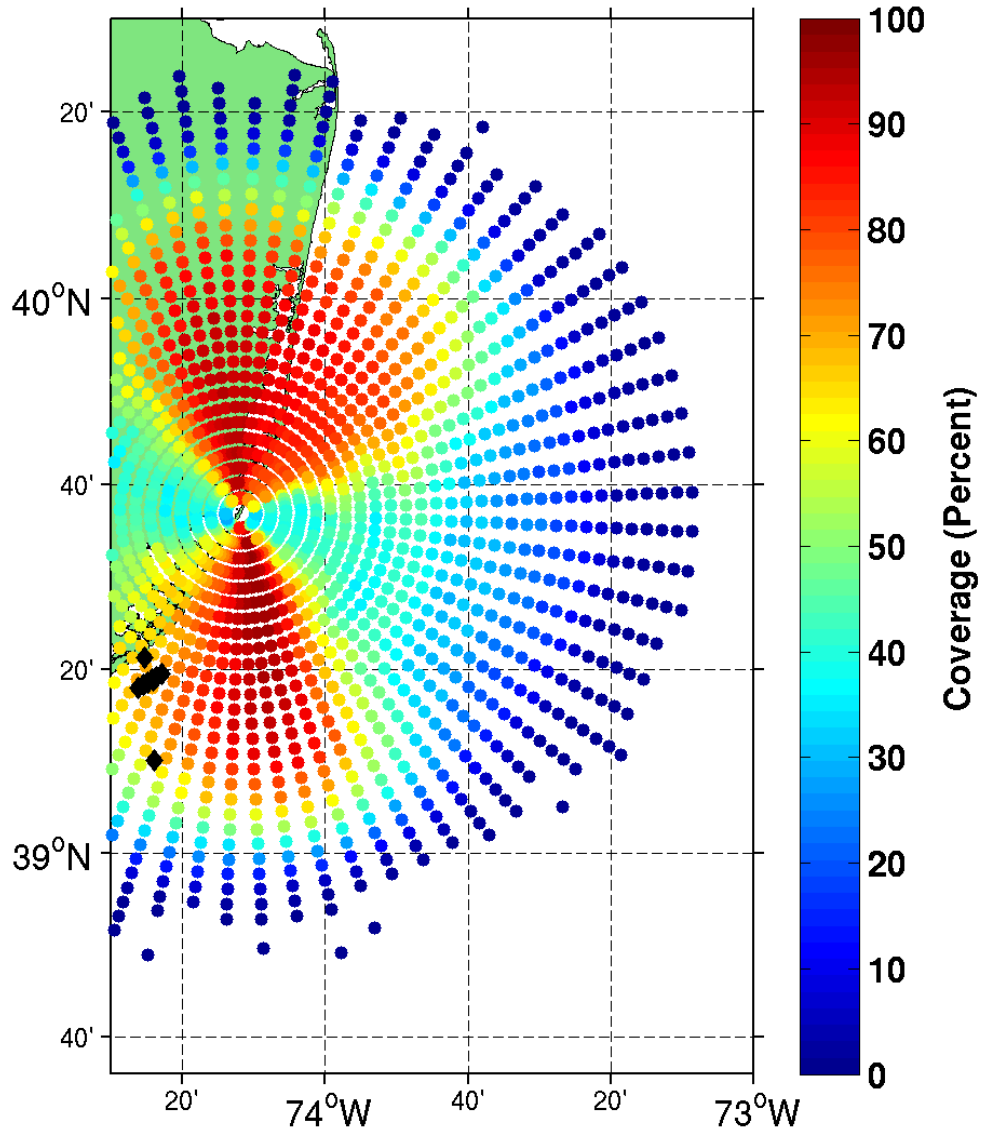
BRNT RDLi Coverage, 91 of 91 possible hourly maps  
From 02-Feb-2012 22:00:02 to 06-Feb-2012 16:00:02



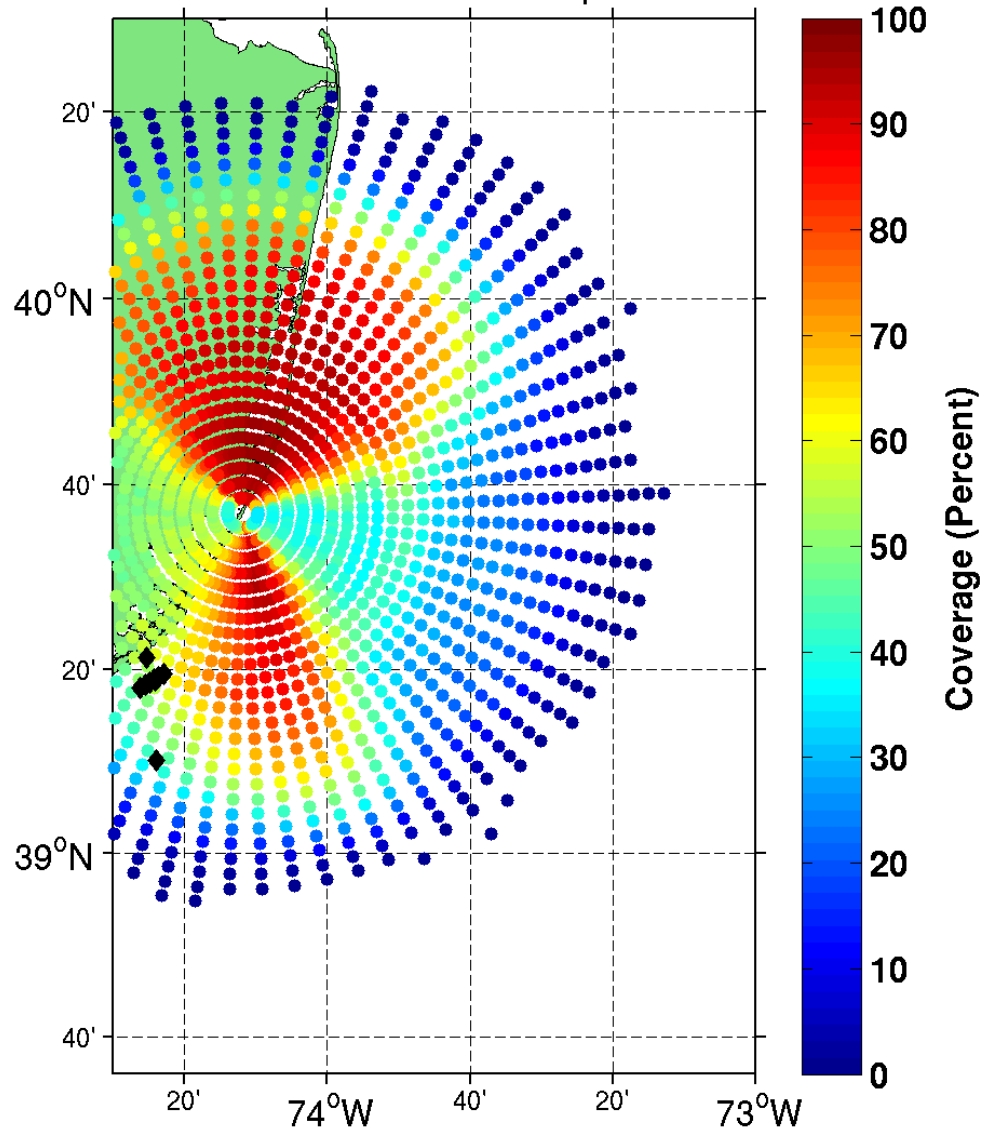


BRNT RDLi Coverage, 560 of 560 possible hourly maps

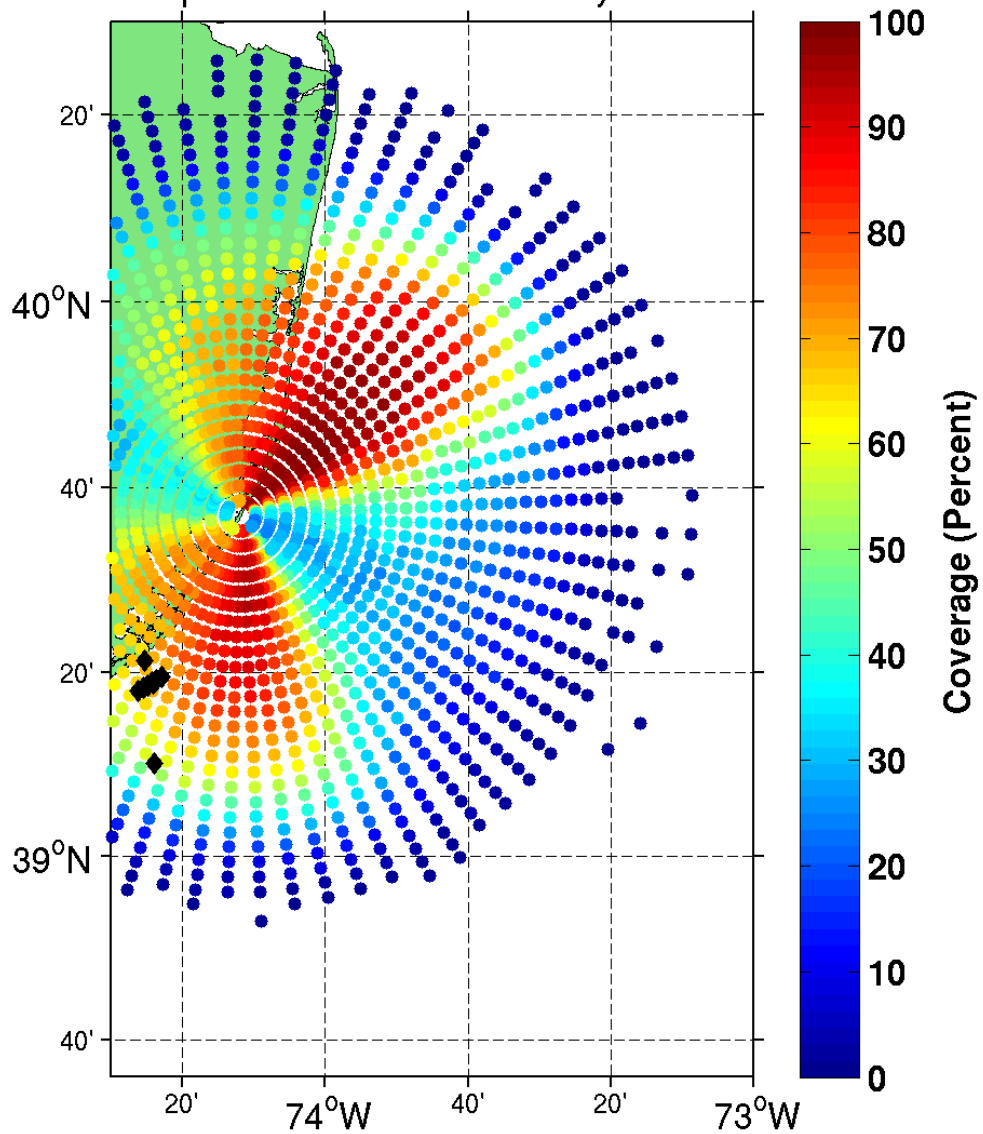
From 06-Feb-2012 17:00:02 to 01-Mar-2012 00:00:02



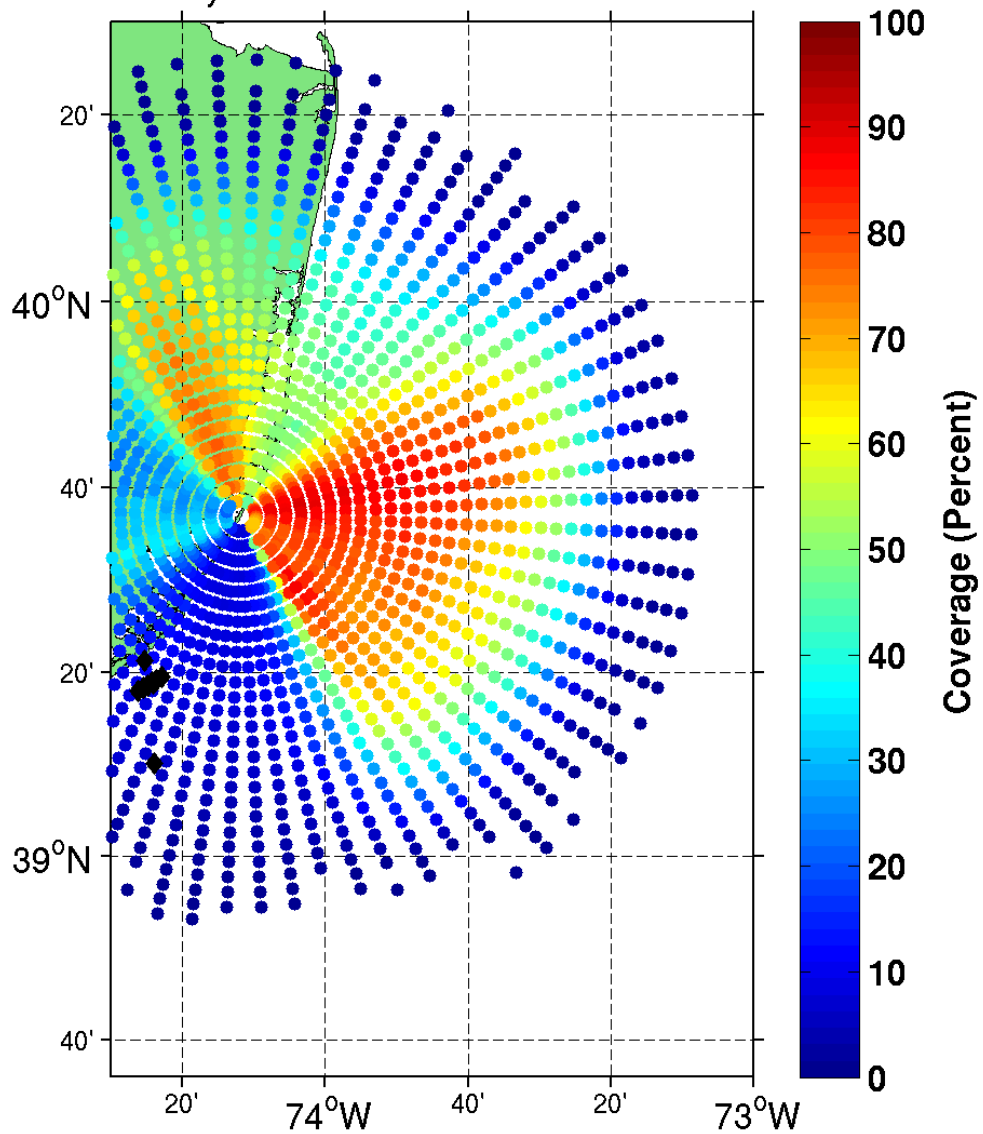
BRNT RDLi Coverage, 745 of 745 possible hourly maps  
From 01-Mar-2012 00:00:02 to 01-Apr-2012 00:00:02



BRNT RDLi Coverage, 410 of 721 possible hourly maps  
From 01-Apr-2012 00:00:02 to 01-May-2012 00:00:02

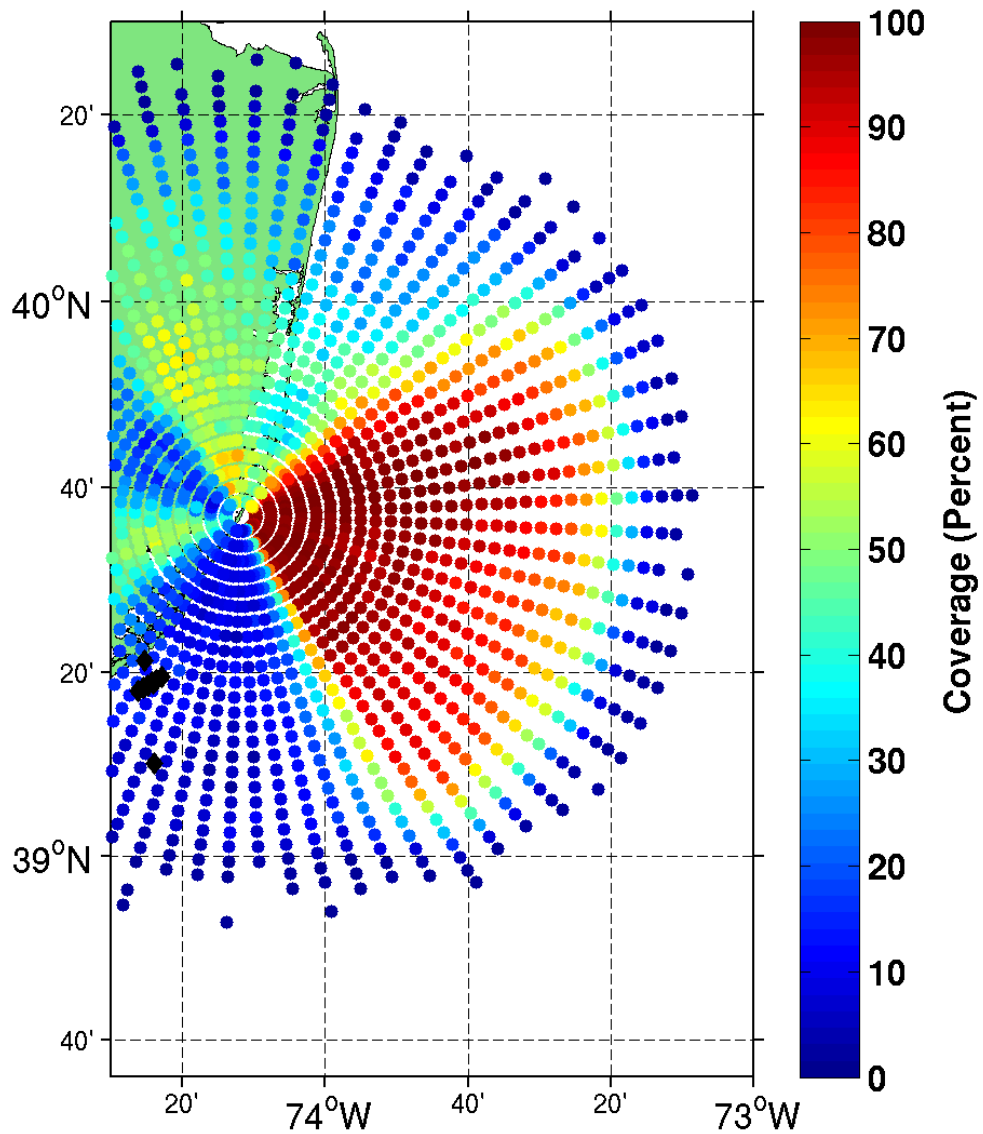


BRNT RDLi Coverage, 743 of 745 possible hourly maps  
From 01-May-2012 00:00:02 to 01-Jun-2012 00:00:02



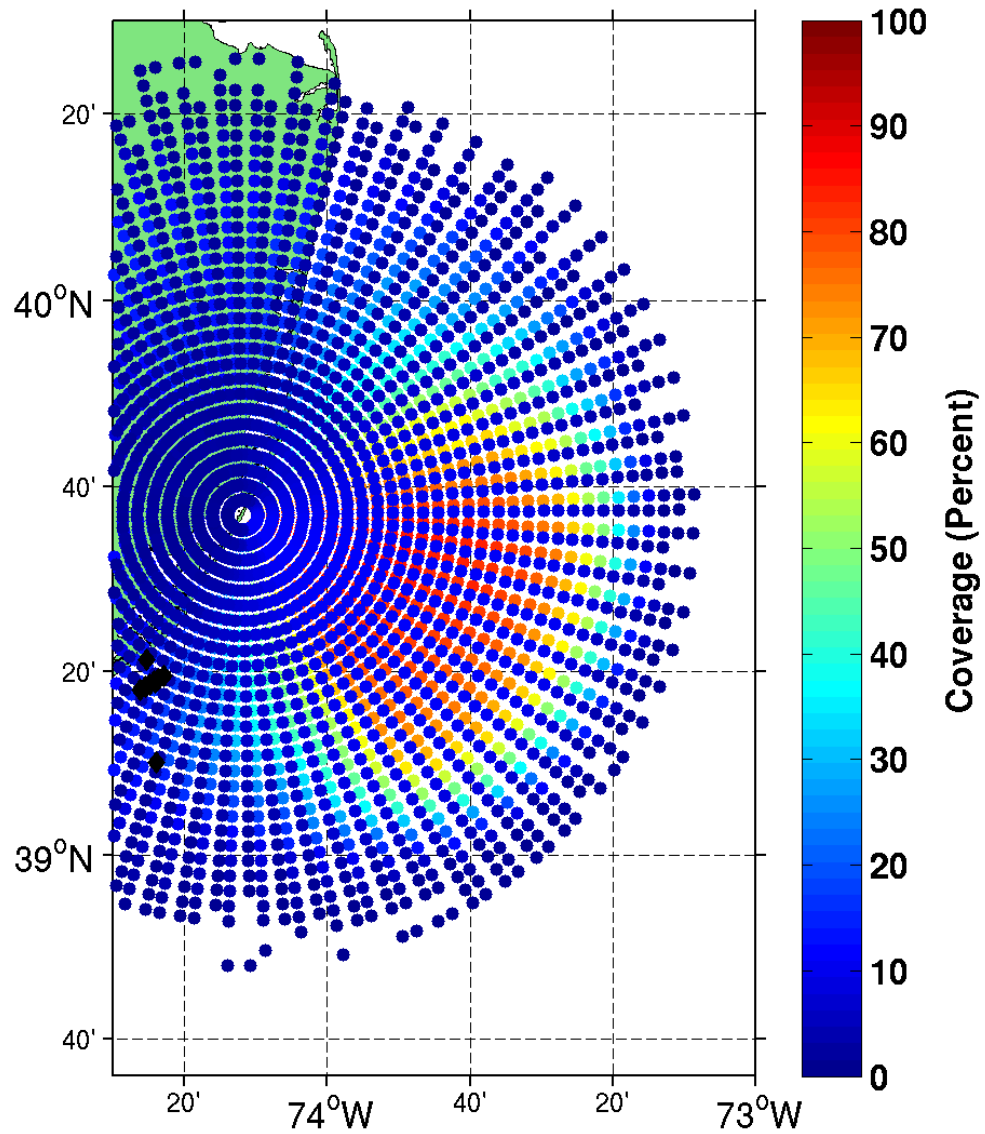
# BRNT RDLi Coverage, 111 of 111 possible hourly maps

From 01-Jun-2012 00:00:02 to 05-Jun-2012 14:00:02

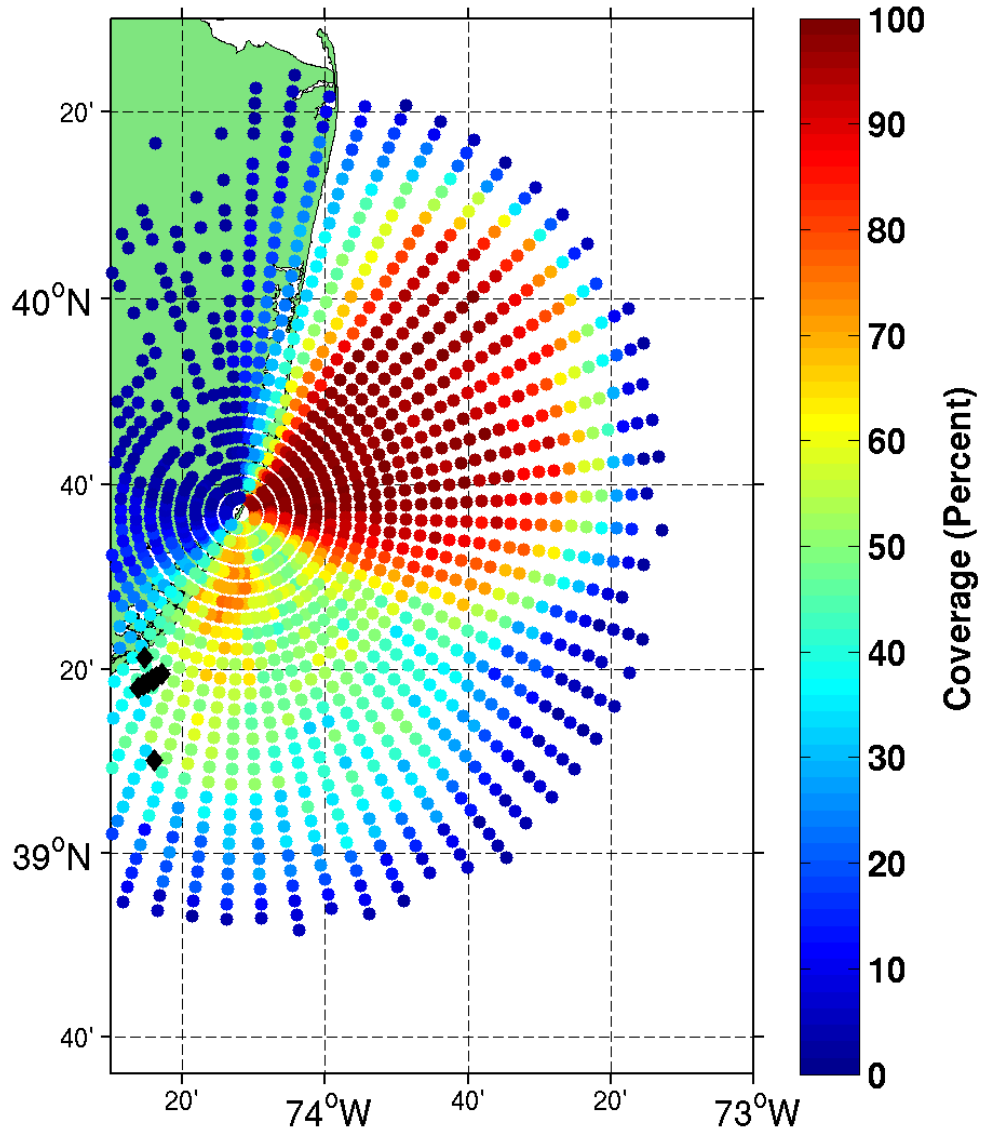


BRNT RDLi Coverage, 716 of 721 possible hourly maps

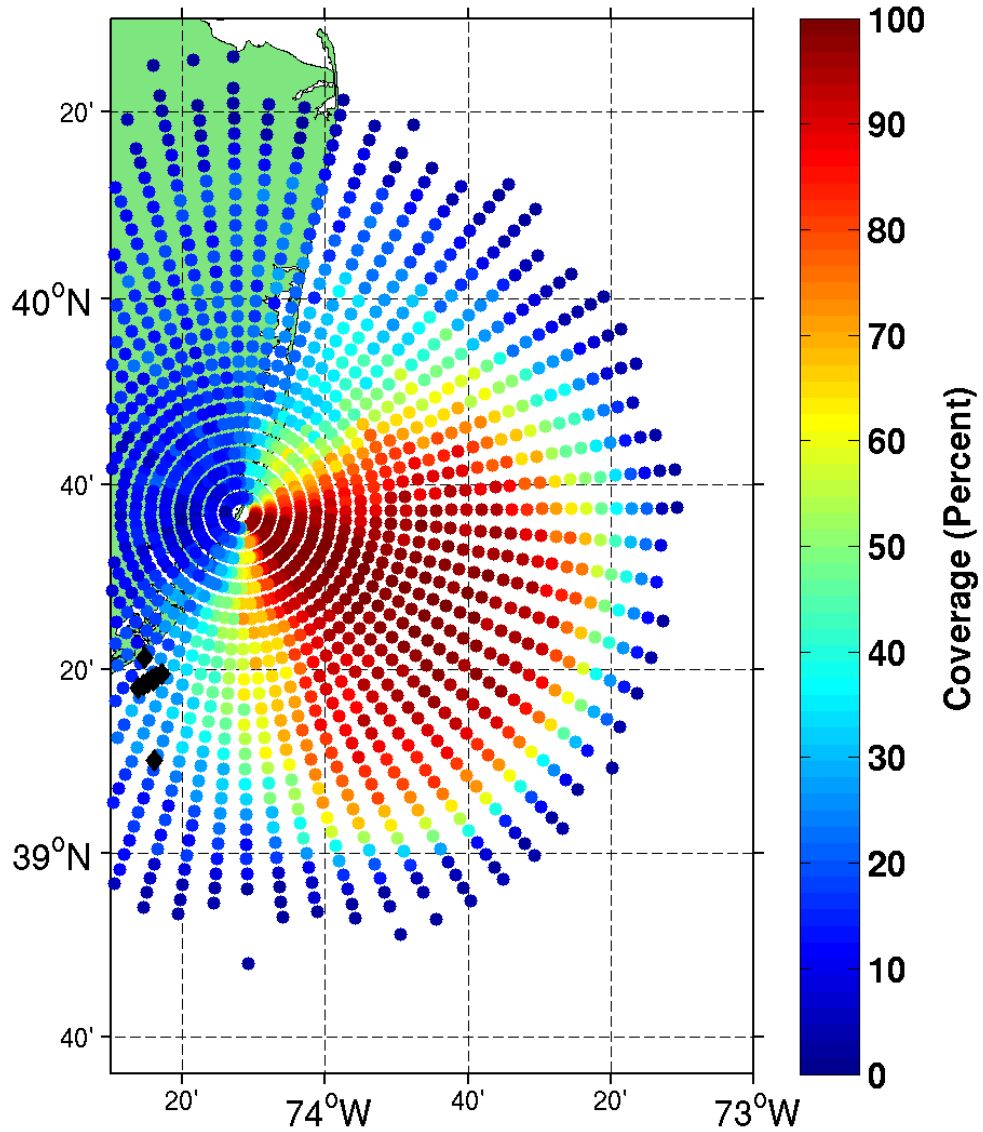
From 01-Jun-2012 00:00:02 to 01-Jul-2012 00:00:02



BRNT RDLi Coverage, 70 of 72 possible hourly maps  
From 05-Jun-2012 15:00:02 to 08-Jun-2012 14:00:02



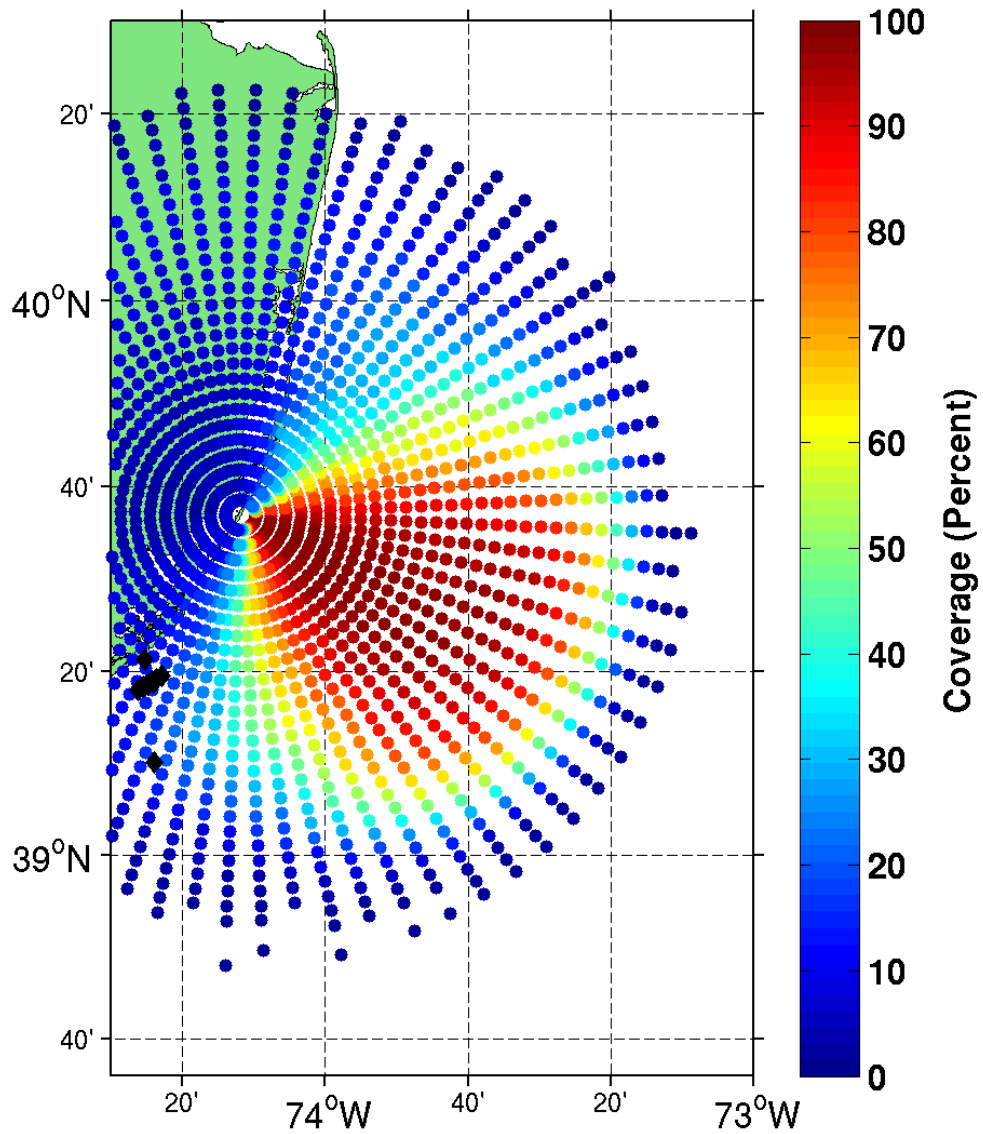
BRNT RDLi Coverage, 77 of 79 possible hourly maps  
From 08-Jun-2012 15:00:02 to 11-Jun-2012 21:00:02



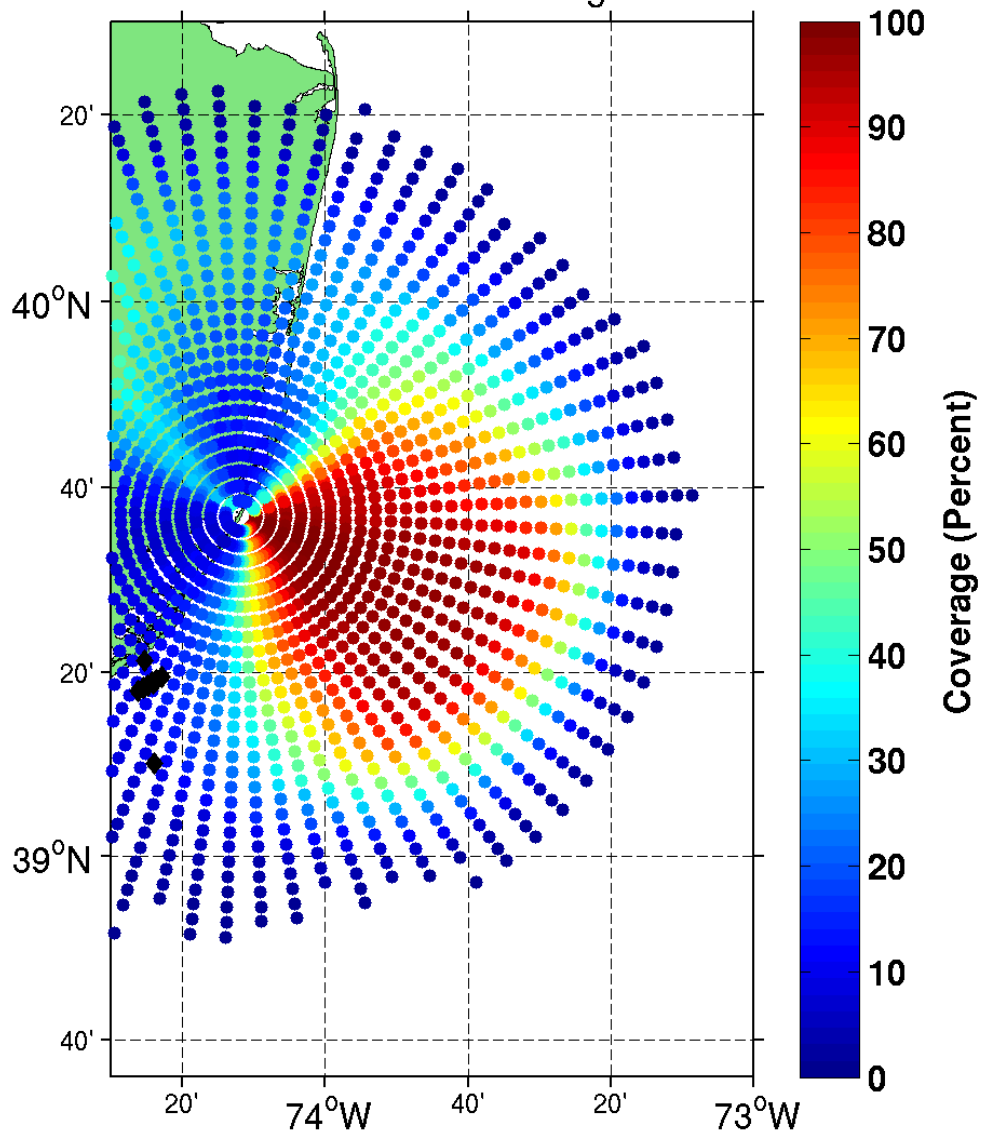


BRNT RDLi Coverage, 458 of 459 possible hourly maps

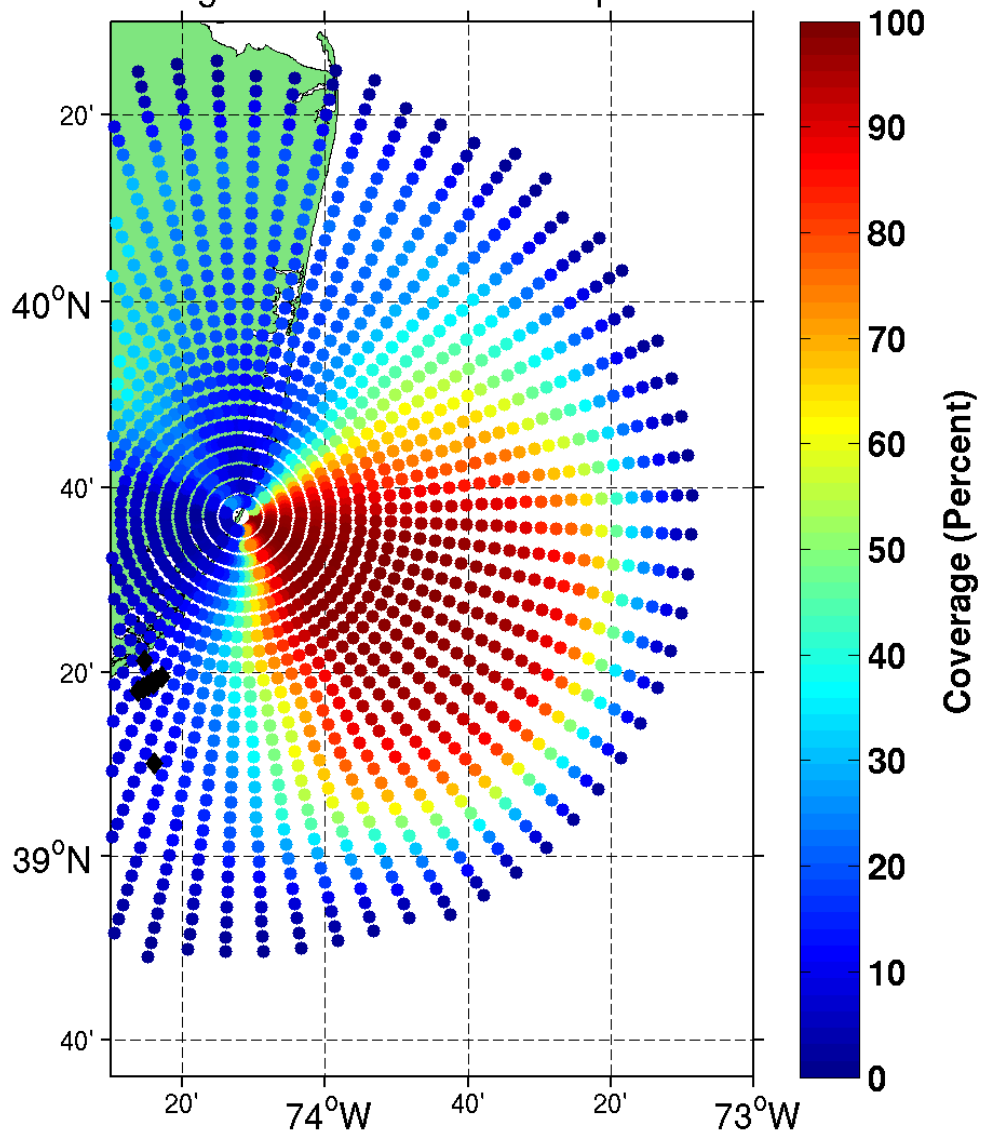
From 11-Jun-2012 22:00:02 to 01-Jul-2012 00:00:02



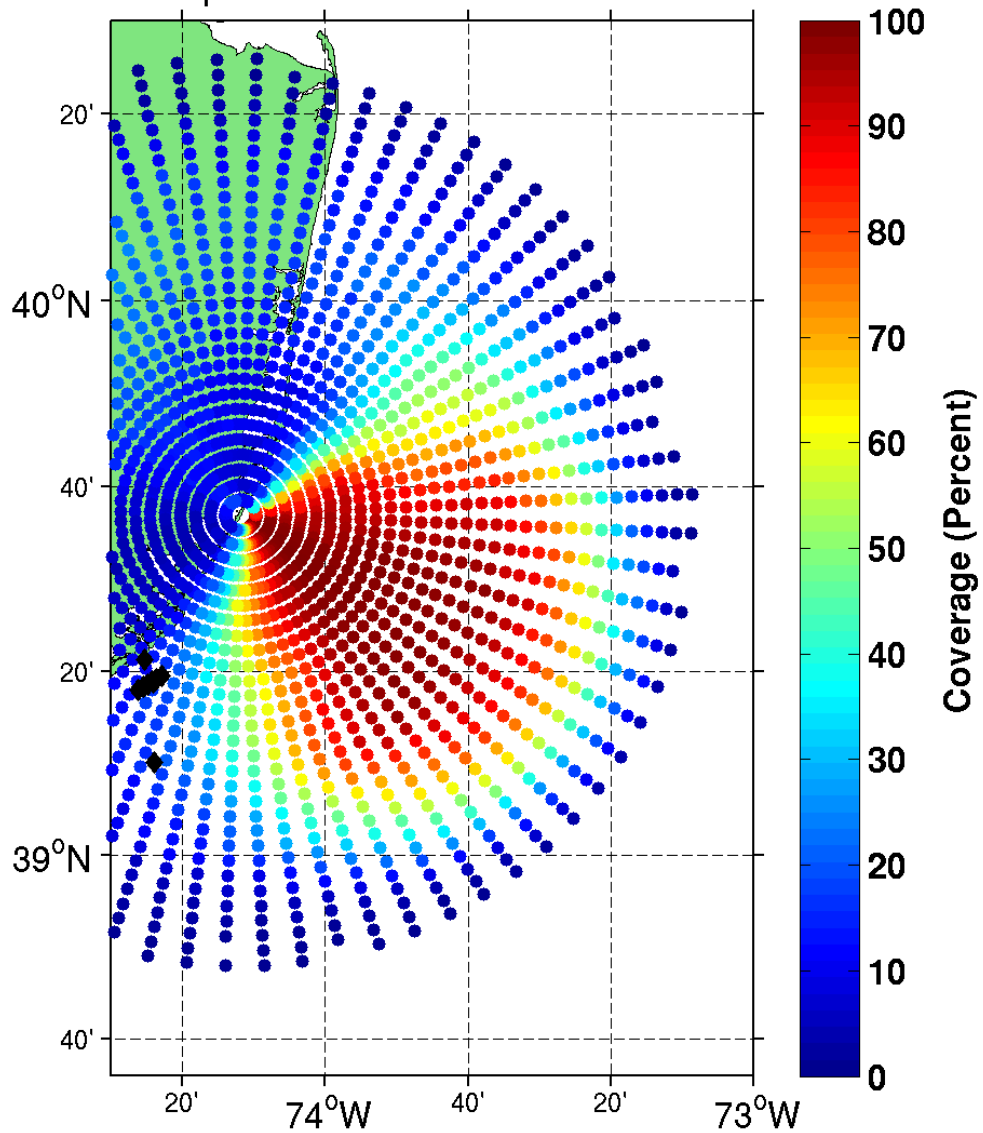
BRNT RDLi Coverage, 745 of 745 possible hourly maps  
From 01-Jul-2012 00:00:02 to 01-Aug-2012 00:00:02



BRNT RDLi Coverage, 744 of 745 possible hourly maps  
From 01-Aug-2012 00:00:02 to 01-Sep-2012 00:00:02

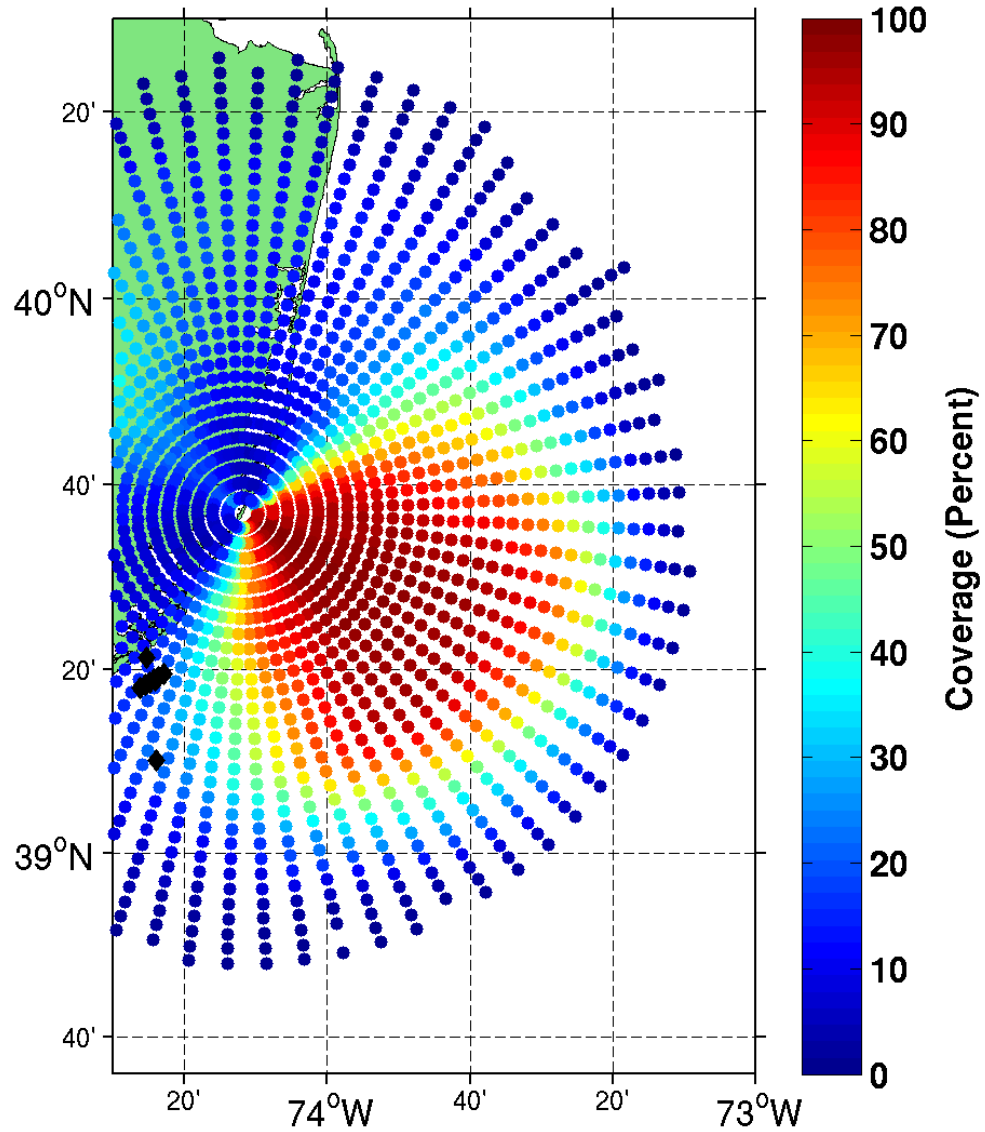


BRNT RDLi Coverage, 721 of 721 possible hourly maps  
From 01-Sep-2012 00:00:02 to 01-Oct-2012 00:00:02

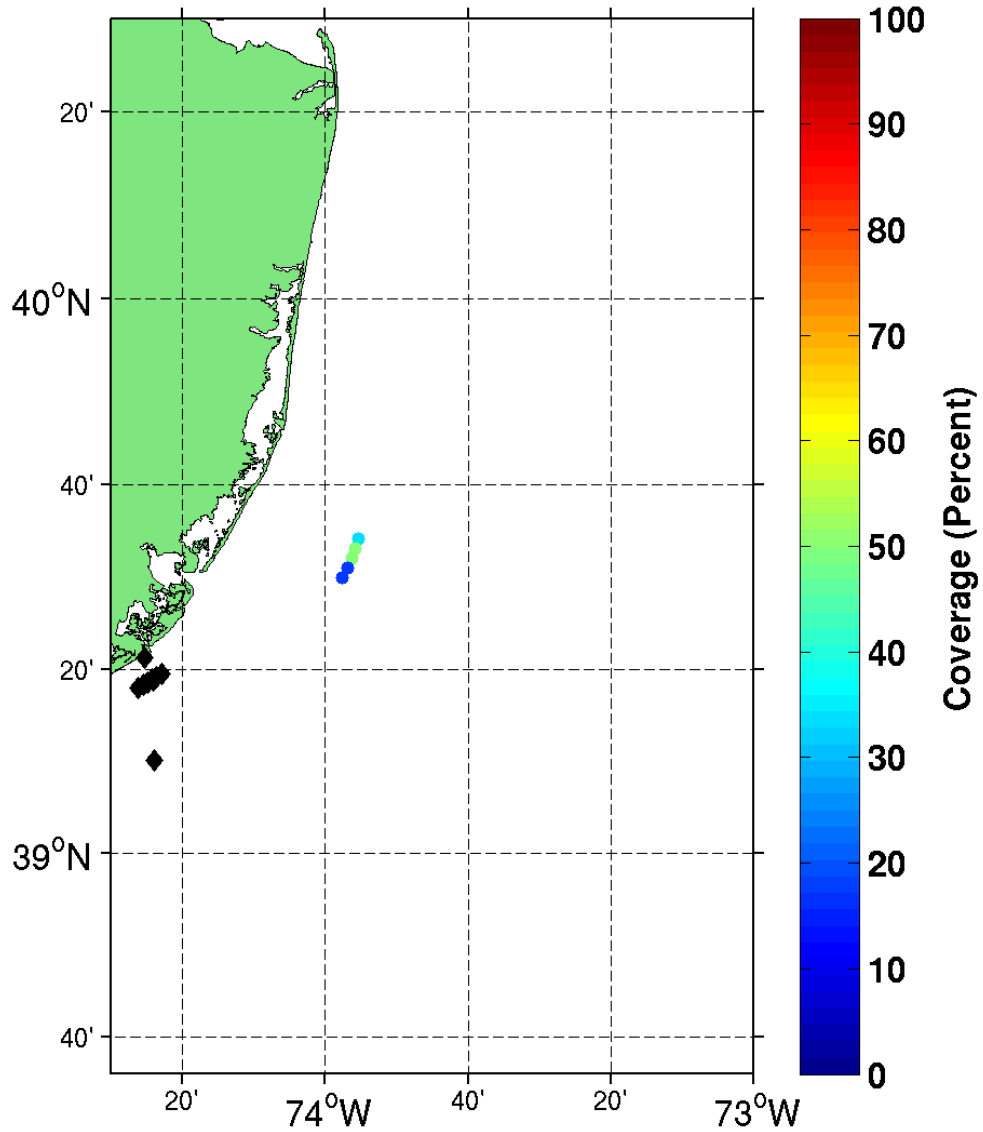


BRNT RDLi Coverage, 690 of 745 possible hourly maps

From 01-Oct-2012 00:00:02 to 01-Nov-2012 00:00:02

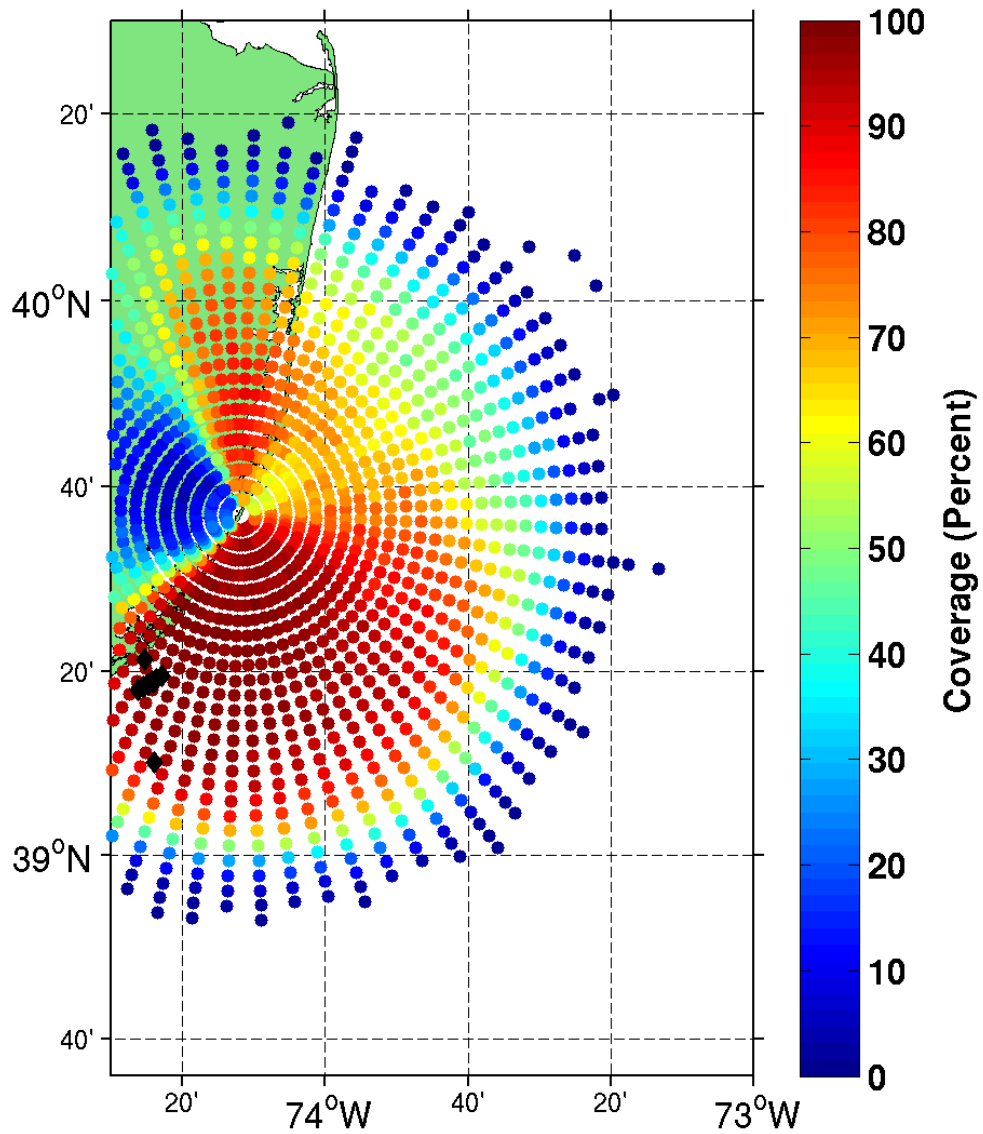


BRNT RDLi Coverage, 6 of 721 possible hourly maps  
From 01-Nov-2012 00:00:02 to 01-Dec-2012 00:00:02



BRNT RDLi Coverage, 266 of 745 possible hourly maps

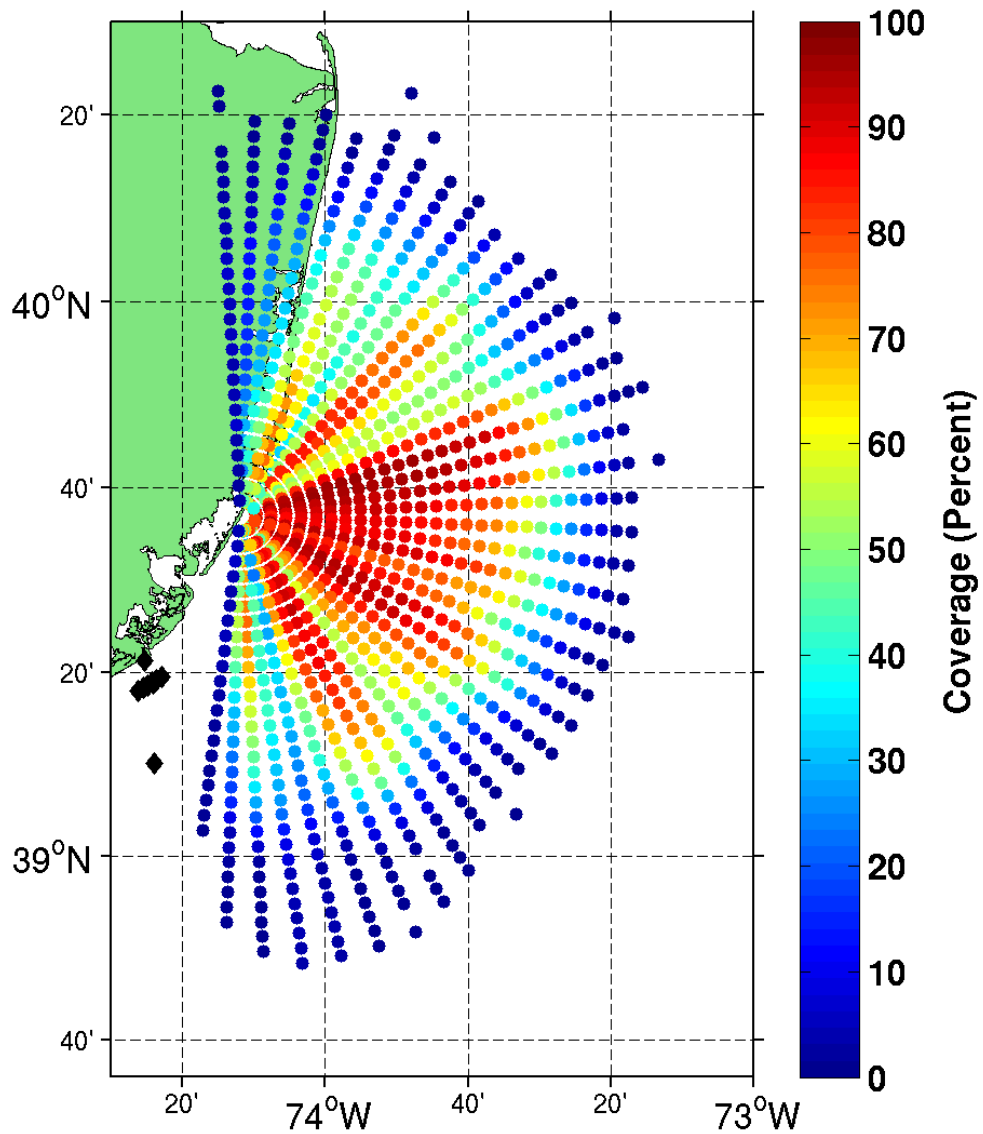
From 01-Dec-2012 00:00:02 to 01-Jan-2013 00:00:02



# **BRANT BEACH MEASURED RADIALS**

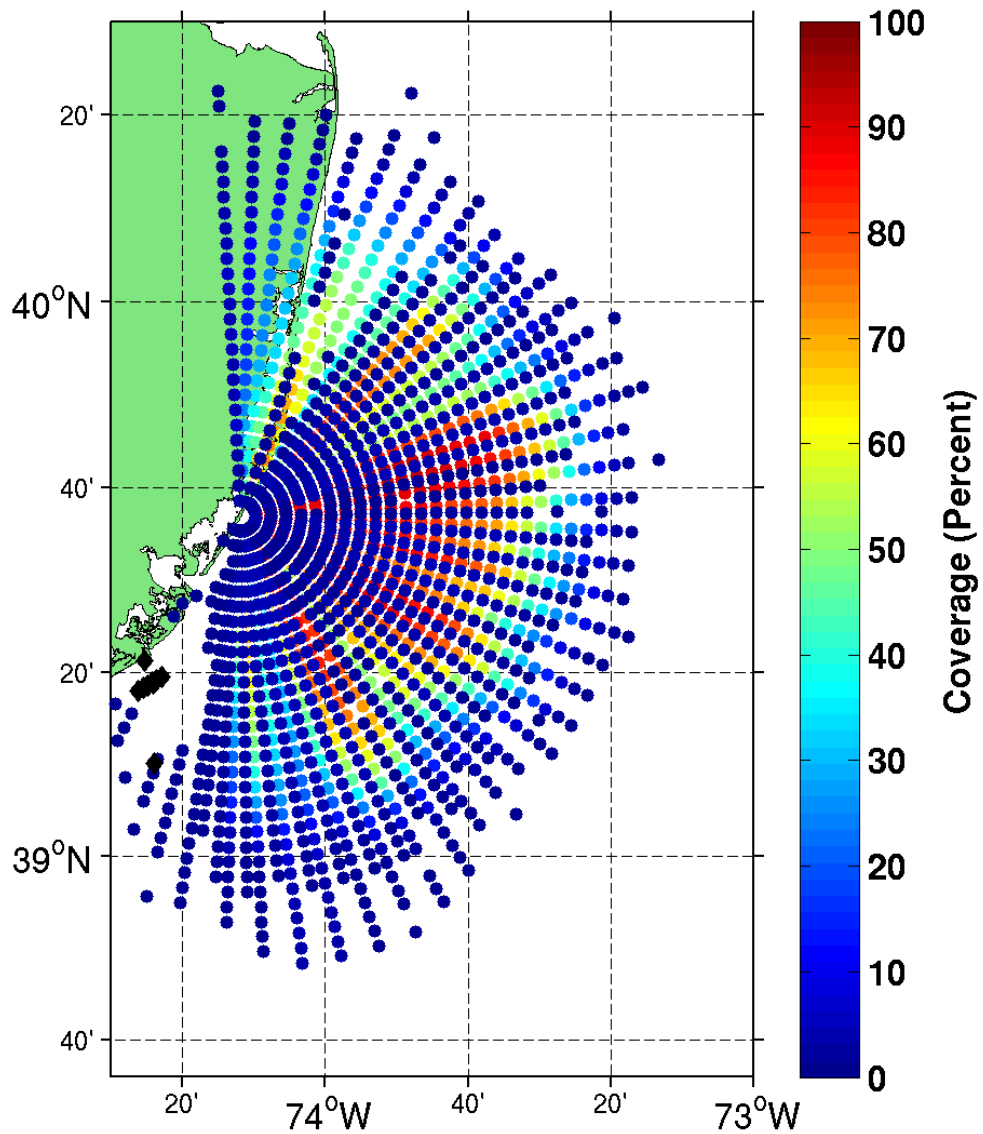


BRNT RDLm Coverage, 716 of 716 possible hourly maps  
From 01-Jan-2012 00:00:02 to 30-Jan-2012 19:00:02

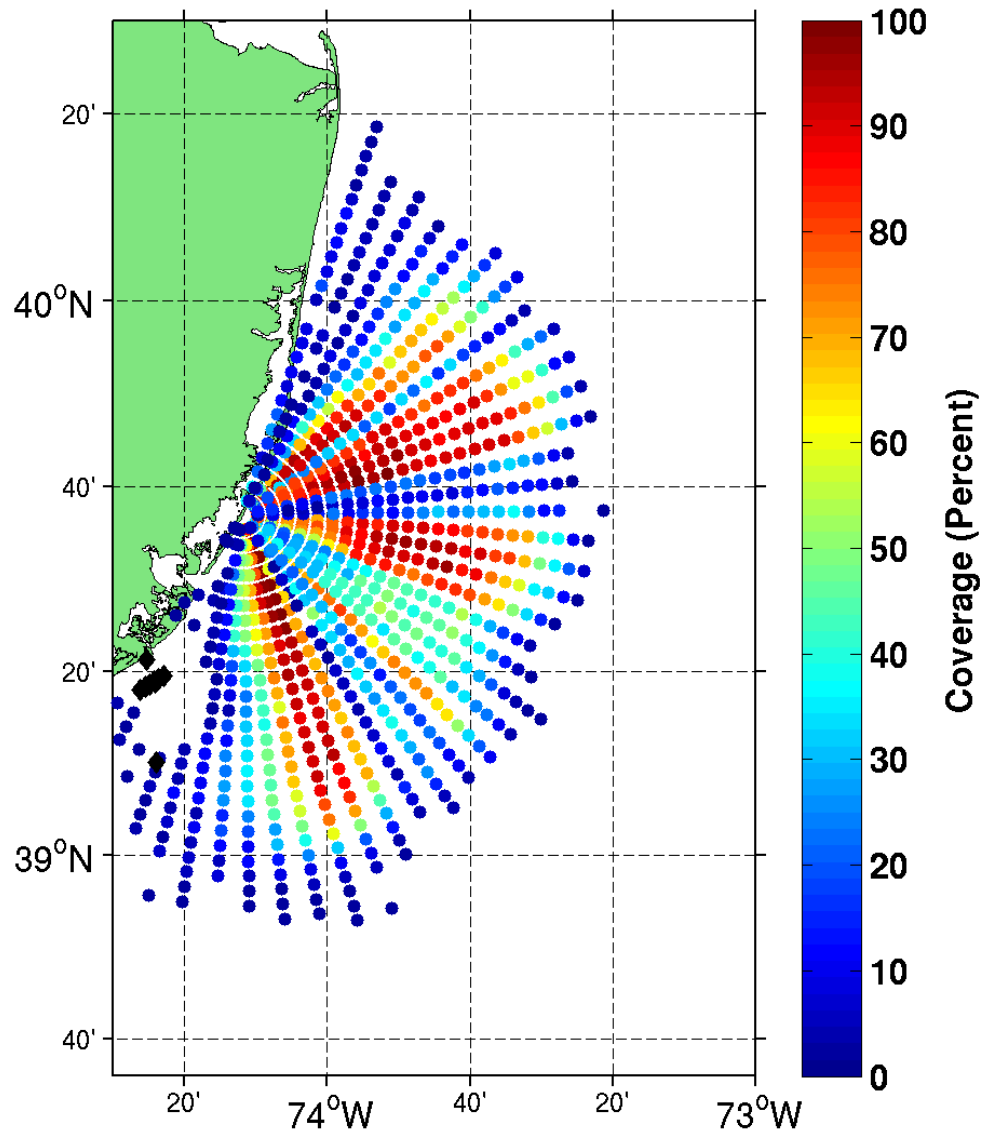


BRNT RDLm Coverage, 744 of 745 possible hourly maps

From 01-Jan-2012 00:00:02 to 01-Feb-2012 00:00:02

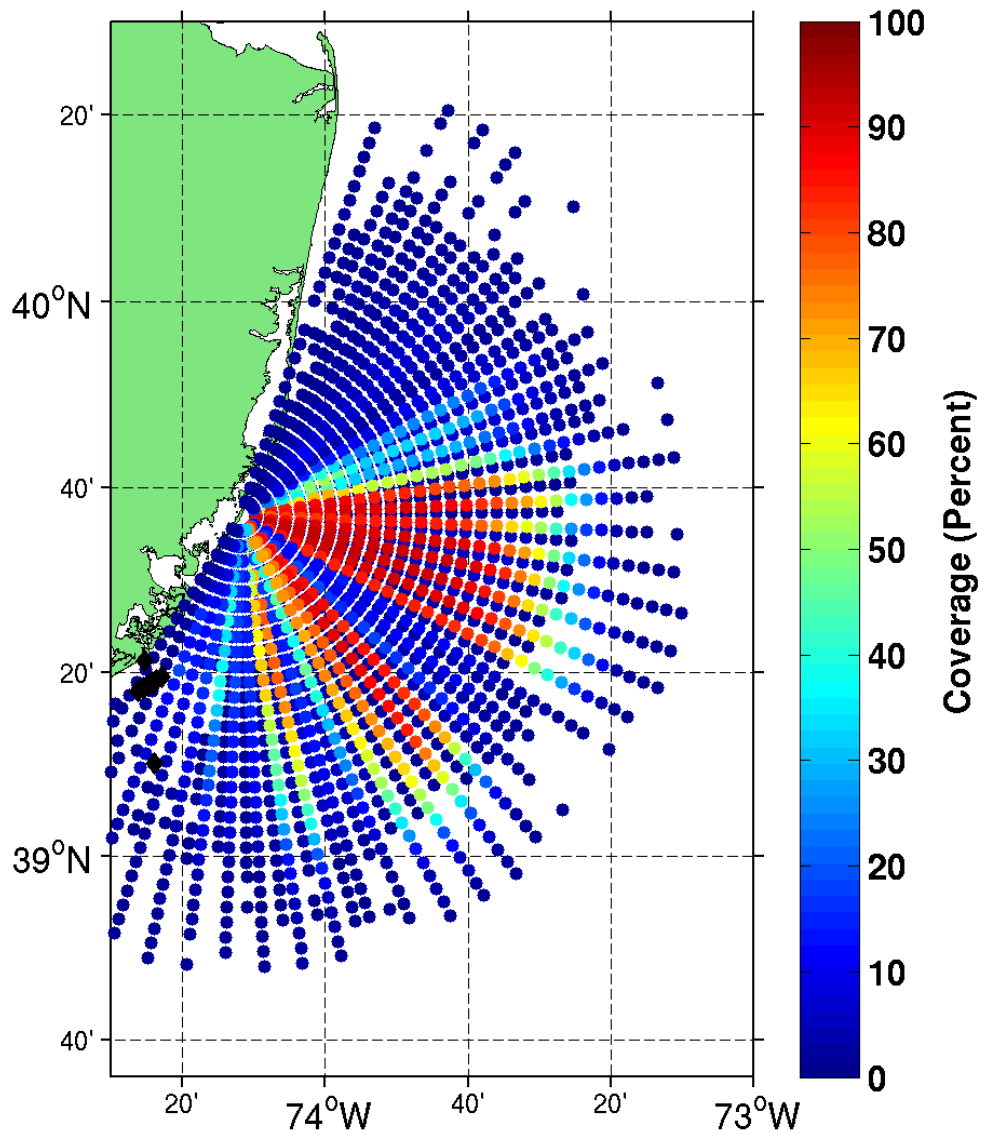


BRNT RDLm Coverage, 70 of 74 possible hourly maps  
From 30-Jan-2012 20:00:02 to 02-Feb-2012 21:00:02



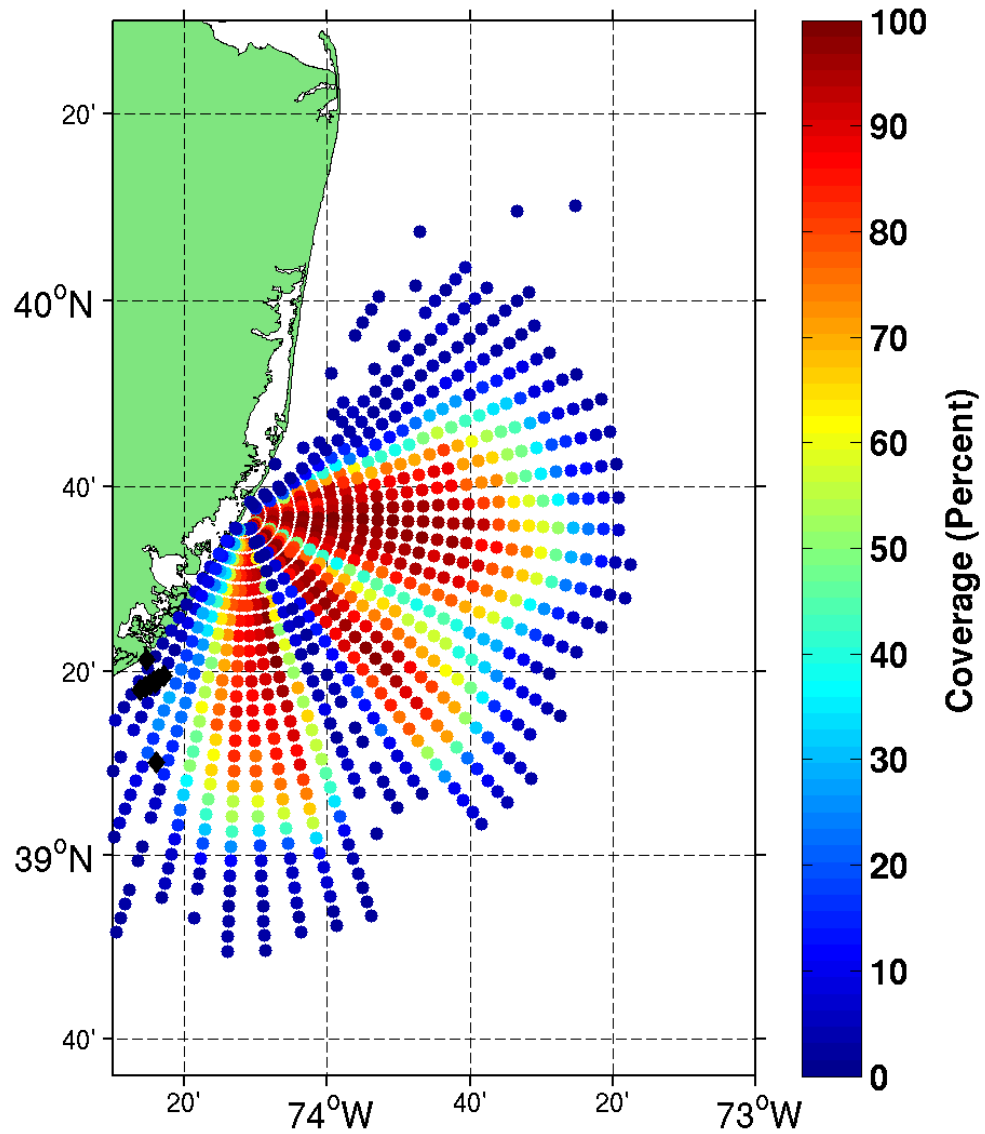
BRNT RDLm Coverage, 694 of 697 possible hourly maps

From 01-Feb-2012 00:00:02 to 01-Mar-2012 00:00:02



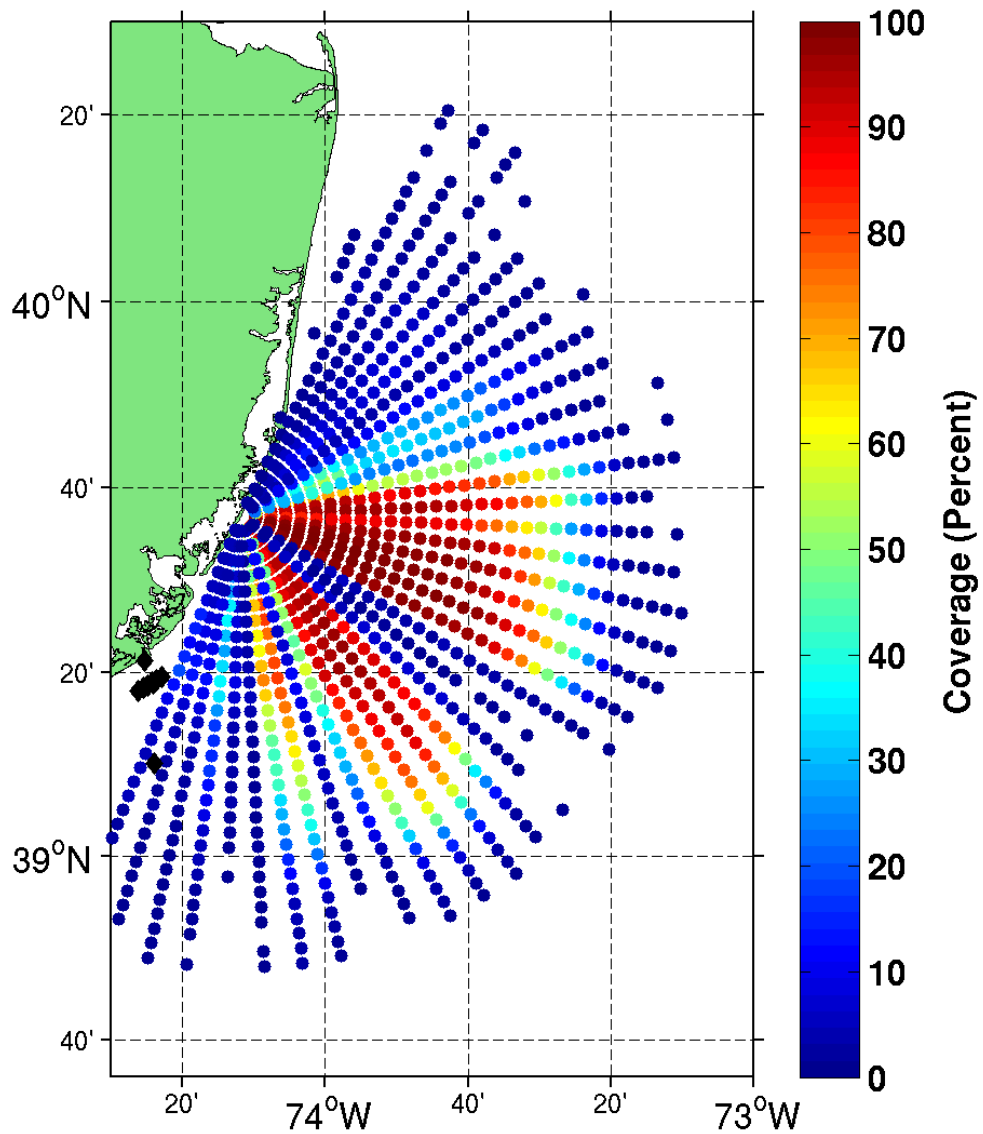
BRNT RDLm Coverage, 91 of 91 possible hourly maps

From 02-Feb-2012 22:00:02 to 06-Feb-2012 16:00:02



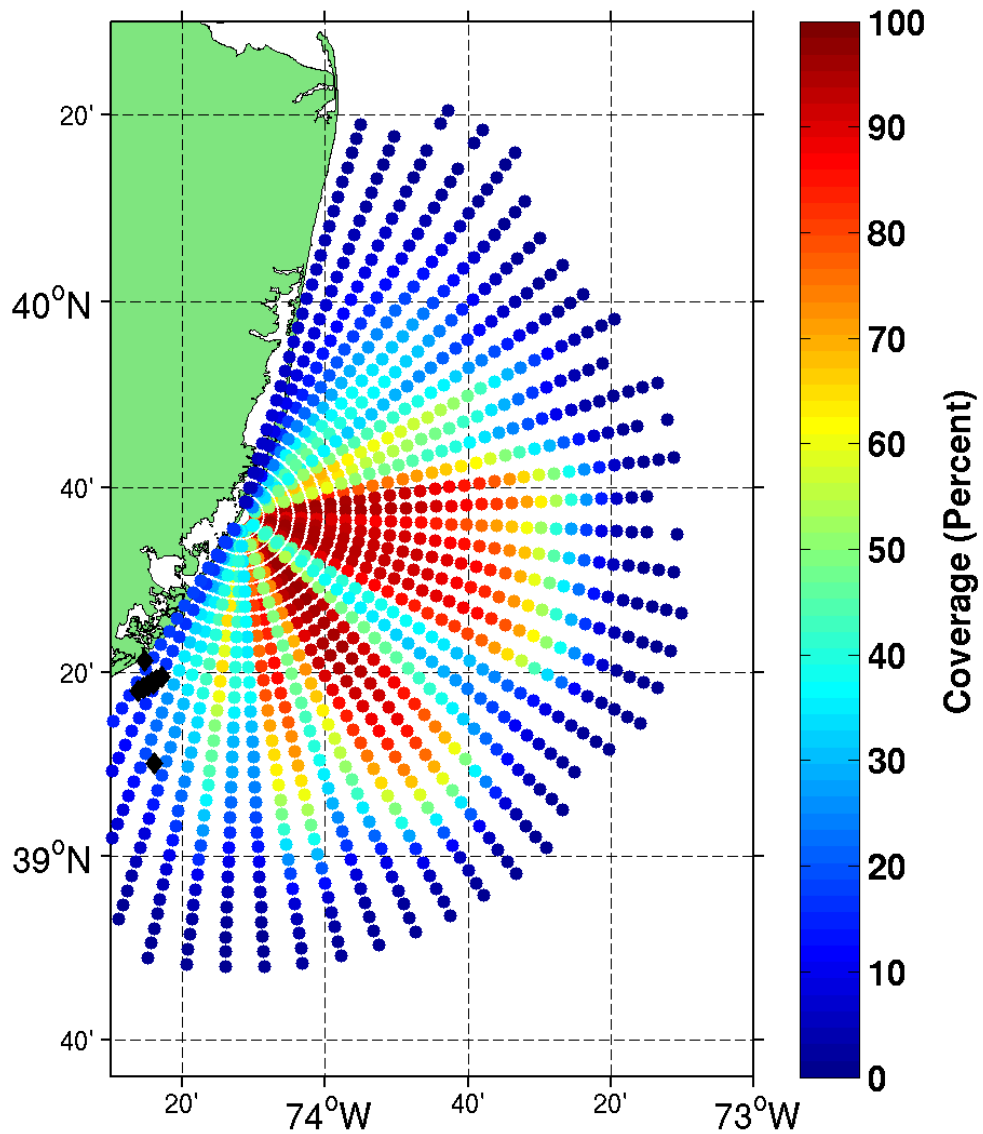
BRNT RDLm Coverage, 560 of 560 possible hourly maps

From 06-Feb-2012 17:00:02 to 01-Mar-2012 00:00:02

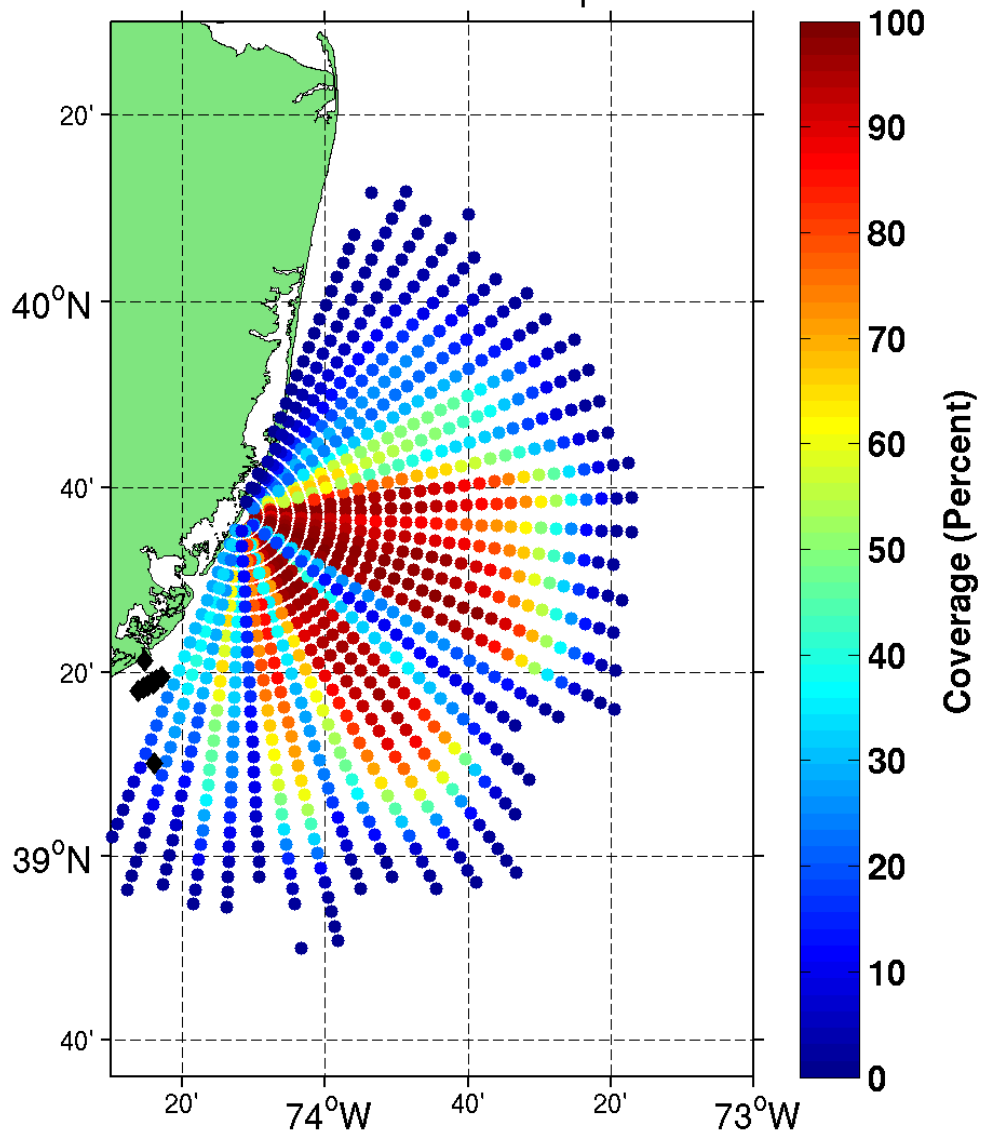


BRNT RDLm Coverage, 2565 of 2878 possible hourly maps

From 06-Feb-2012 17:00:02 to 05-Jun-2012 14:00:02

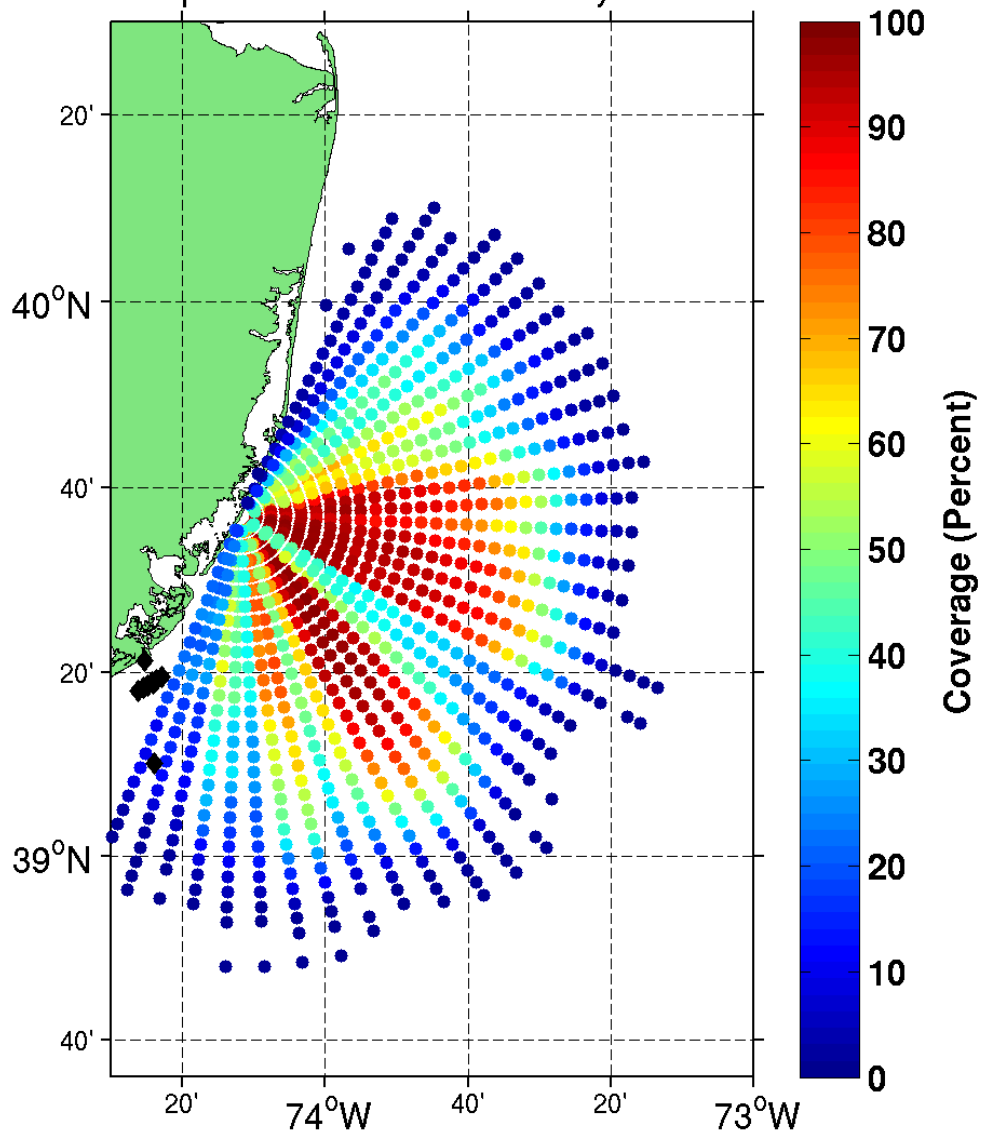


BRNT RDLm Coverage, 745 of 745 possible hourly maps  
From 01-Mar-2012 00:00:02 to 01-Apr-2012 00:00:02



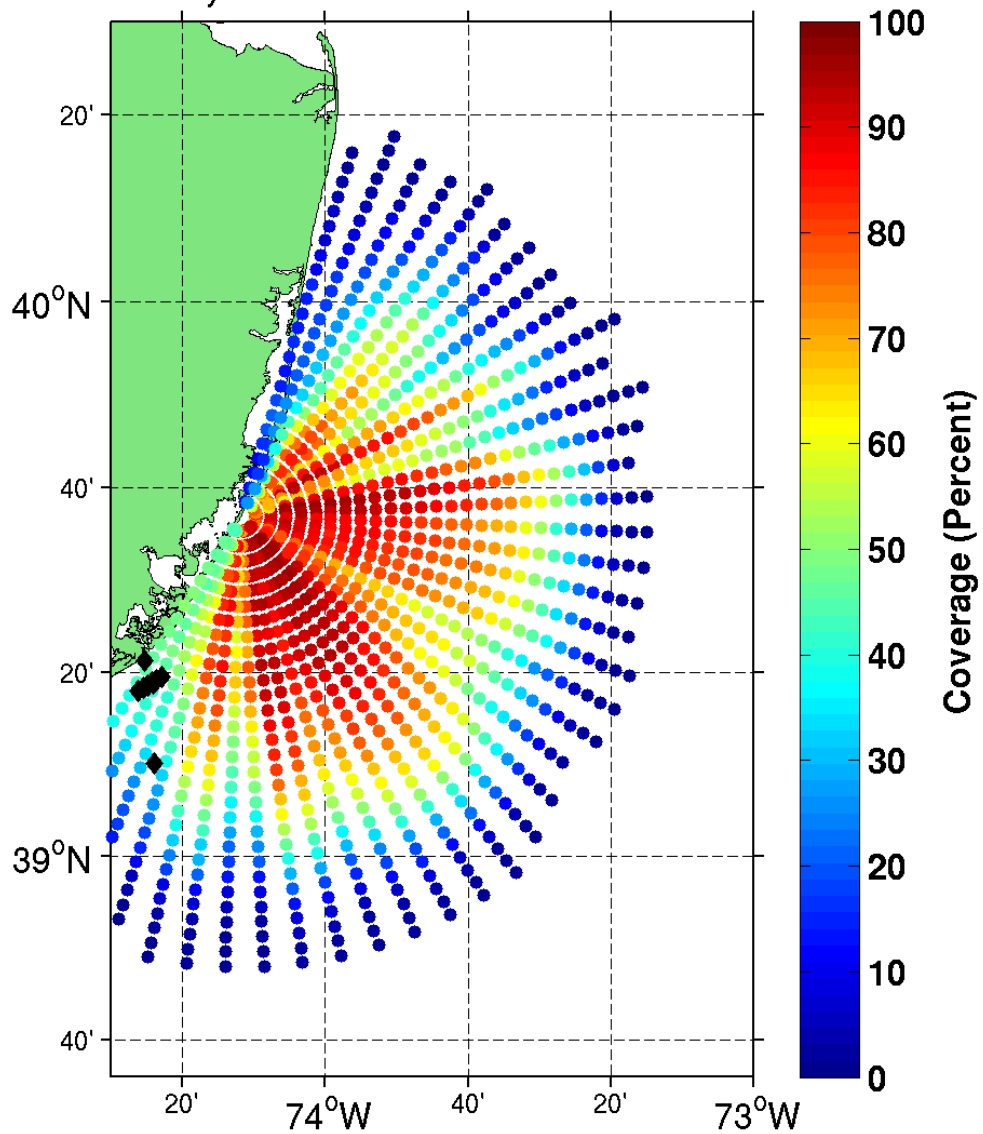


BRNT RDLm Coverage, 410 of 721 possible hourly maps  
From 01-Apr-2012 00:00:02 to 01-May-2012 00:00:02



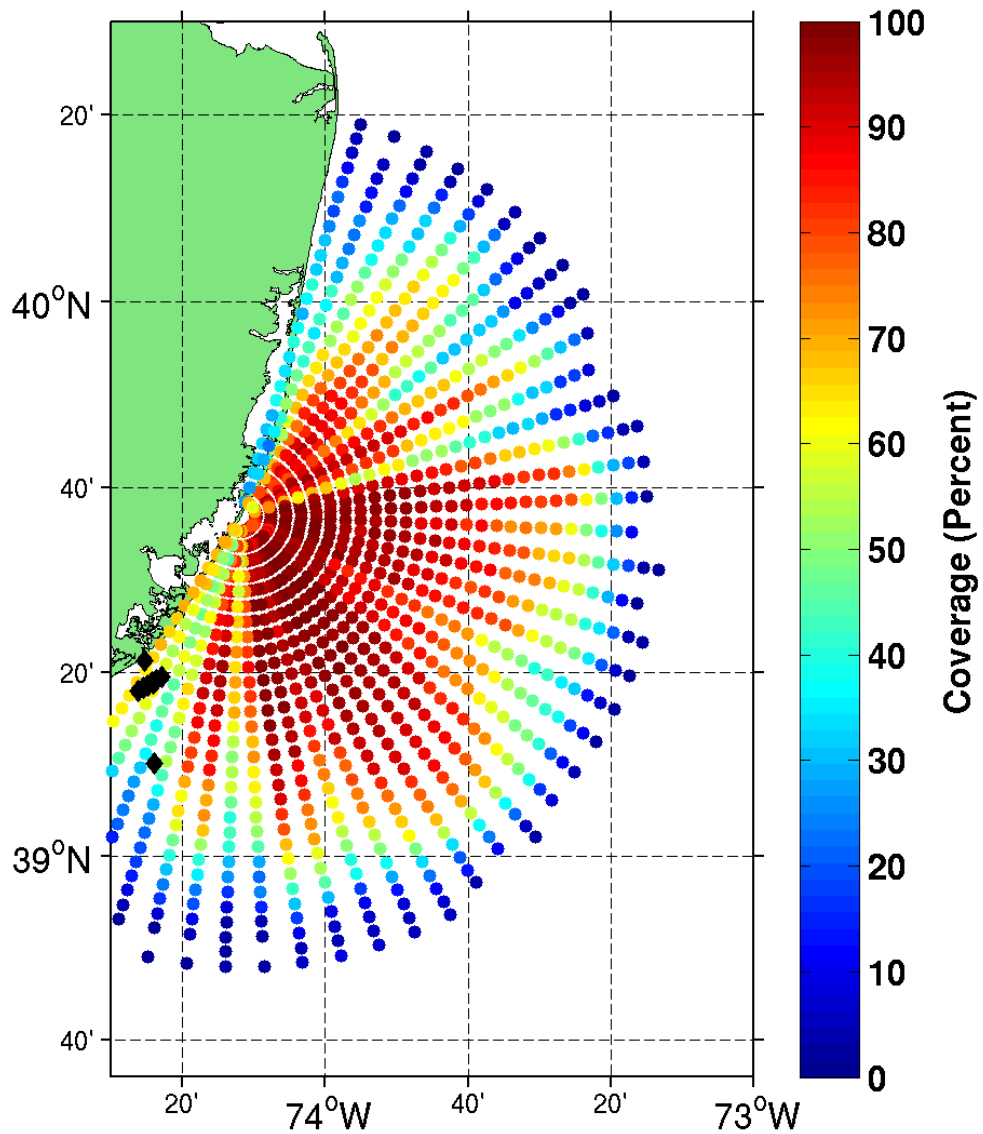
BRNT RDLm Coverage, 743 of 745 possible hourly maps

From 01-May-2012 00:00:02 to 01-Jun-2012 00:00:02



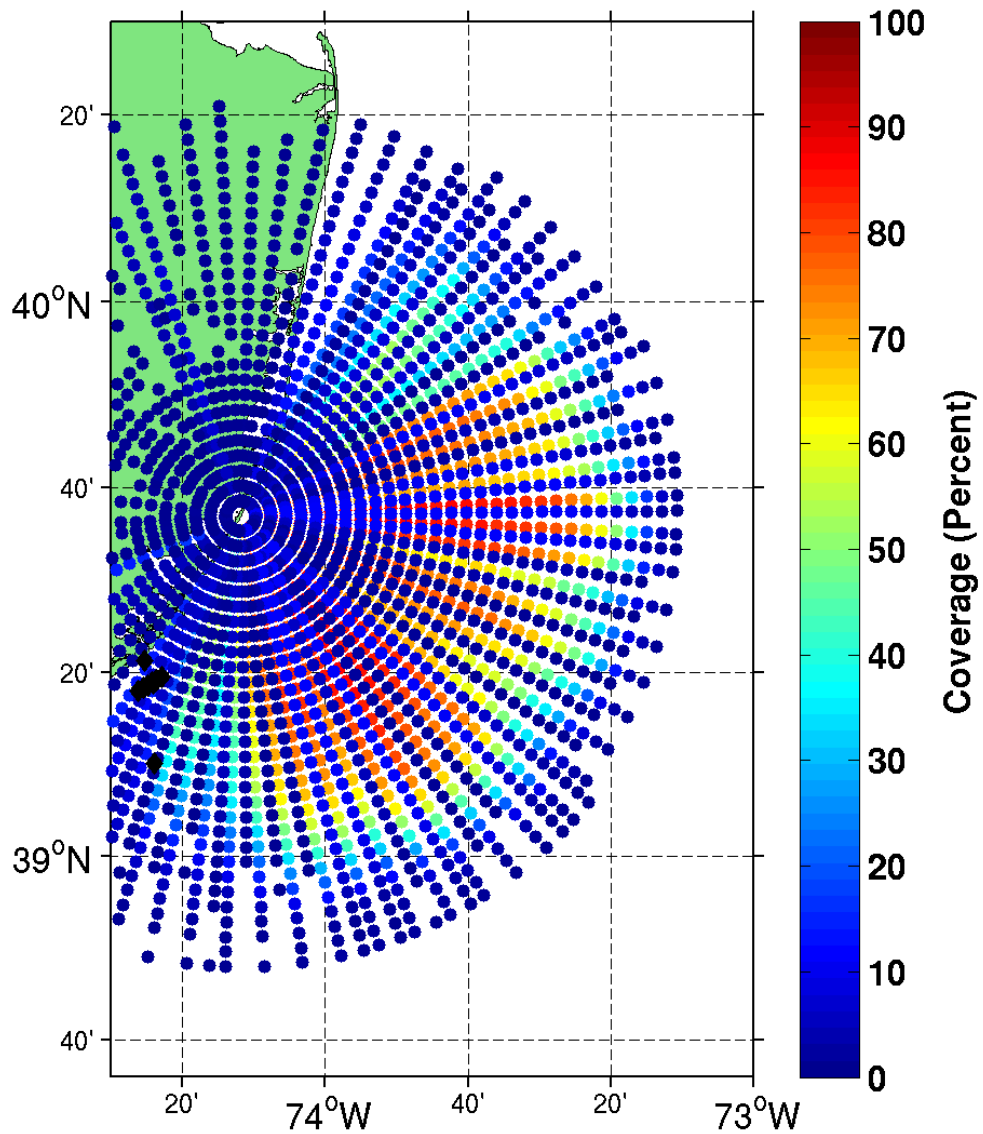
BRNT RDLm Coverage, 111 of 111 possible hourly maps

From 01-Jun-2012 00:00:02 to 05-Jun-2012 14:00:02



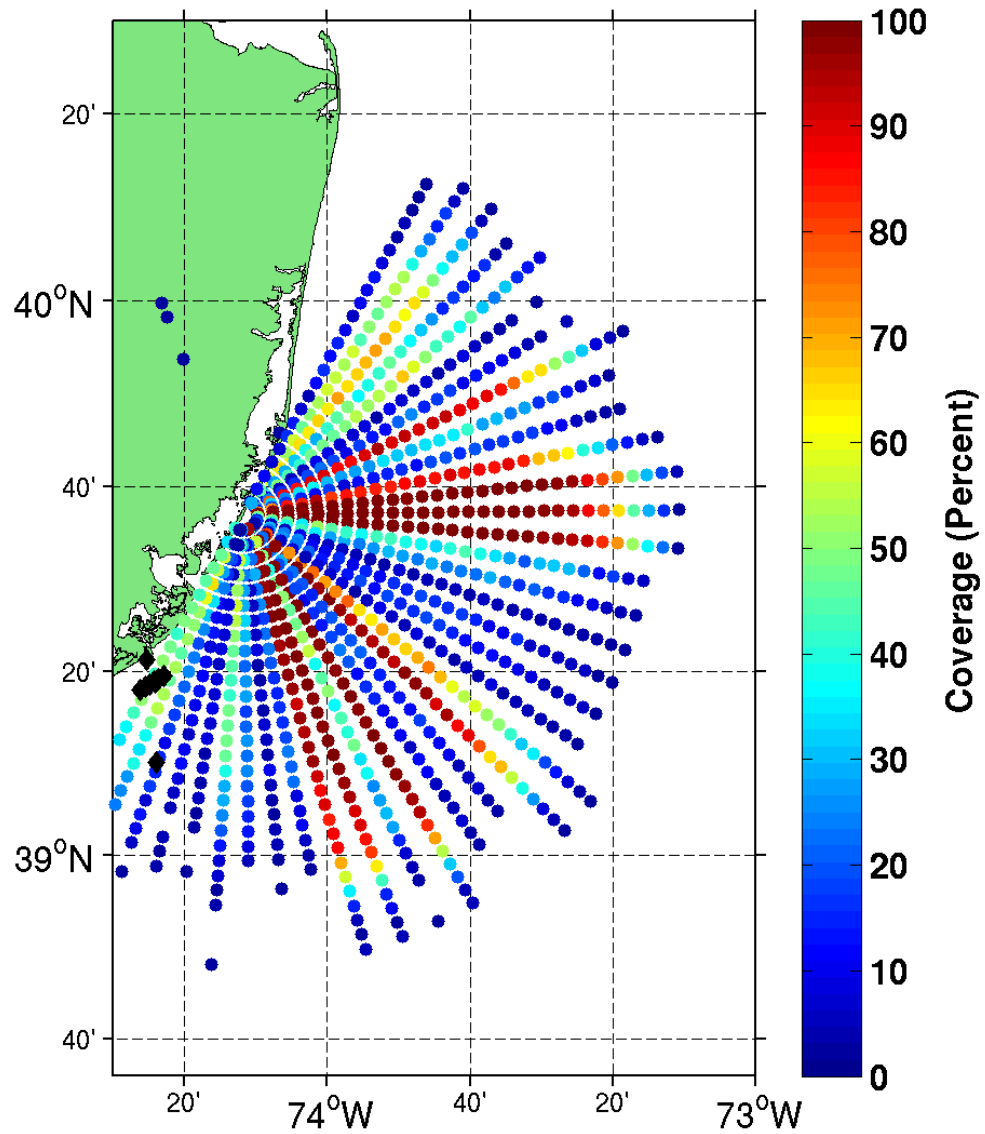
BRNT RDLm Coverage, 716 of 721 possible hourly maps

From 01-Jun-2012 00:00:02 to 01-Jul-2012 00:00:02



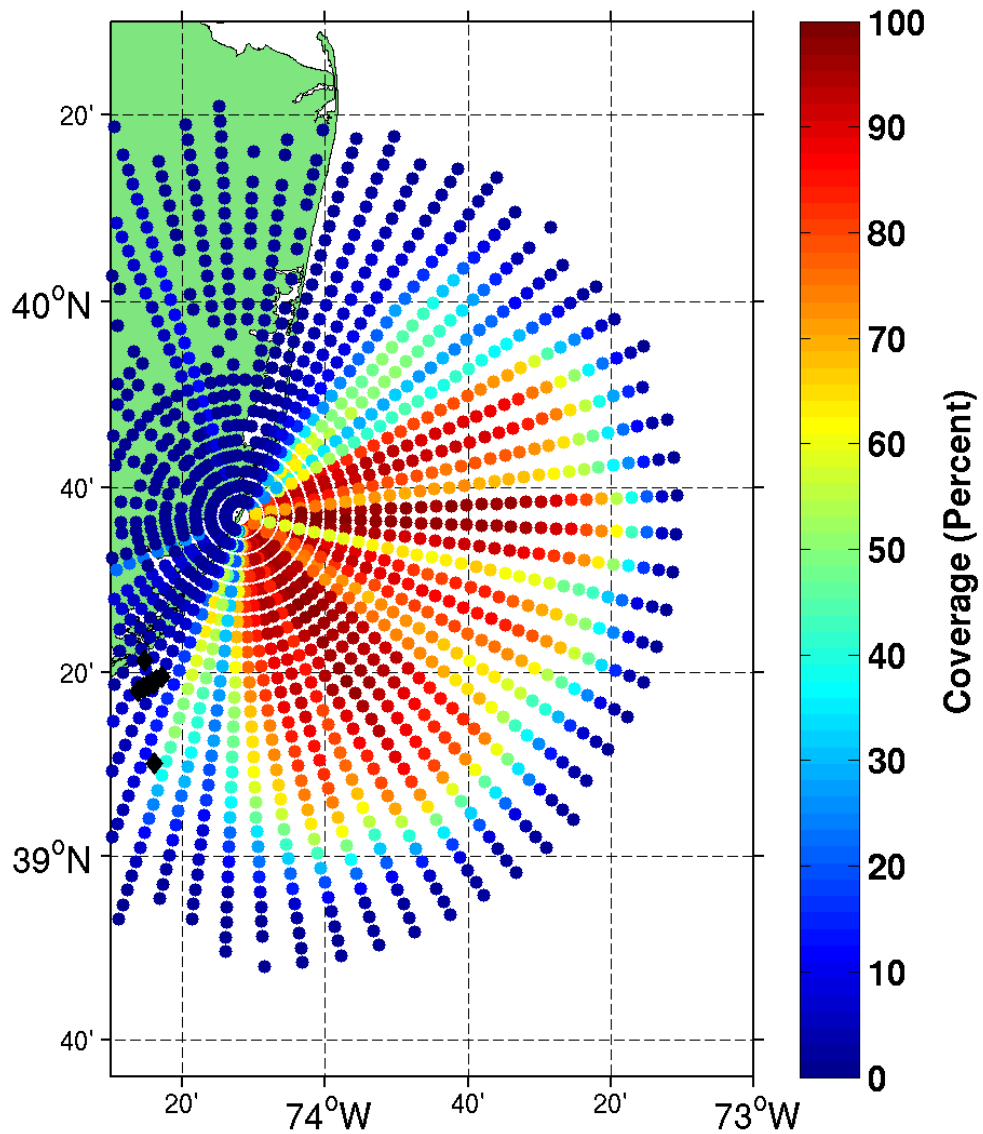
BRNT RDLm Coverage, 77 of 79 possible hourly maps

From 08-Jun-2012 15:00:02 to 11-Jun-2012 21:00:02

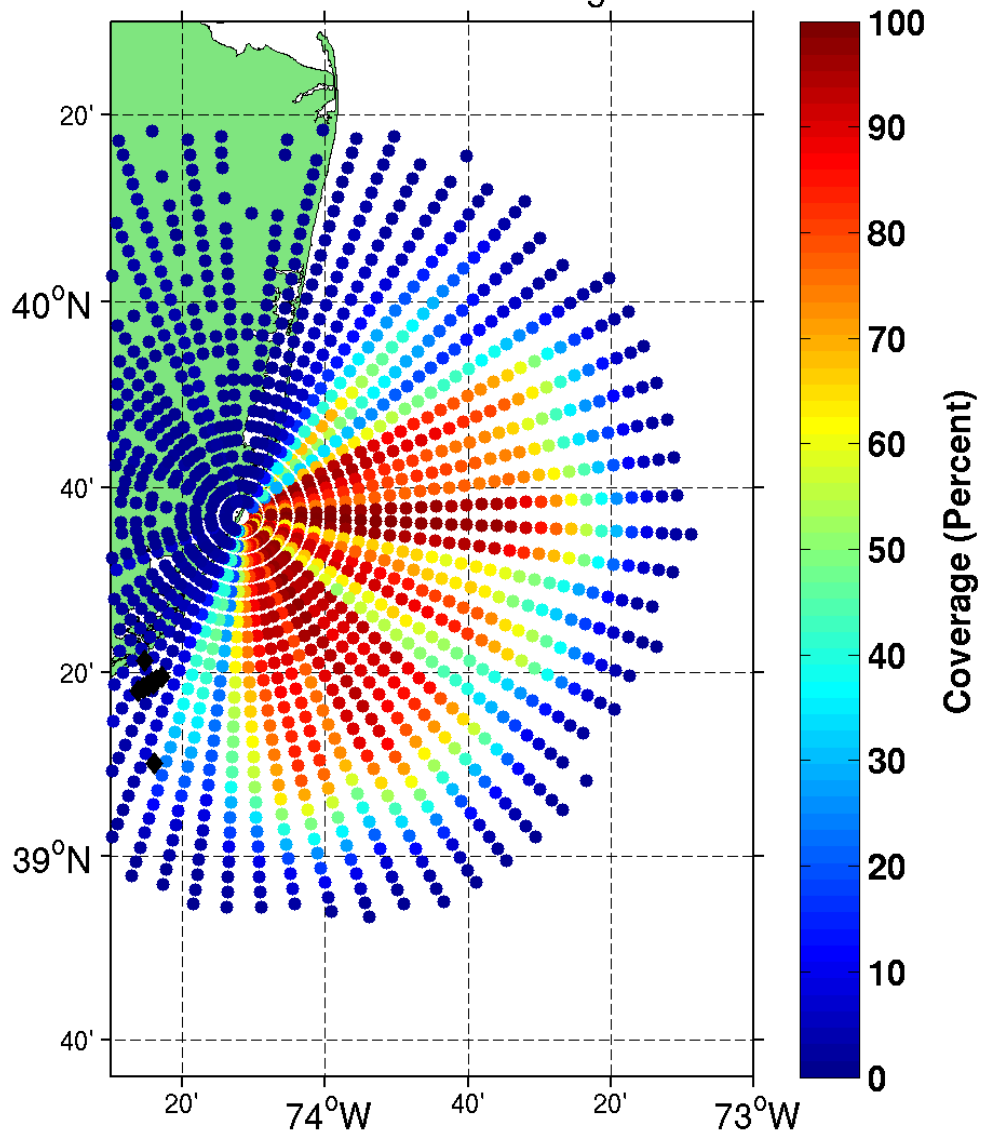


BRNT RDLm Coverage, 458 of 459 possible hourly maps

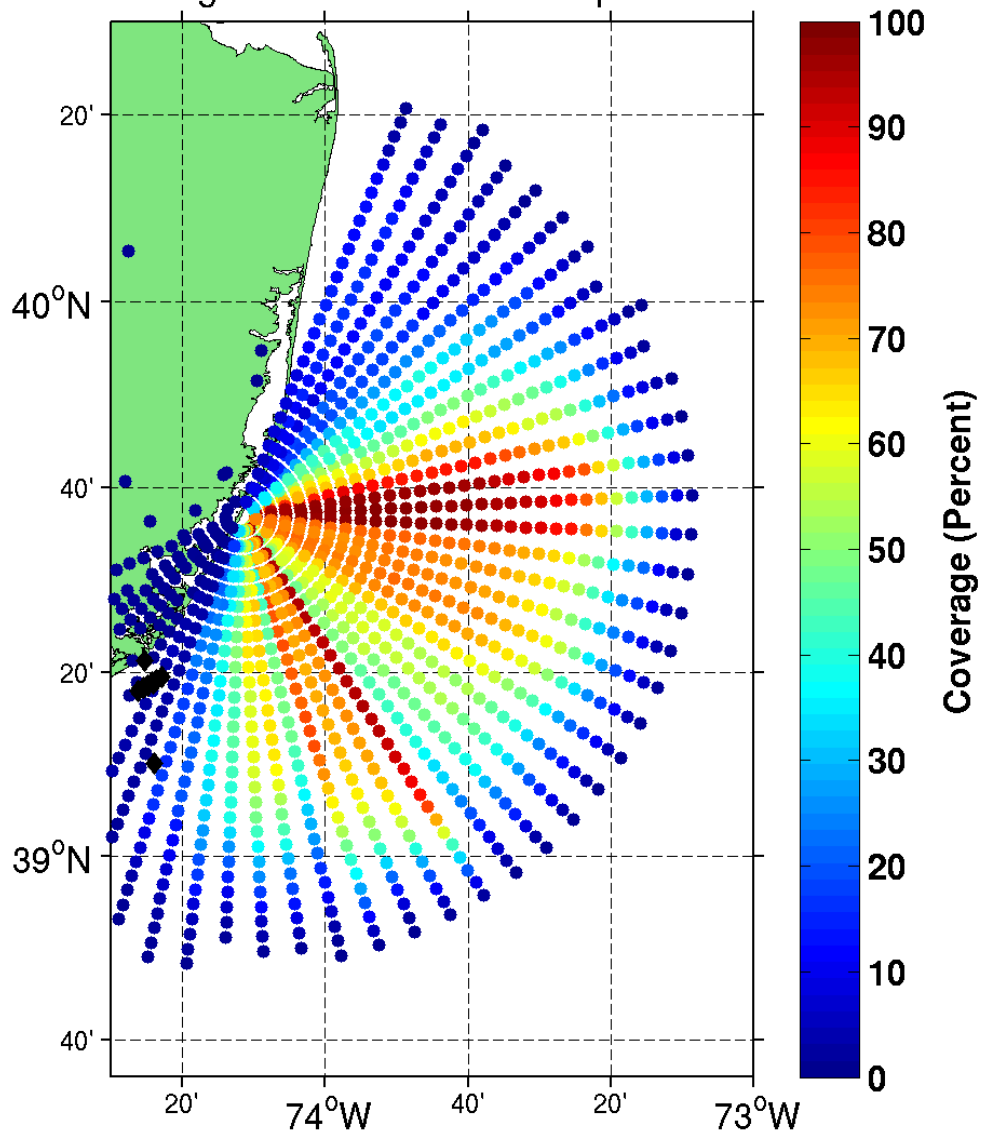
From 11-Jun-2012 22:00:02 to 01-Jul-2012 00:00:02



BRNT RDLm Coverage, 745 of 745 possible hourly maps  
From 01-Jul-2012 00:00:02 to 01-Aug-2012 00:00:02



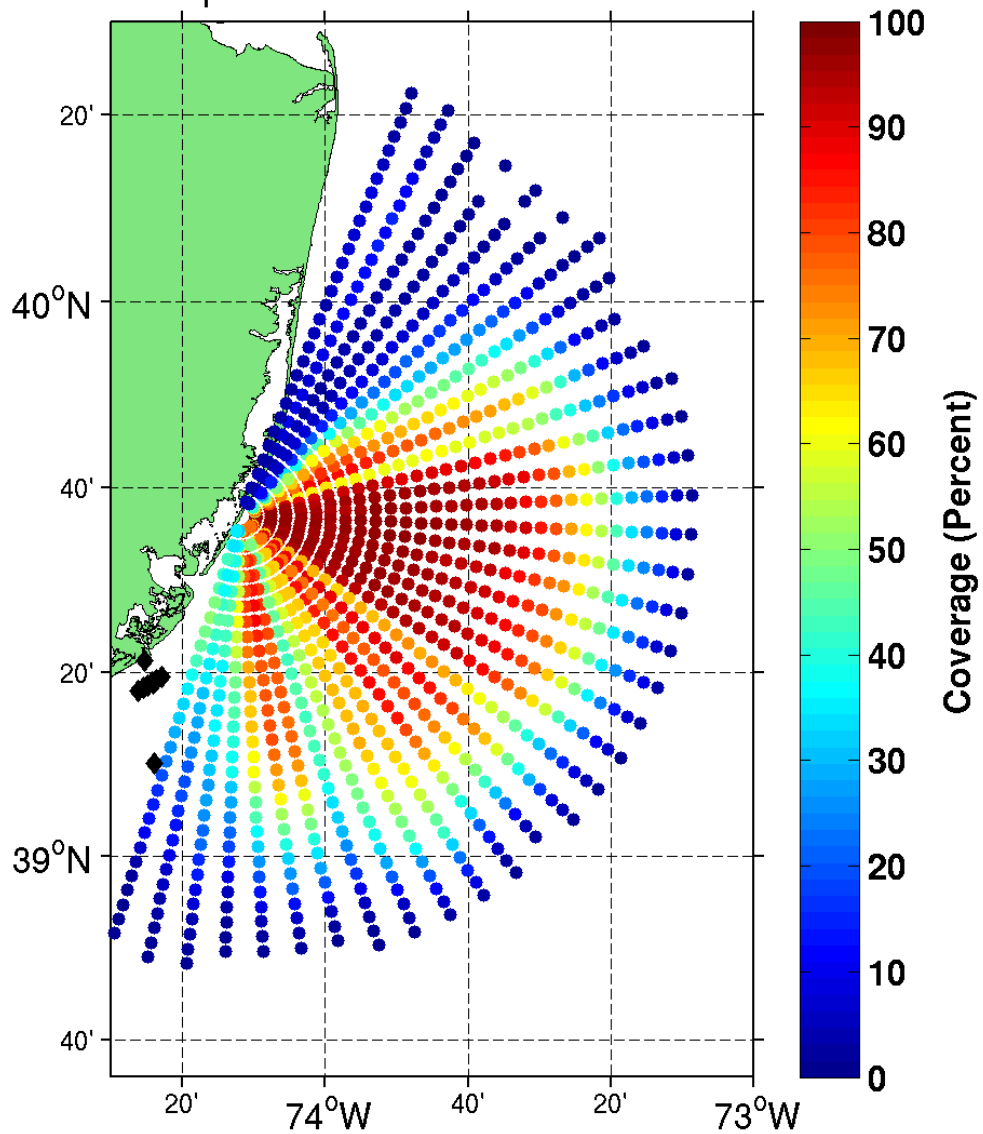
BRNT RDLm Coverage, 744 of 745 possible hourly maps  
From 01-Aug-2012 00:00:02 to 01-Sep-2012 00:00:02



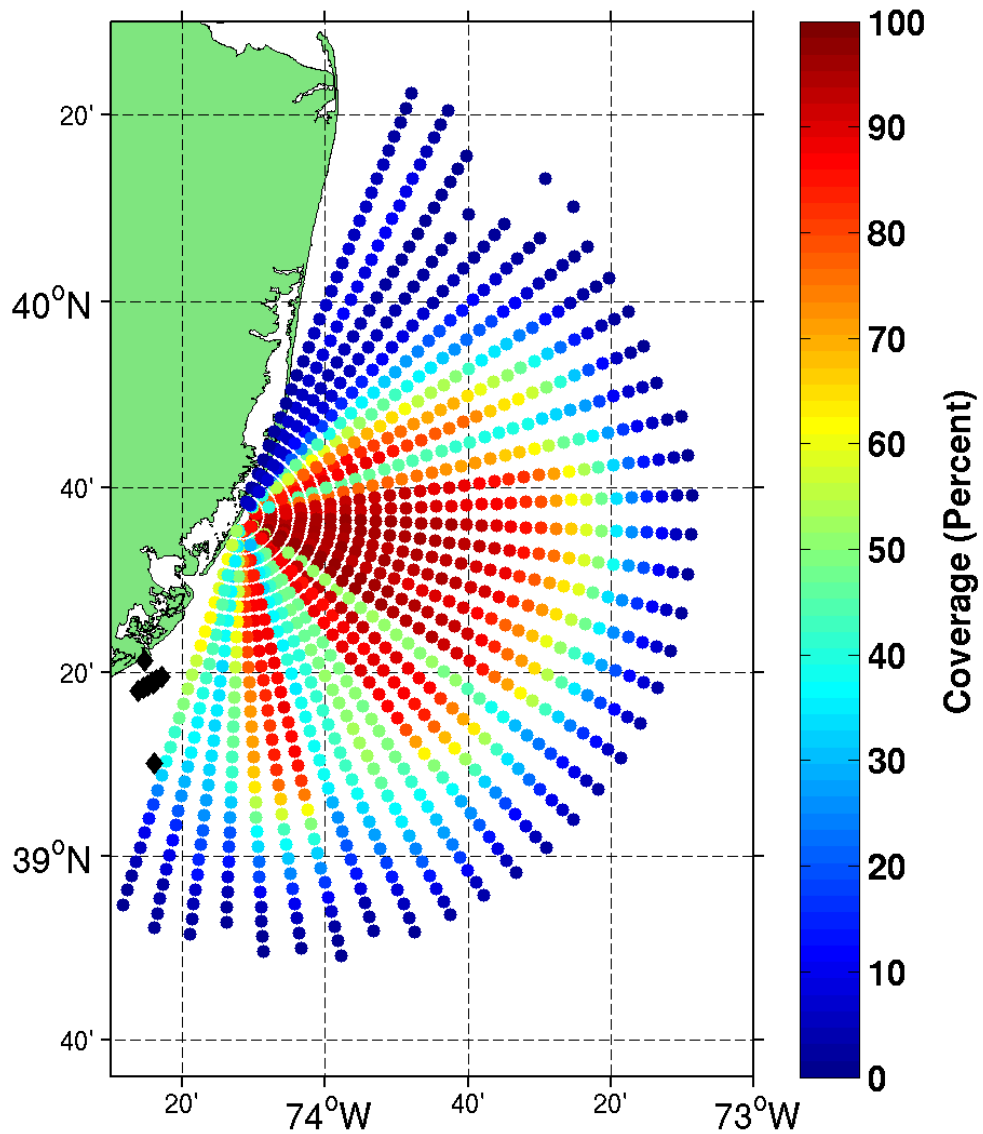


BRNT RDLm Coverage, 721 of 721 possible hourly maps

From 01-Sep-2012 00:00:02 to 01-Oct-2012 00:00:02

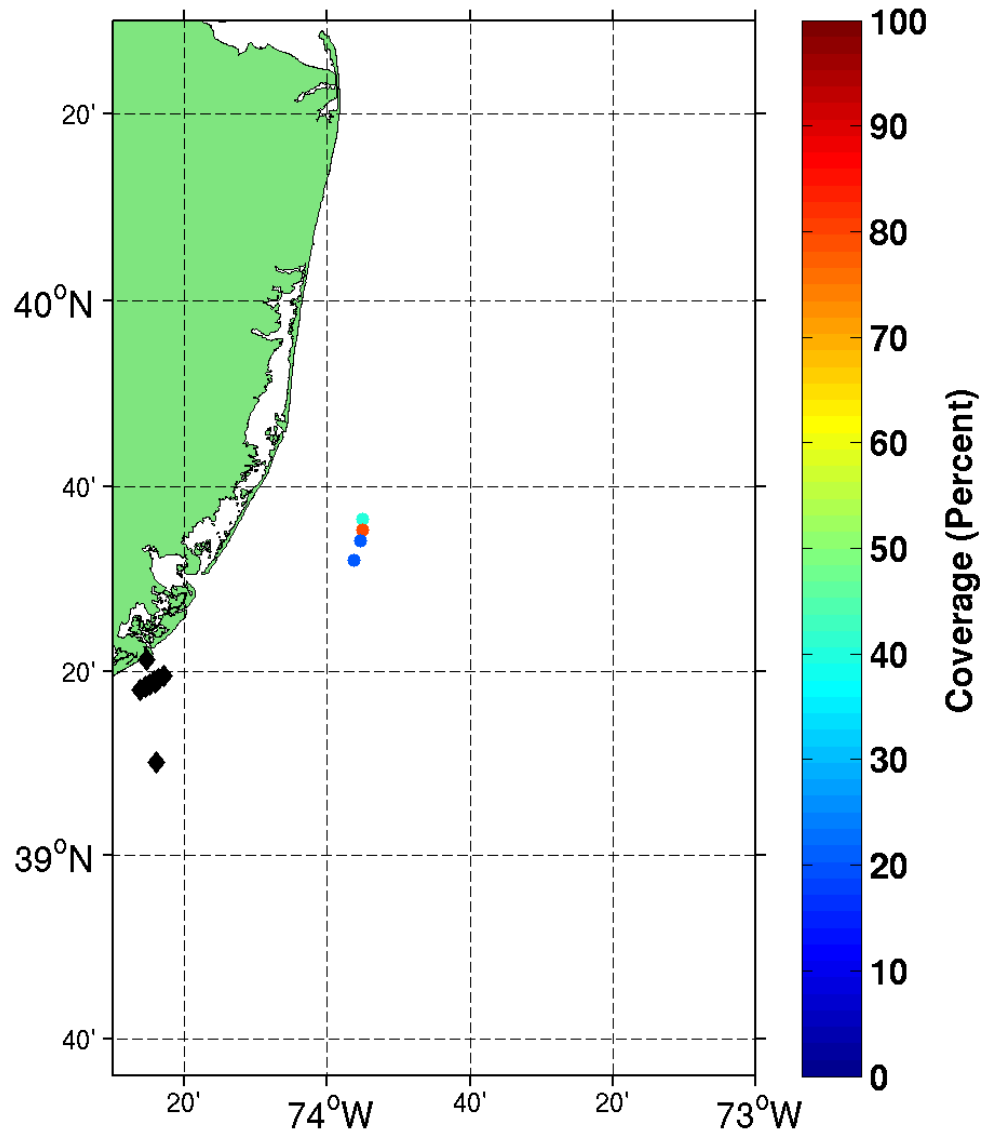


BRNT RDLm Coverage, 690 of 745 possible hourly maps  
From 01-Oct-2012 00:00:02 to 01-Nov-2012 00:00:02



BRNT RDLm Coverage, 5 of 721 possible hourly maps

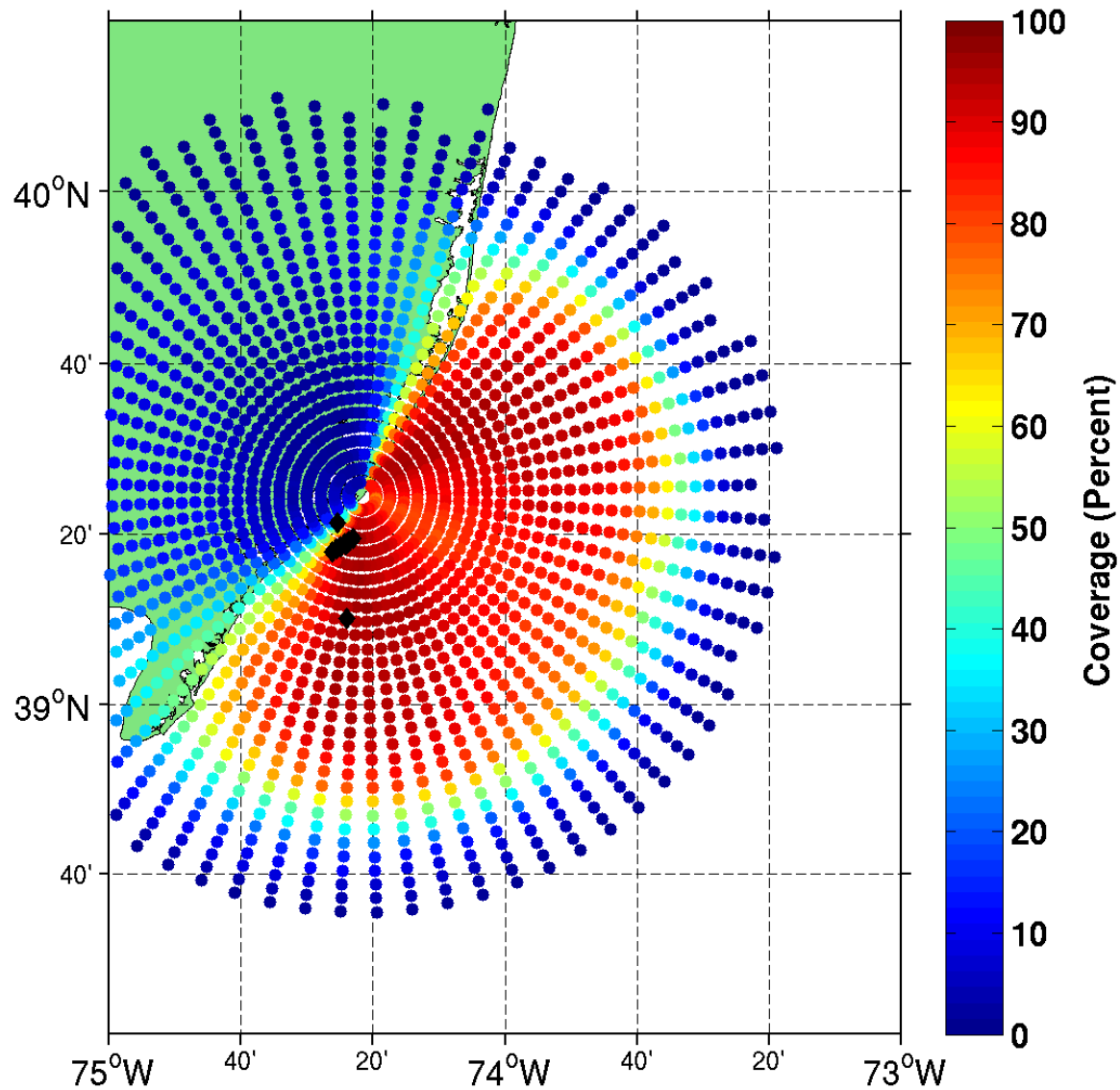
From 01-Nov-2012 00:00:02 to 01-Dec-2012 00:00:02



# **BRIGANTINE IDEAL RADIALS**

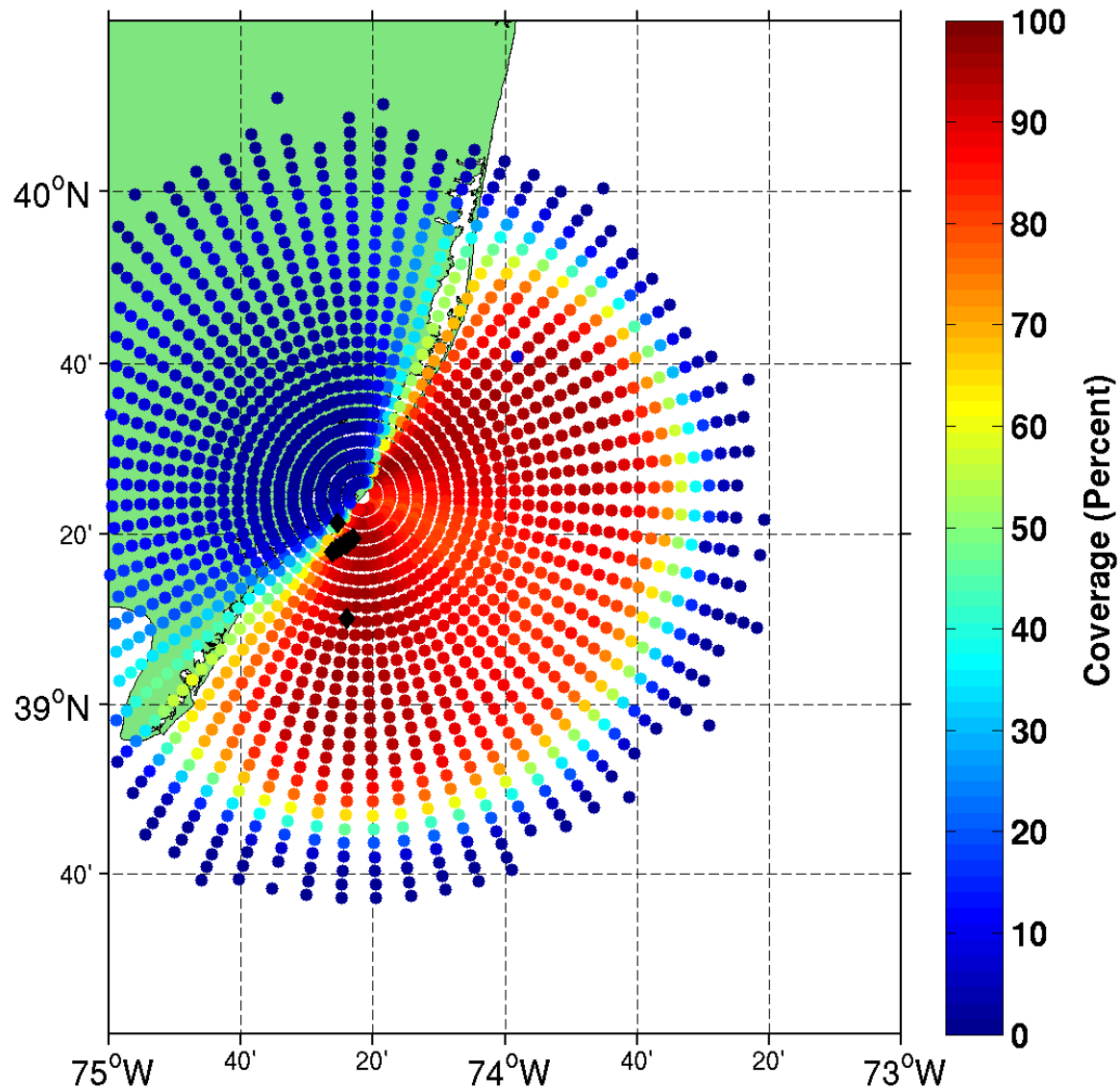
BRMR RDLi Coverage, 745 of 745 possible hourly maps

From 01-Jan-2012 00:00:02 to 01-Feb-2012 00:00:02

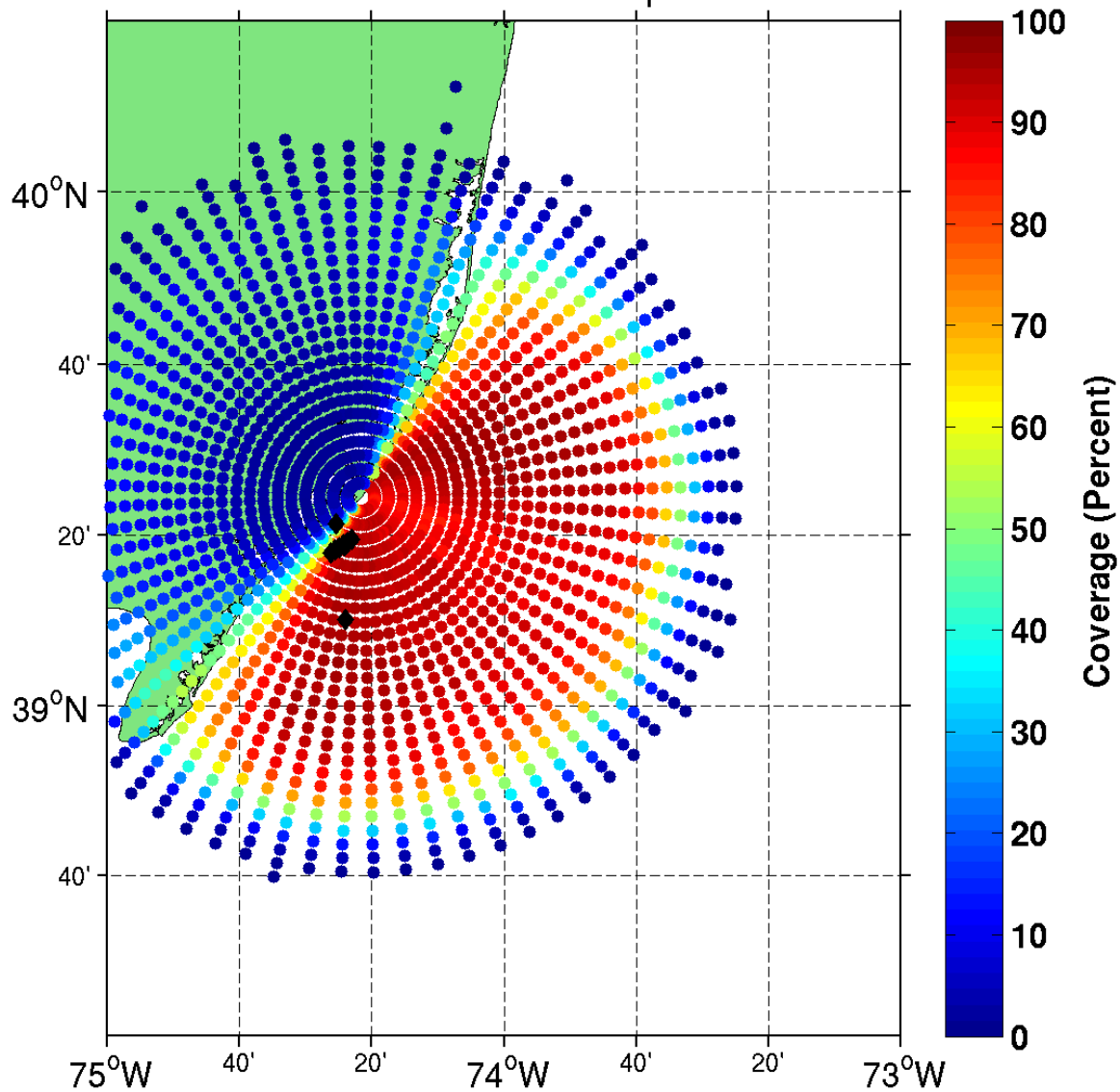


BRMR RDLi Coverage, 697 of 697 possible hourly maps

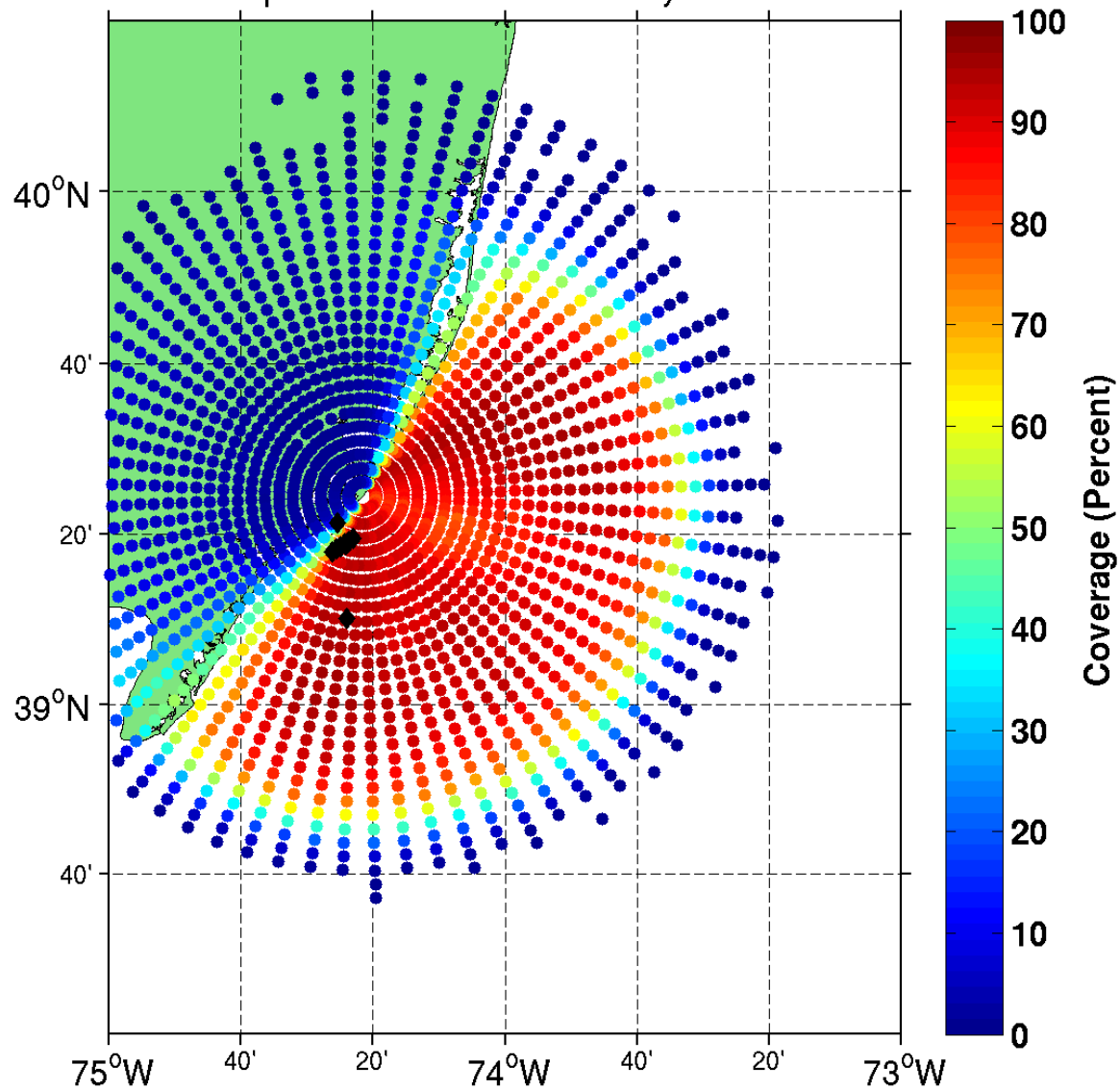
From 01-Feb-2012 00:00:02 to 01-Mar-2012 00:00:02



BRMR RDLi Coverage, 744 of 745 possible hourly maps  
From 01-Mar-2012 00:00:02 to 01-Apr-2012 00:00:02

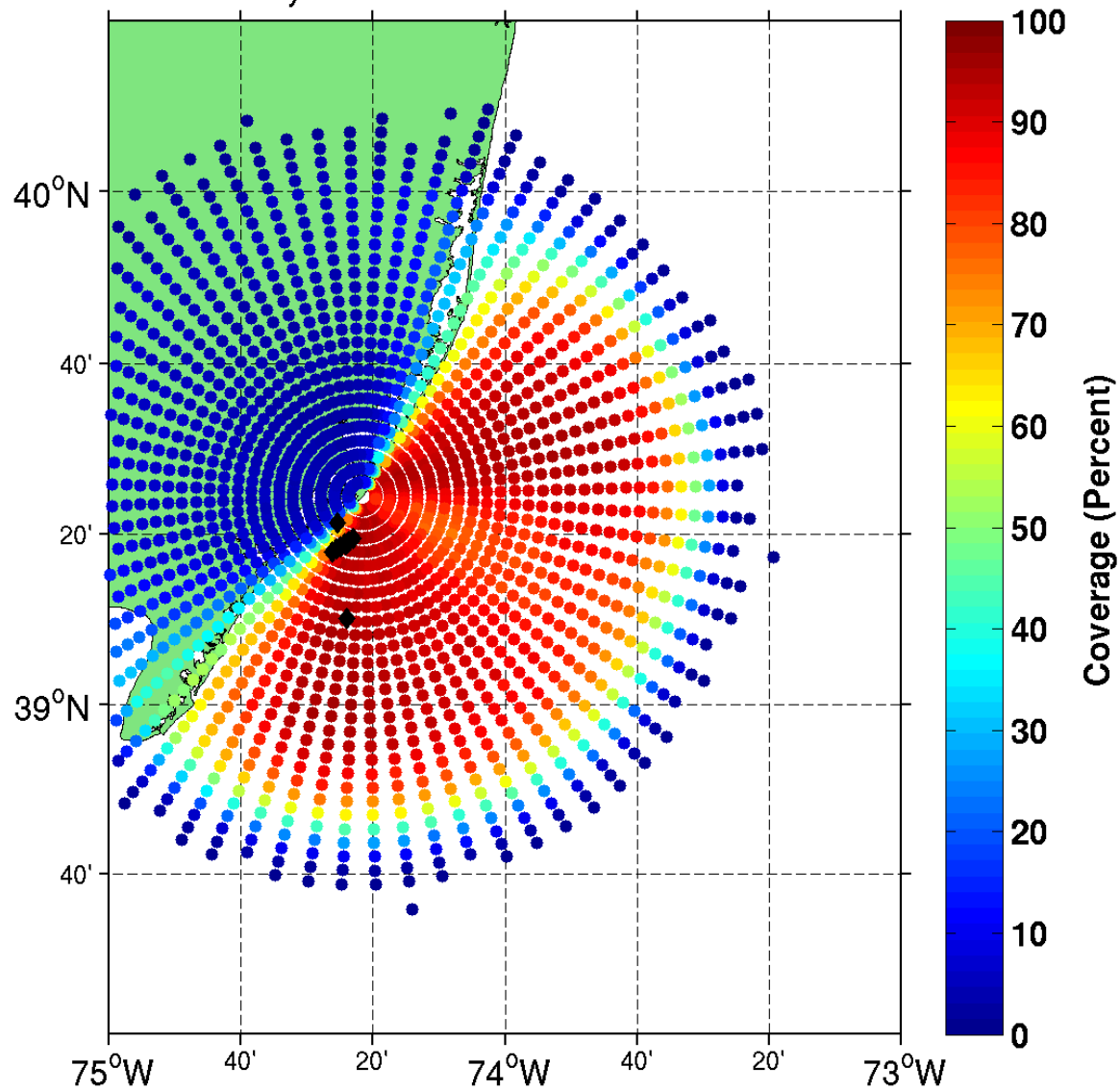


BRMR RDLi Coverage, 715 of 721 possible hourly maps  
From 01-Apr-2012 00:00:02 to 01-May-2012 00:00:02



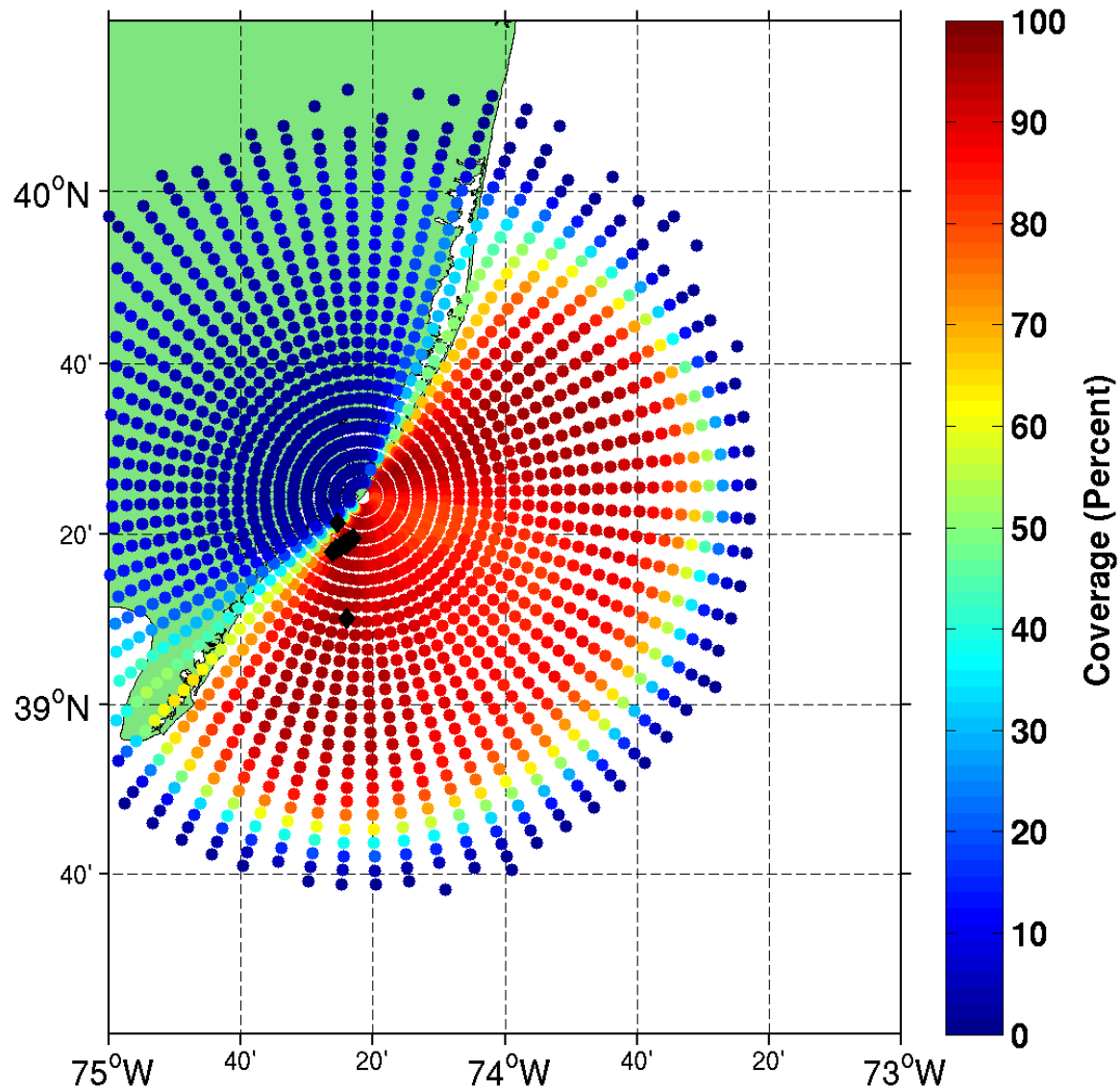


BRMR RDLi Coverage, 745 of 745 possible hourly maps  
From 01-May-2012 00:00:02 to 01-Jun-2012 00:00:02

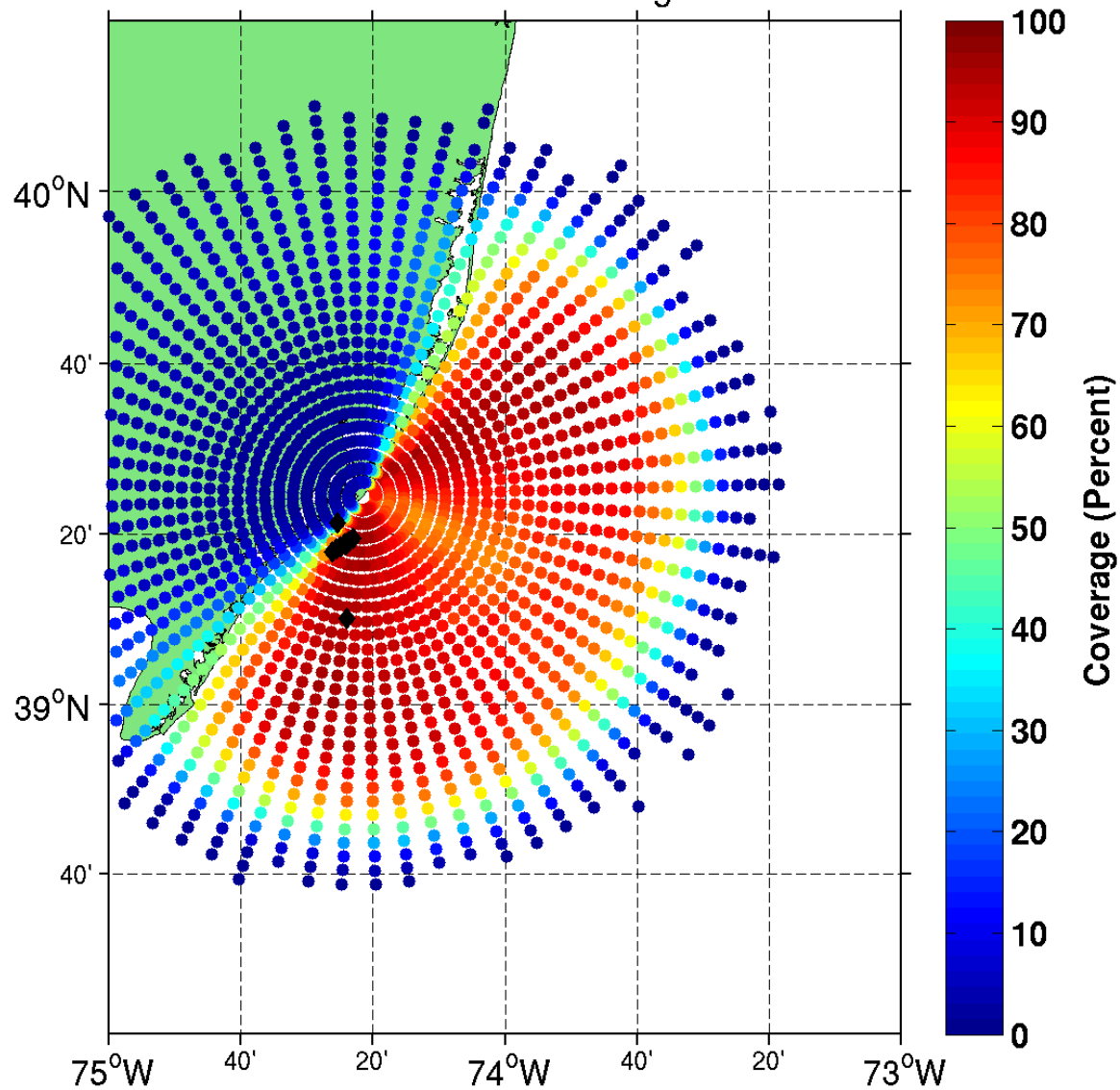


BRMR RDLi Coverage, 702 of 721 possible hourly maps

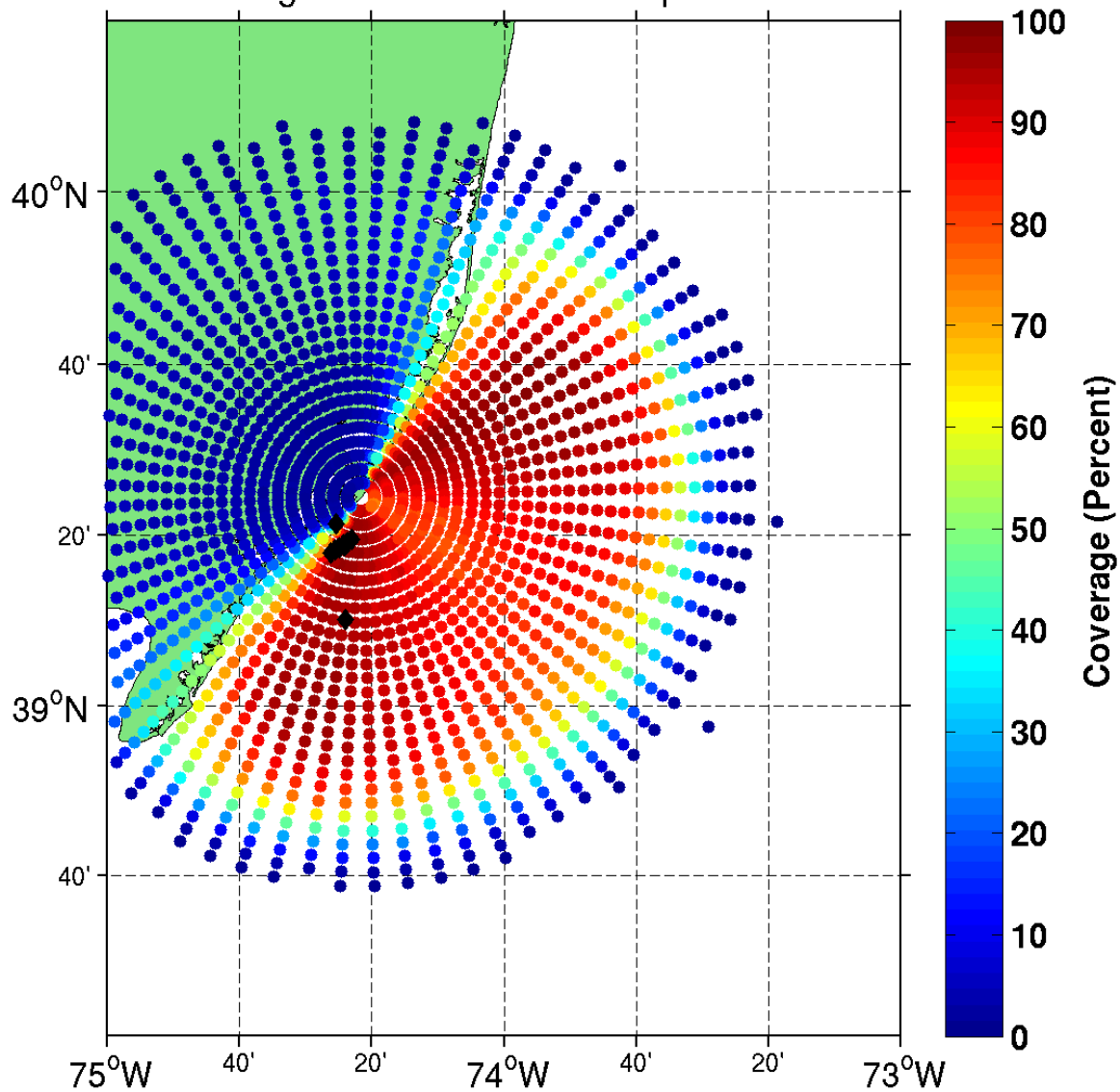
From 01-Jun-2012 00:00:02 to 01-Jul-2012 00:00:02



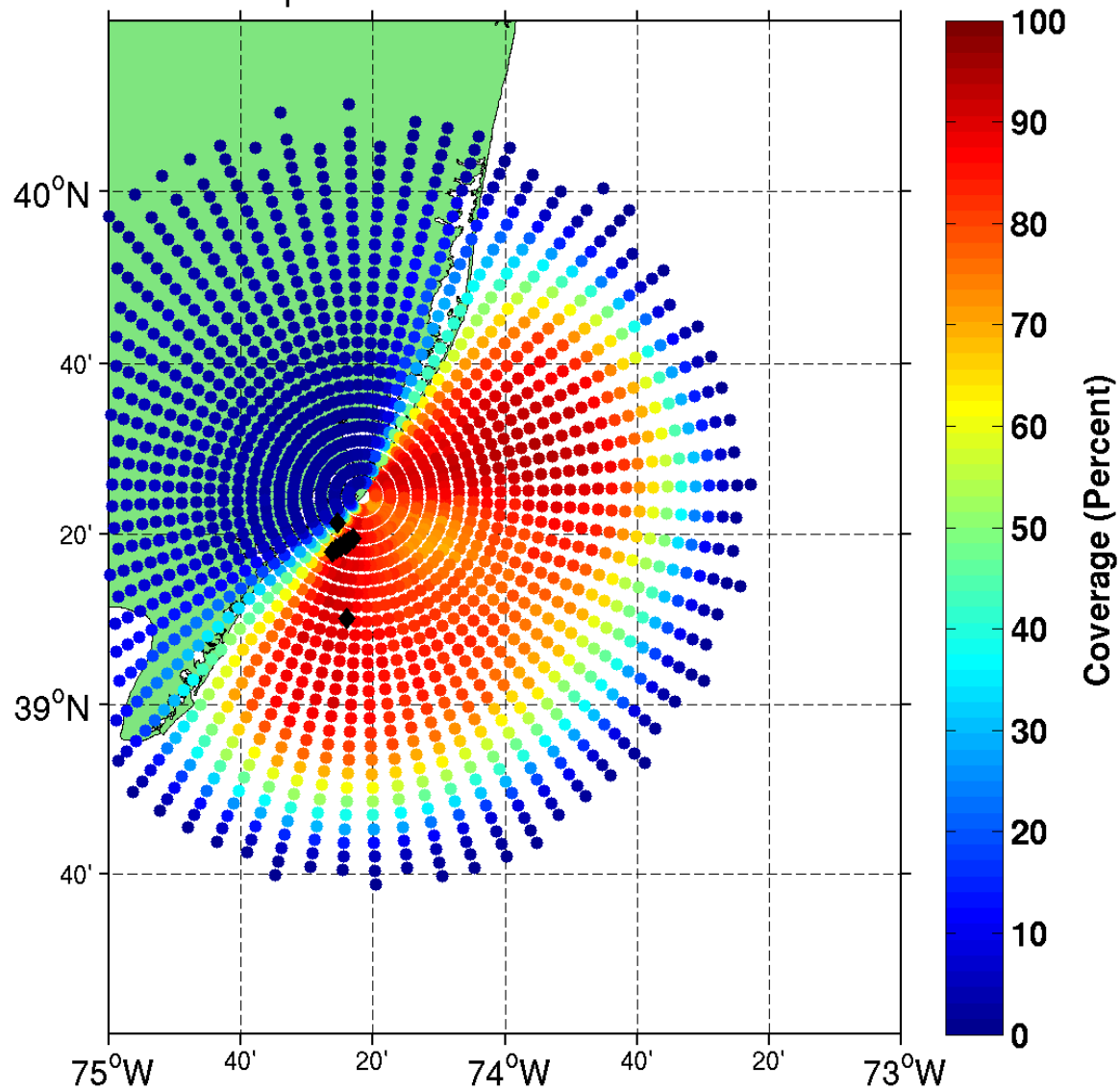
BRMR RDLi Coverage, 677 of 745 possible hourly maps  
From 01-Jul-2012 00:00:02 to 01-Aug-2012 00:00:02



BRMR RDLi Coverage, 741 of 745 possible hourly maps  
From 01-Aug-2012 00:00:02 to 01-Sep-2012 00:00:02

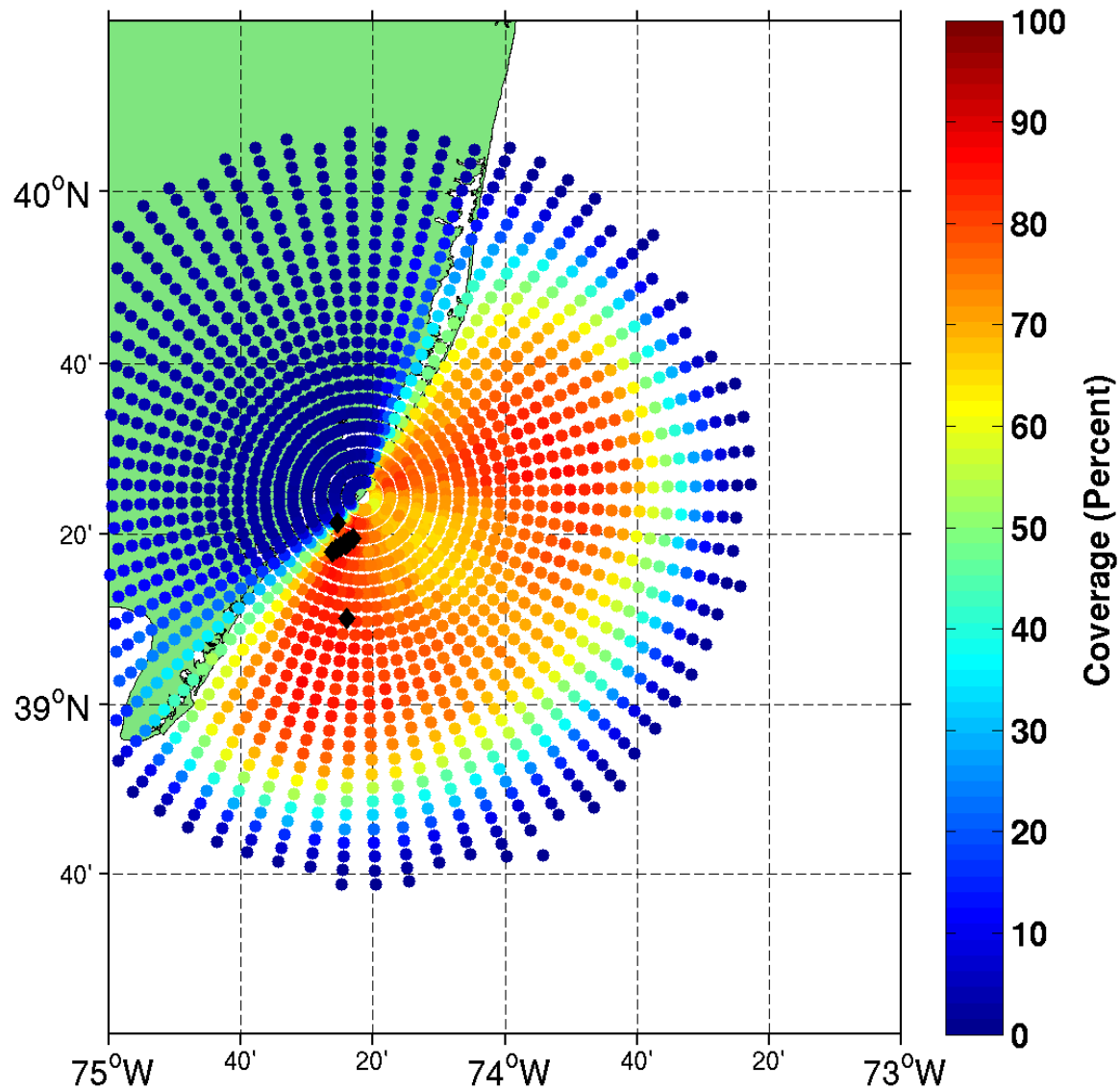


BRMR RDLi Coverage, 721 of 721 possible hourly maps  
From 01-Sep-2012 00:00:02 to 01-Oct-2012 00:00:02



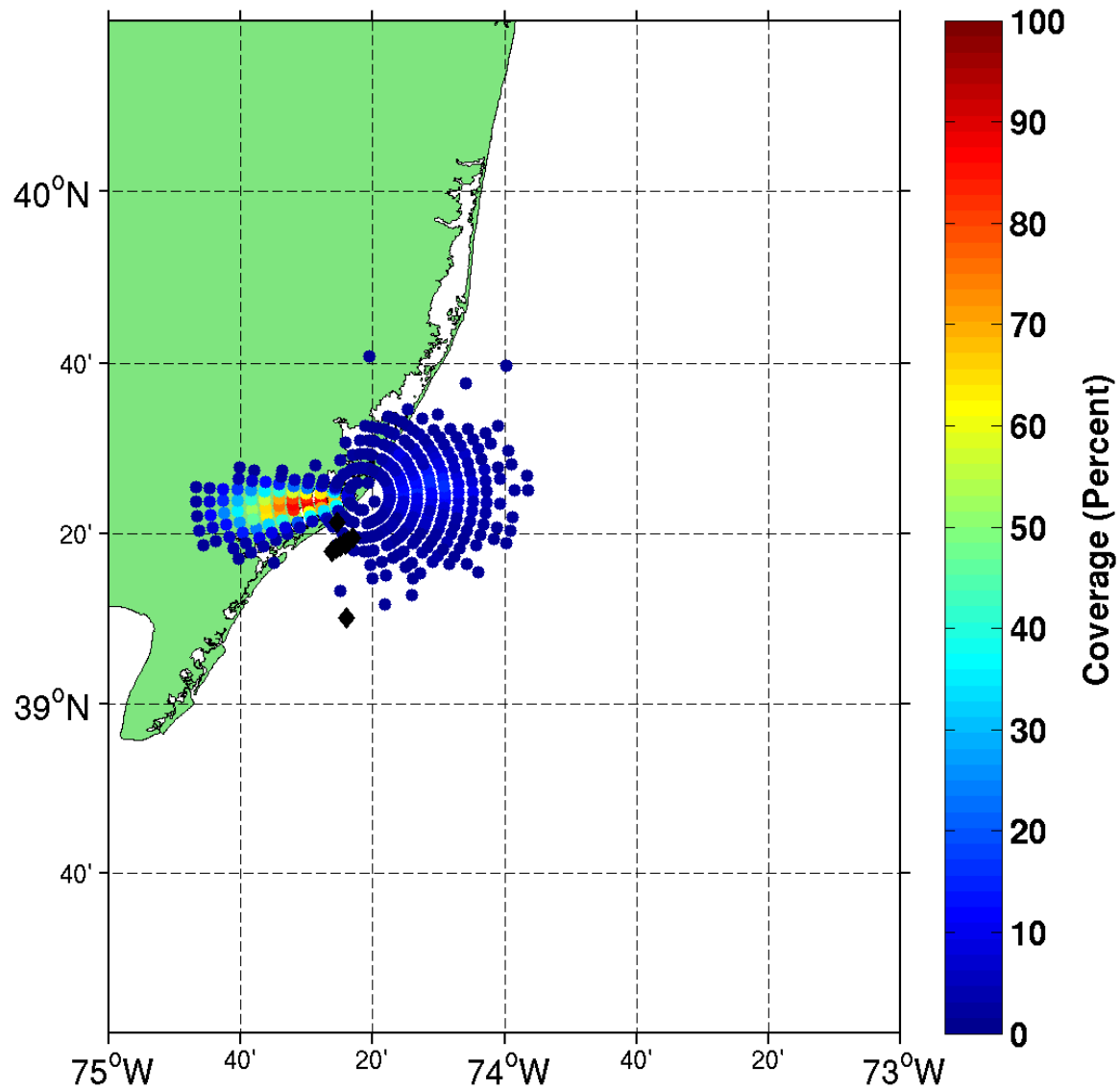
BRMR RDLi Coverage, 691 of 745 possible hourly maps

From 01-Oct-2012 00:00:02 to 01-Nov-2012 00:00:02



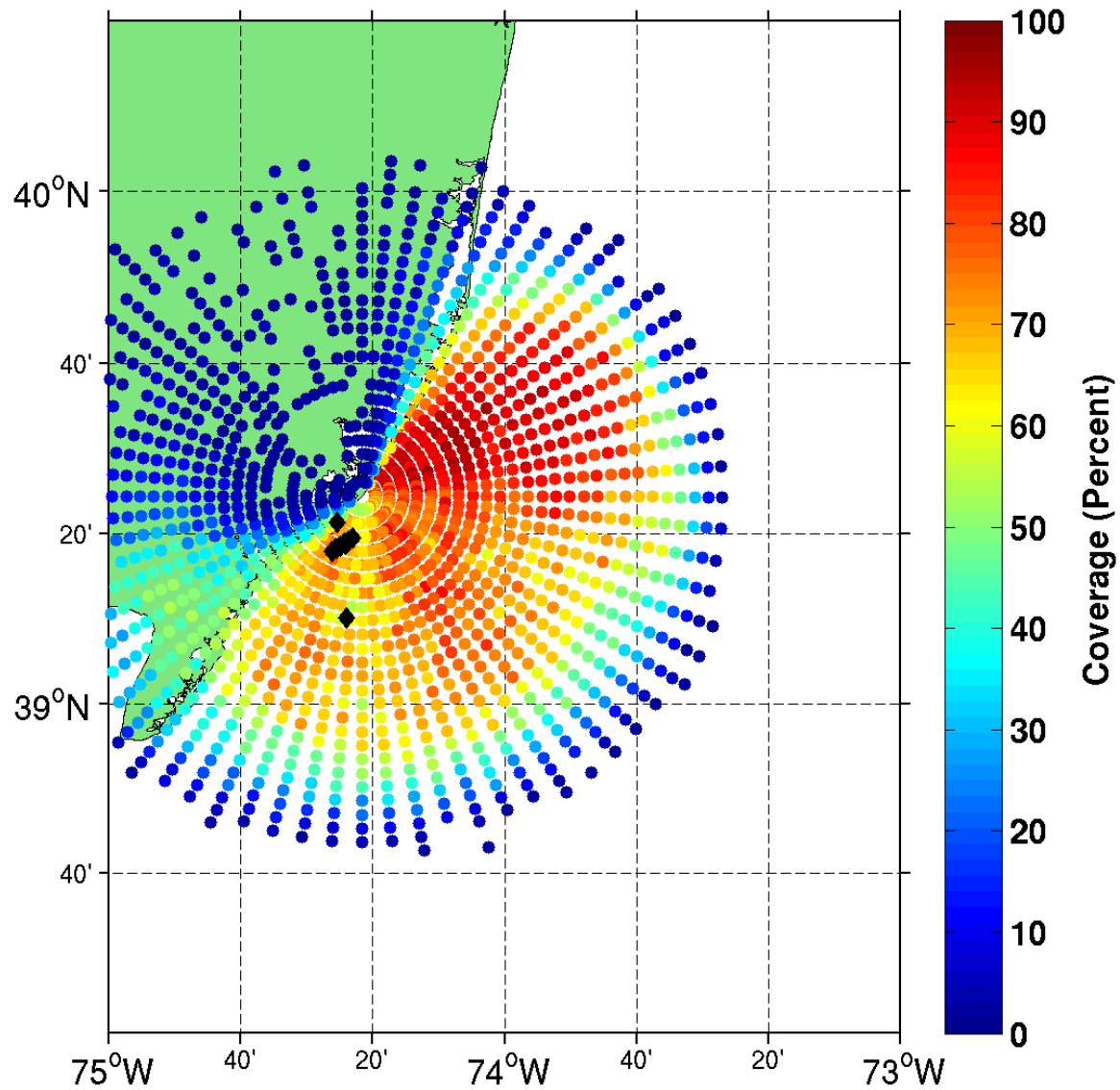
BRMR RDLi Coverage, 147 of 721 possible hourly maps

From 01-Nov-2012 00:00:02 to 01-Dec-2012 00:00:02



BRMR RDLi Coverage, 104 of 745 possible hourly maps

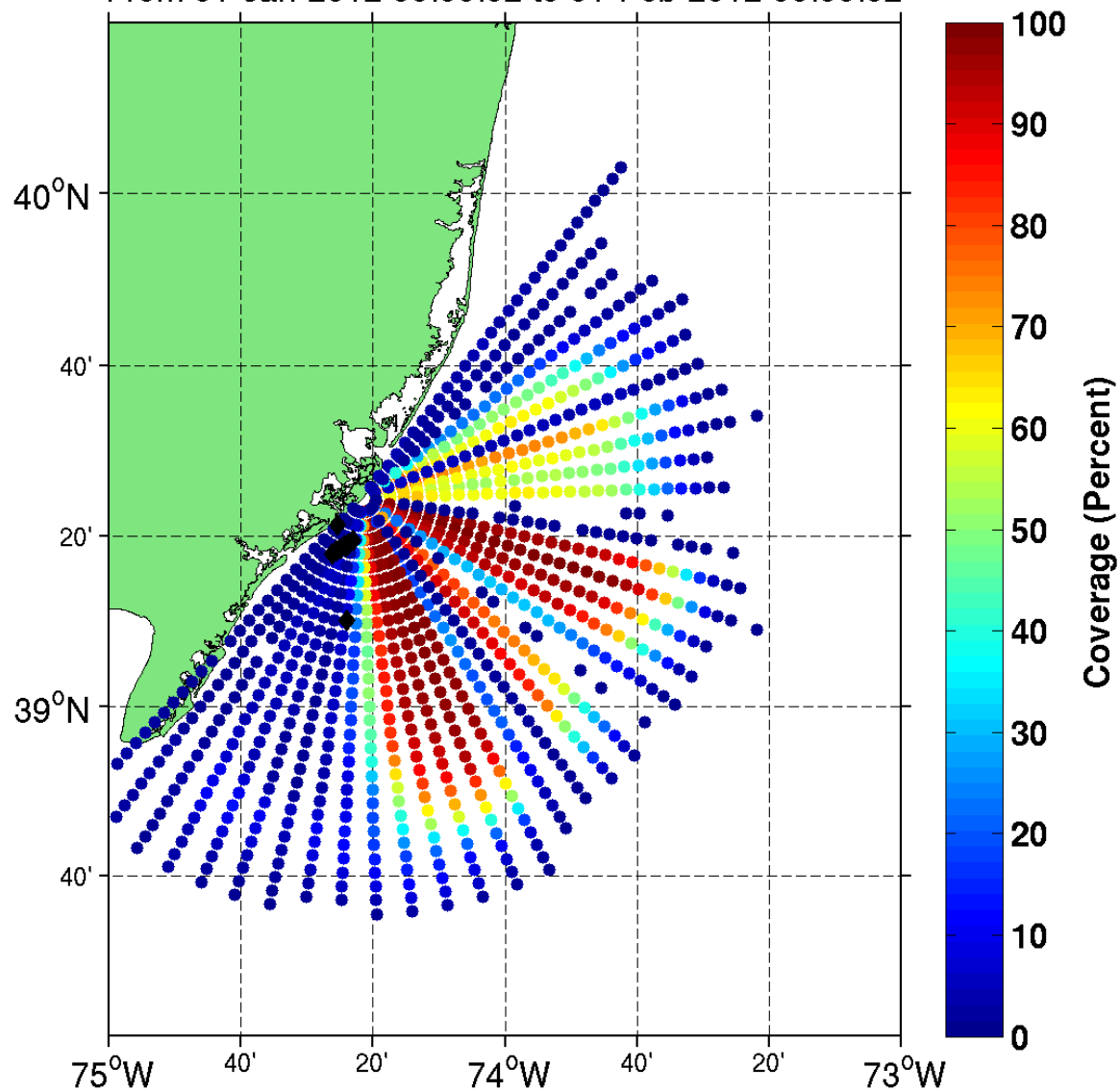
From 01-Dec-2012 00:00:02 to 01-Jan-2013 00:00:02



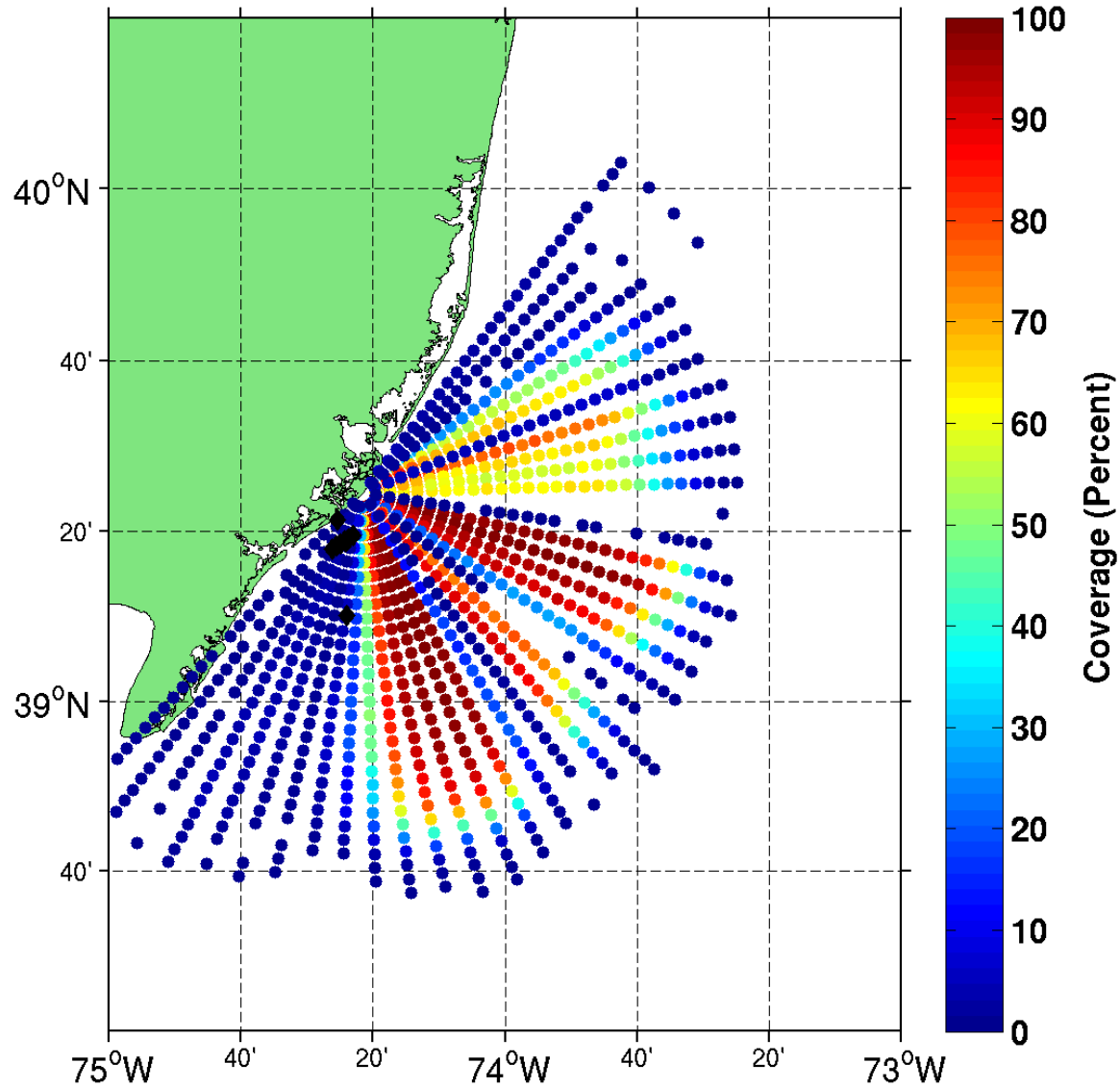


# **BRIAGANTINE MEASURED RADIALS**

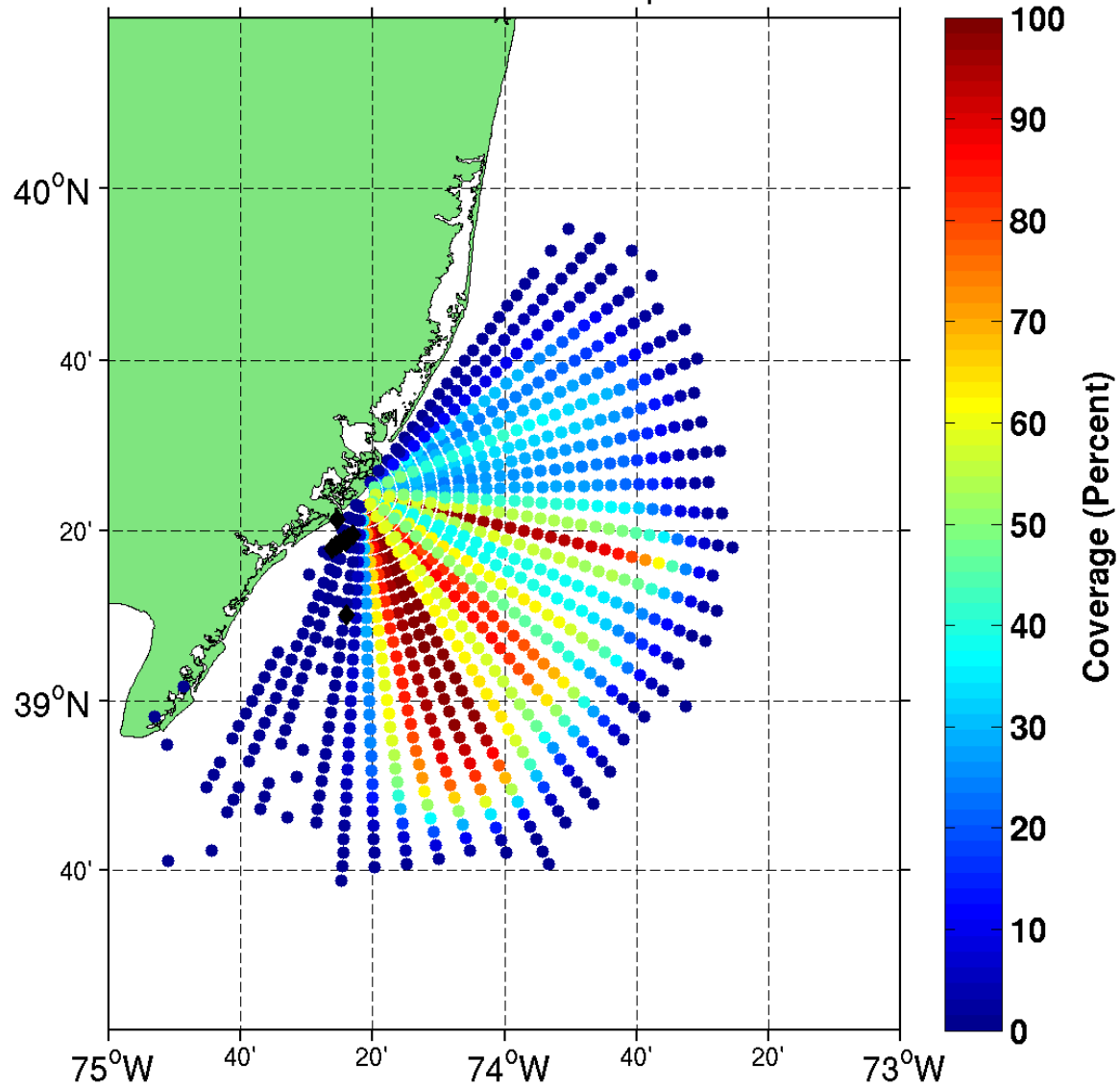
BRMR RDLm Coverage, 745 of 745 possible hourly maps  
From 01-Jan-2012 00:00:02 to 01-Feb-2012 00:00:02



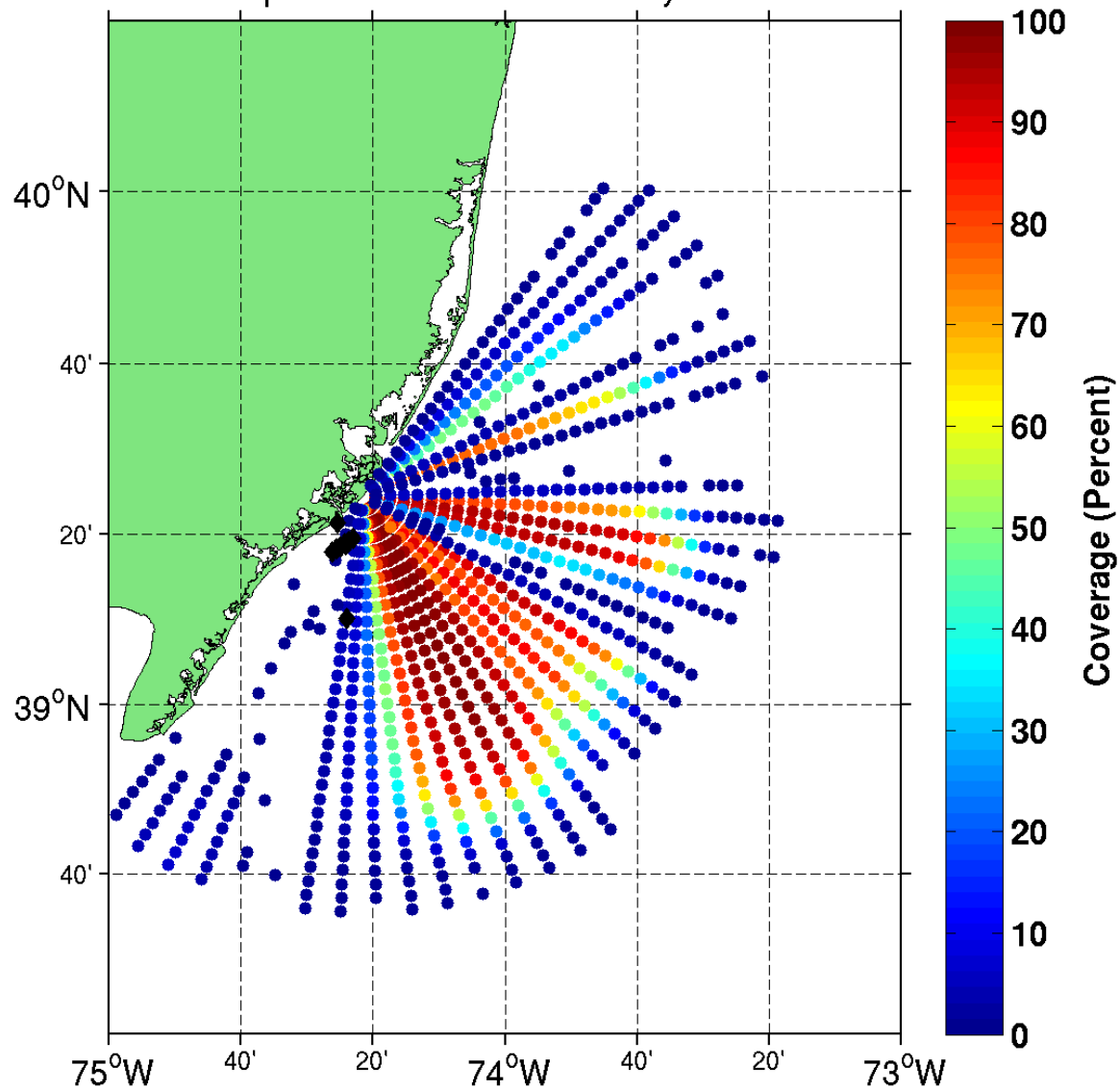
BRMR RDLm Coverage, 697 of 697 possible hourly maps  
From 01-Feb-2012 00:00:02 to 01-Mar-2012 00:00:02



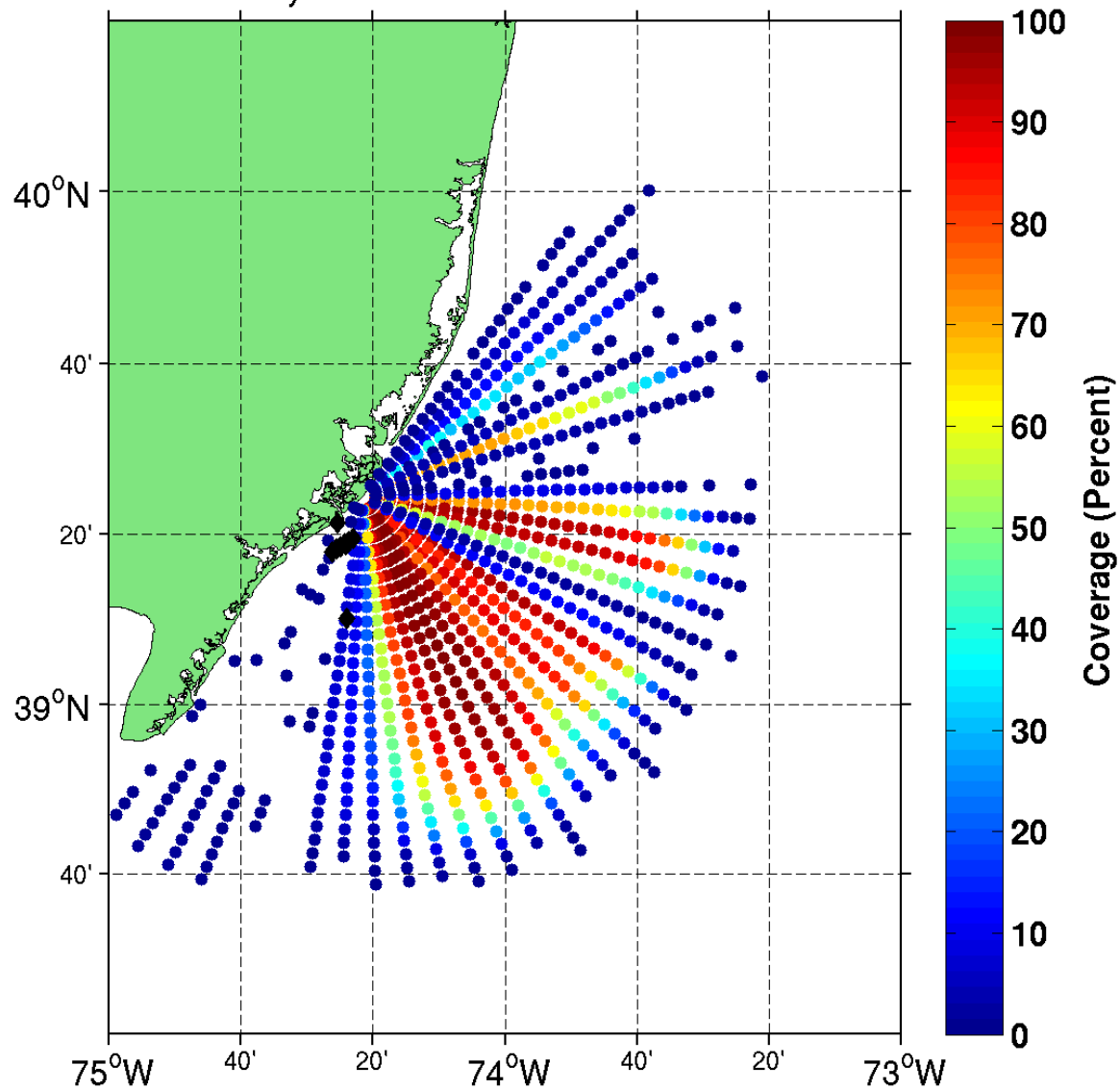
BRMR RDLm Coverage, 727 of 745 possible hourly maps  
From 01-Mar-2012 00:00:02 to 01-Apr-2012 00:00:02



BRMR RDLm Coverage, 715 of 721 possible hourly maps  
From 01-Apr-2012 00:00:02 to 01-May-2012 00:00:02

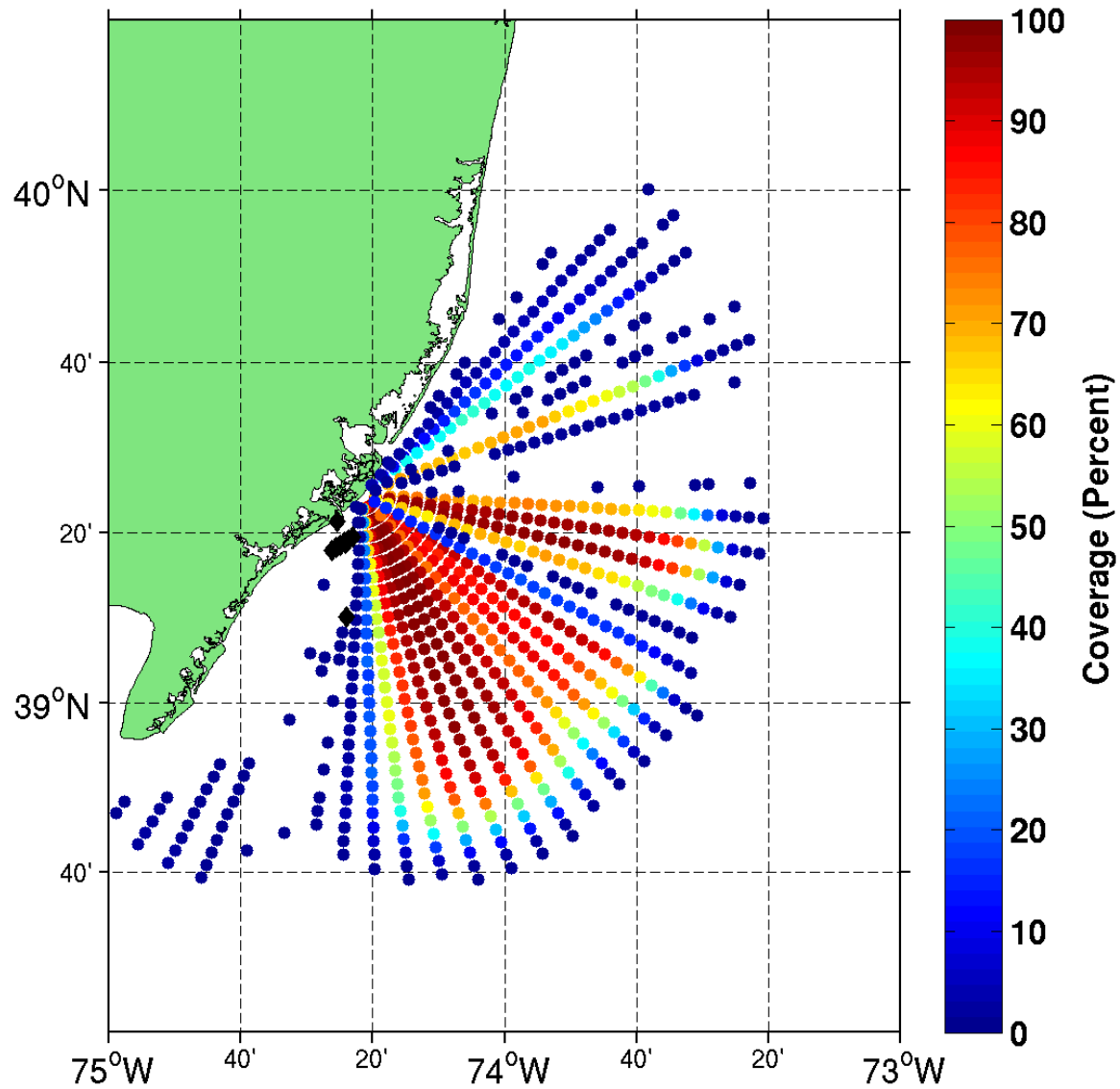


BRMR RDLm Coverage, 721 of 745 possible hourly maps  
From 01-May-2012 00:00:02 to 01-Jun-2012 00:00:02

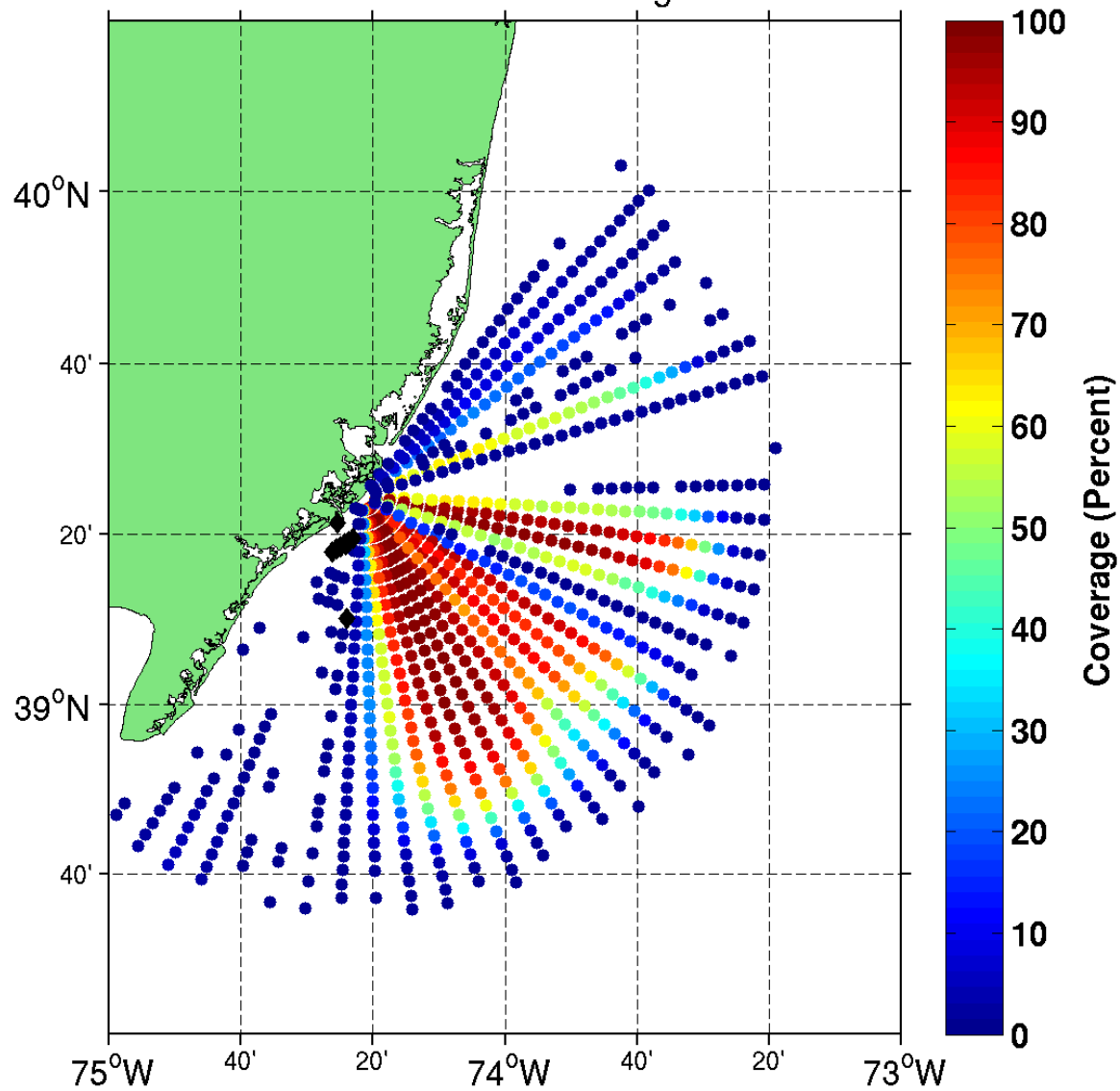


BRMR RDLm Coverage, 702 of 721 possible hourly maps

From 01-Jun-2012 00:00:02 to 01-Jul-2012 00:00:02

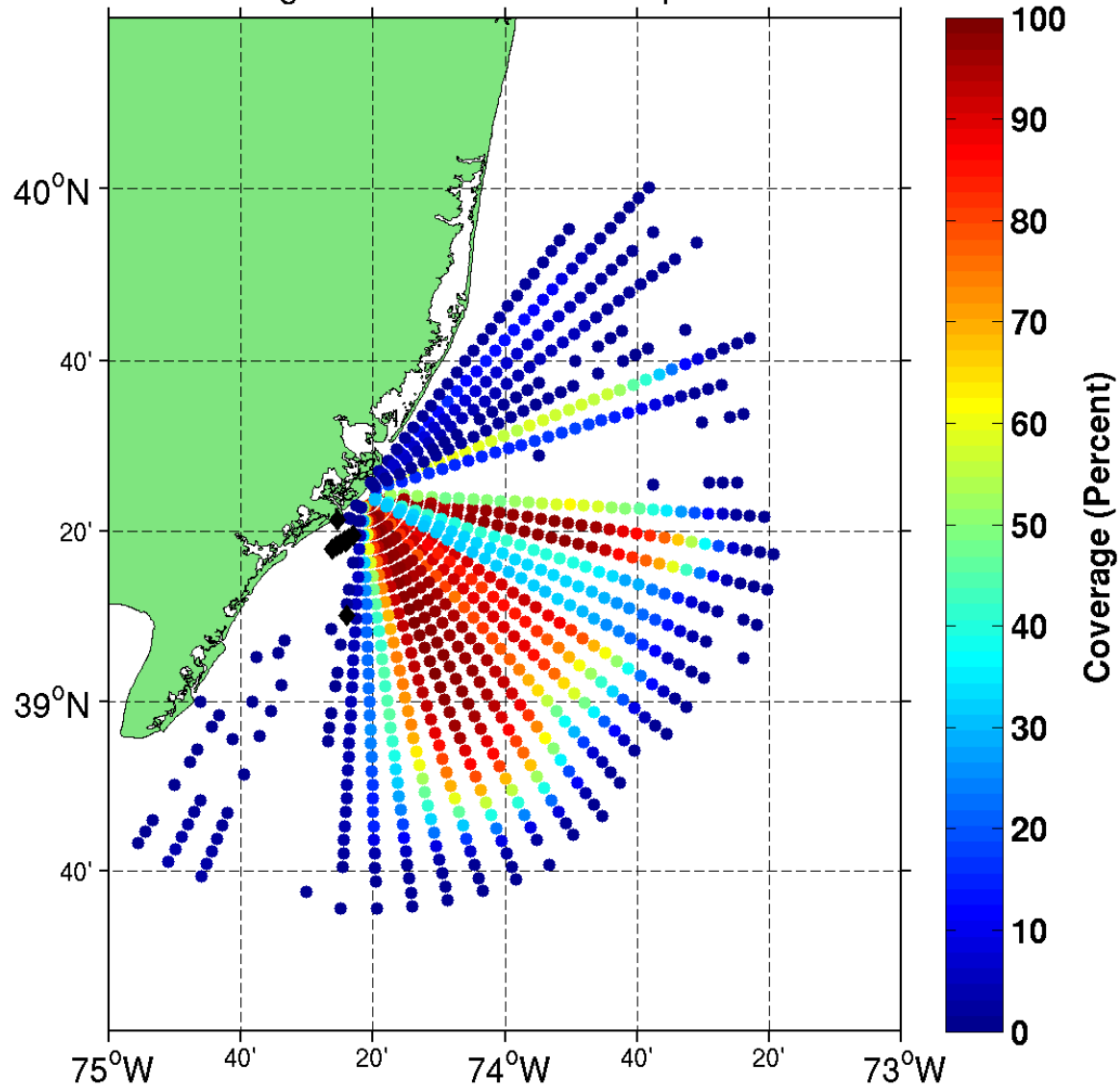


BRMR RDLm Coverage, 677 of 745 possible hourly maps  
From 01-Jul-2012 00:00:02 to 01-Aug-2012 00:00:02

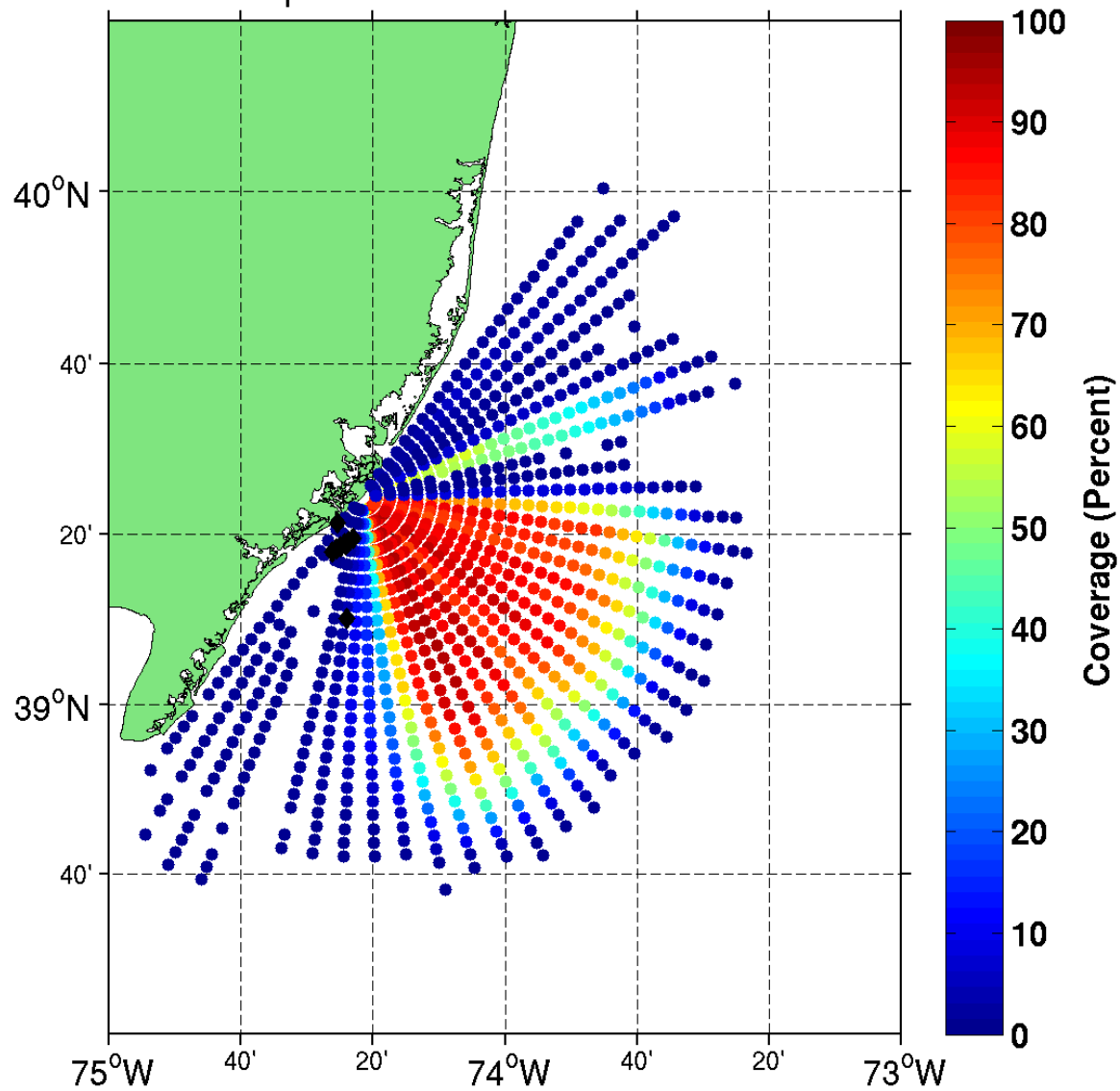




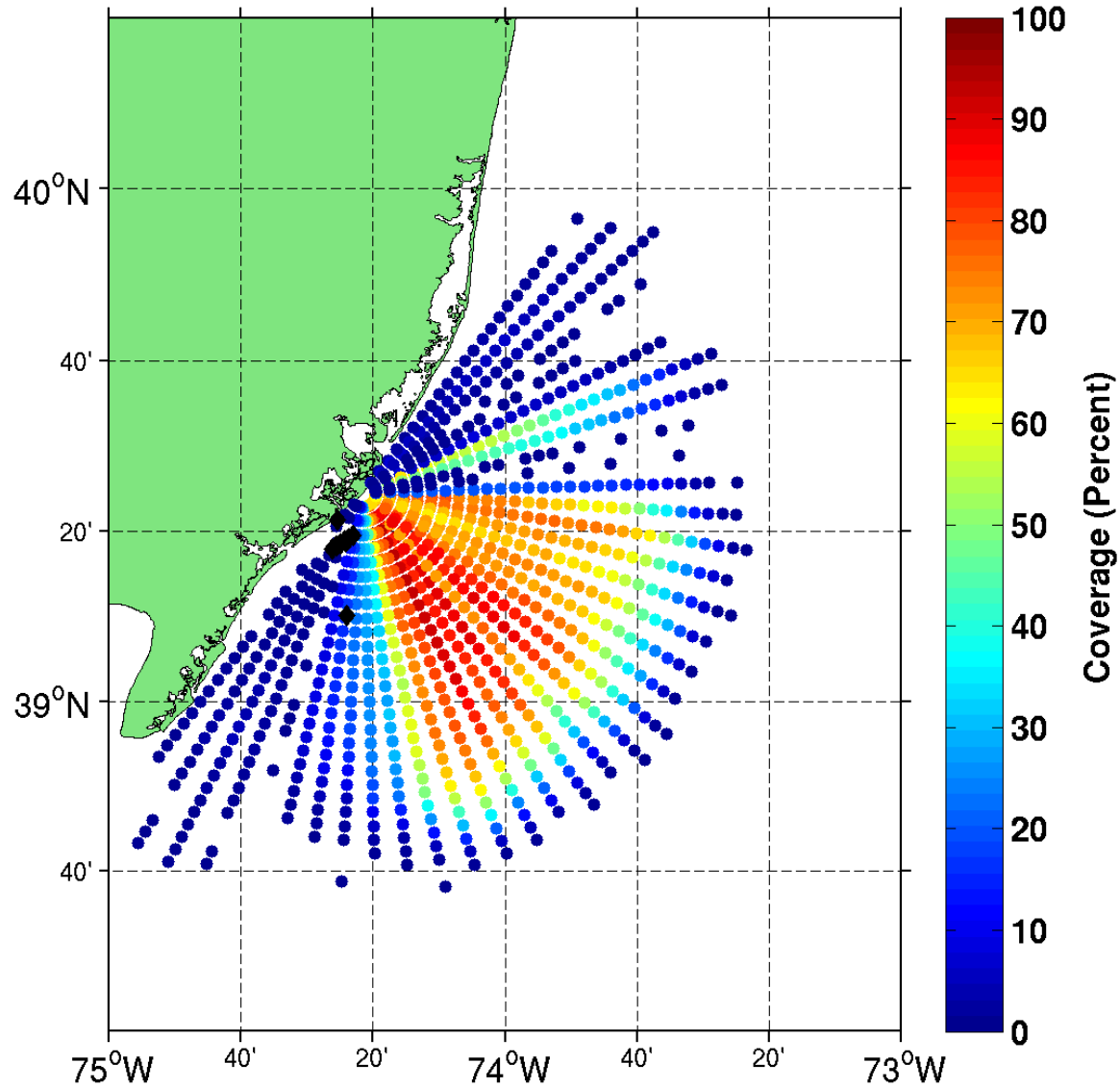
BRMR RDLm Coverage, 741 of 745 possible hourly maps  
From 01-Aug-2012 00:00:02 to 01-Sep-2012 00:00:02



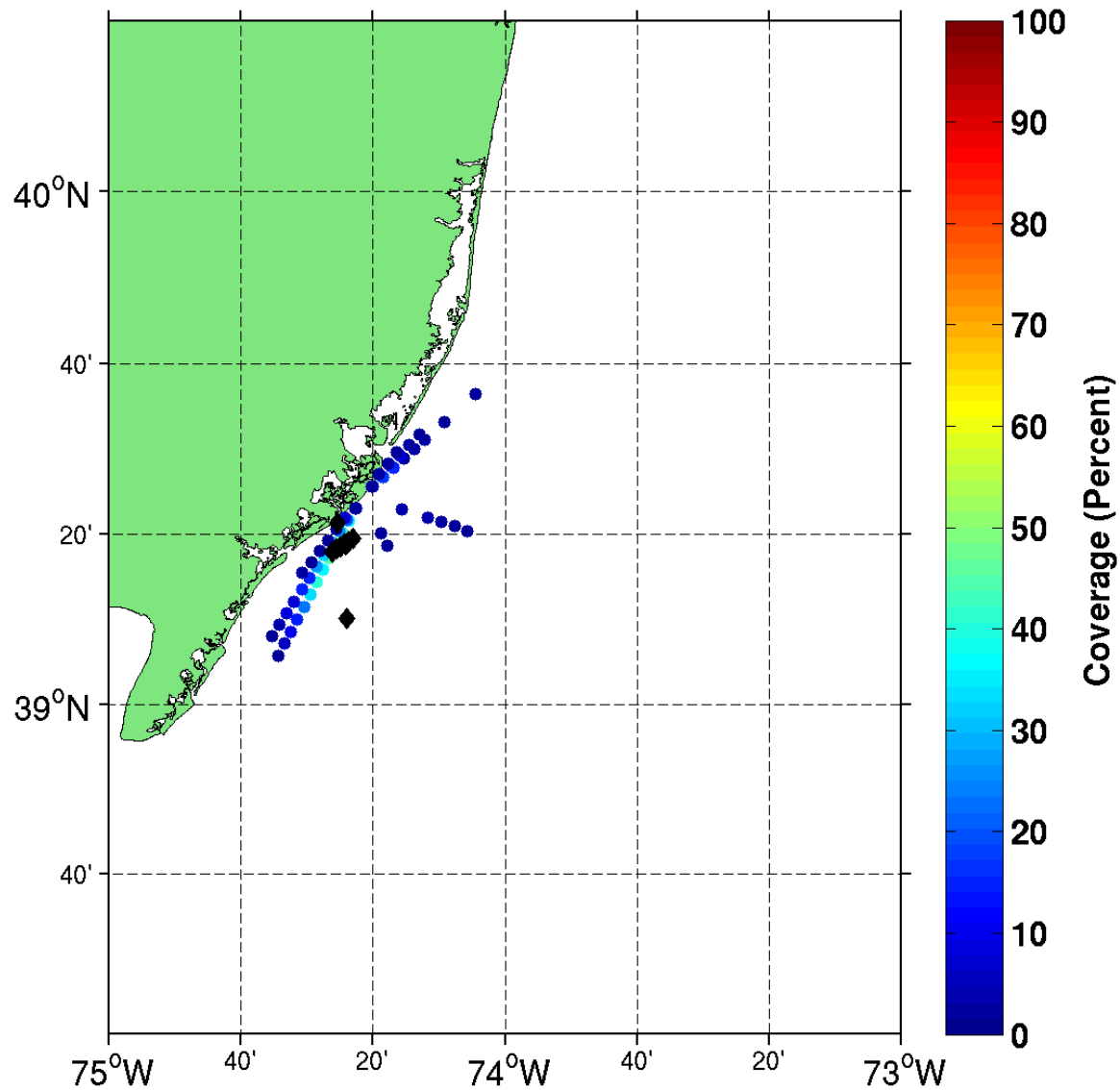
BRMR RDLm Coverage, 721 of 721 possible hourly maps  
From 01-Sep-2012 00:00:02 to 01-Oct-2012 00:00:02



BRMR RDLm Coverage, 691 of 745 possible hourly maps  
From 01-Oct-2012 00:00:02 to 01-Nov-2012 00:00:02

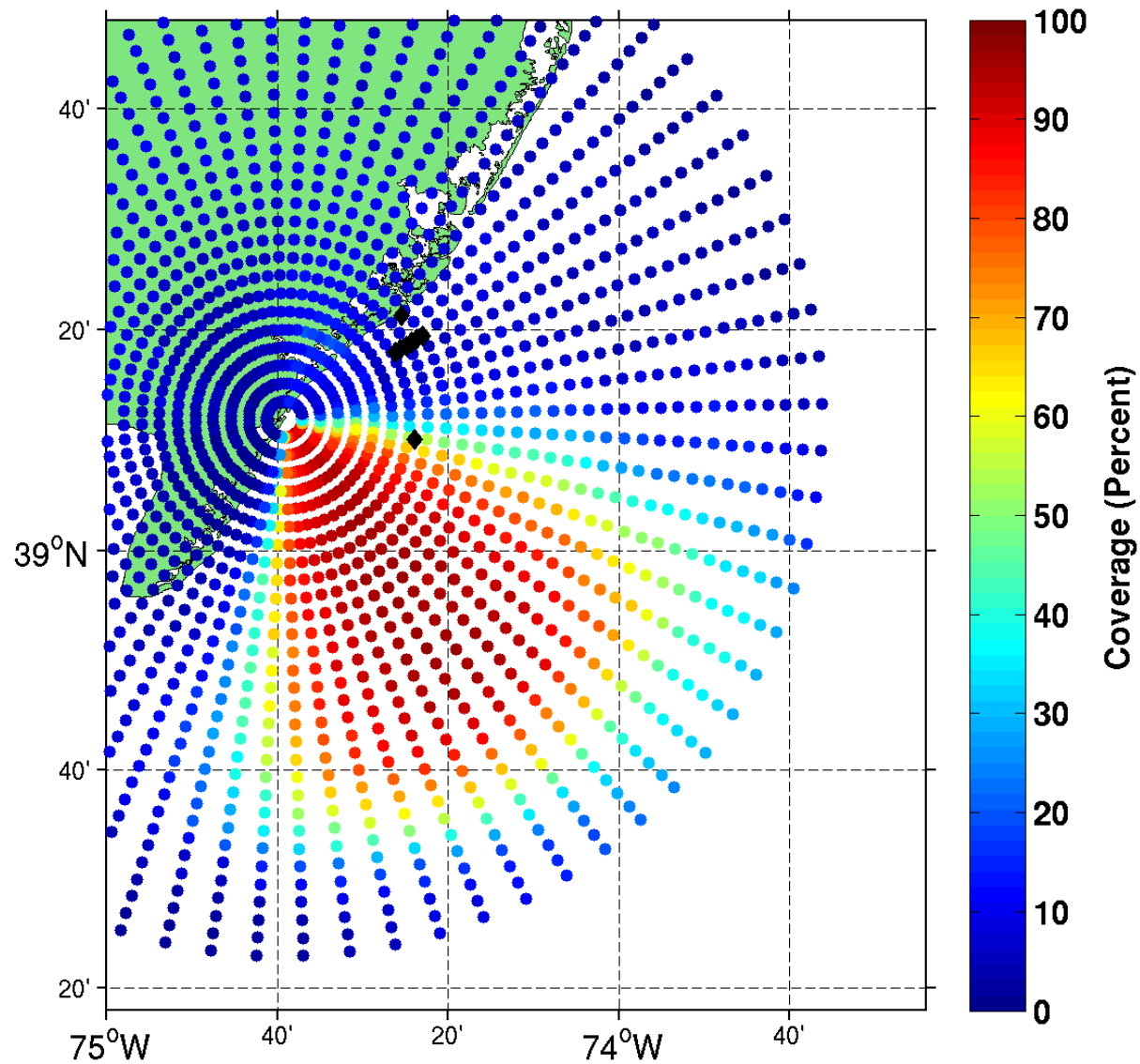


BRMR RDLm Coverage, 109 of 721 possible hourly maps  
From 01-Nov-2012 00:00:02 to 01-Dec-2012 00:00:02

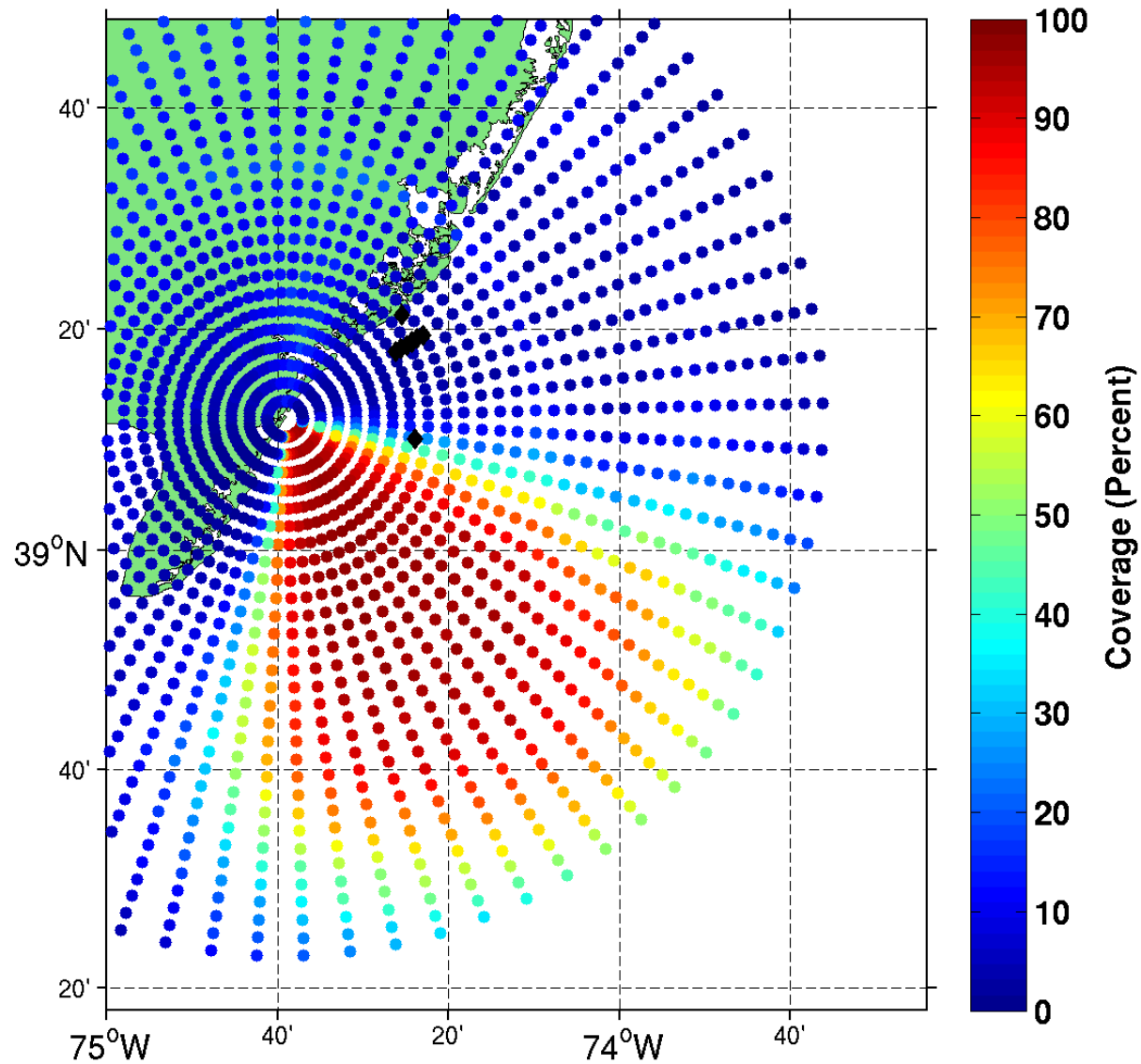


# **STRATHMERE IDEAL RADIALS**

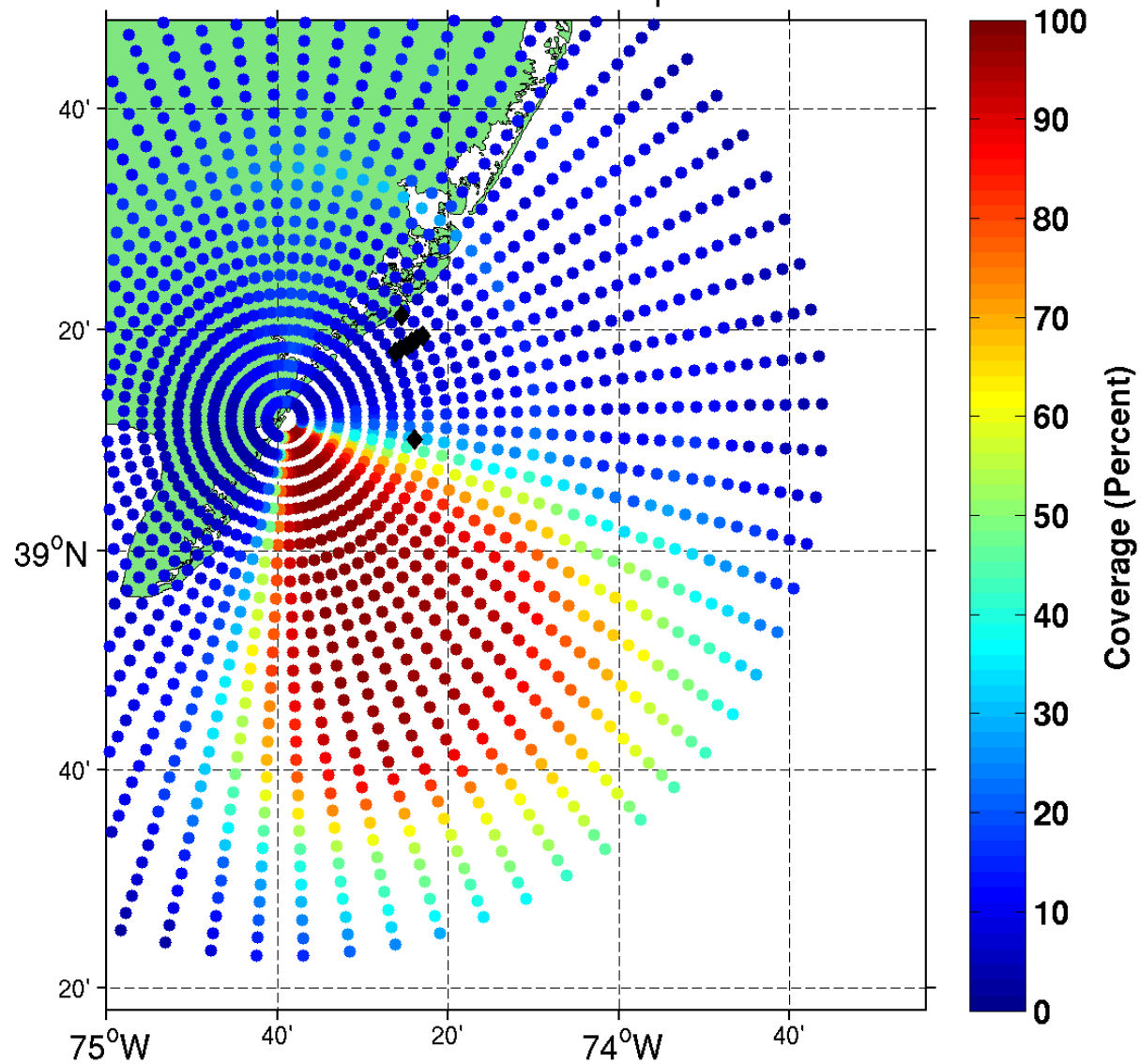
RATH RDLi Coverage, 434 of 745 possible hourly maps  
From 01-Jan-2012 00:00:02 to 01-Feb-2012 00:00:02



RATH RDLi Coverage, 581 of 697 possible hourly maps  
From 01-Feb-2012 00:00:02 to 01-Mar-2012 00:00:02

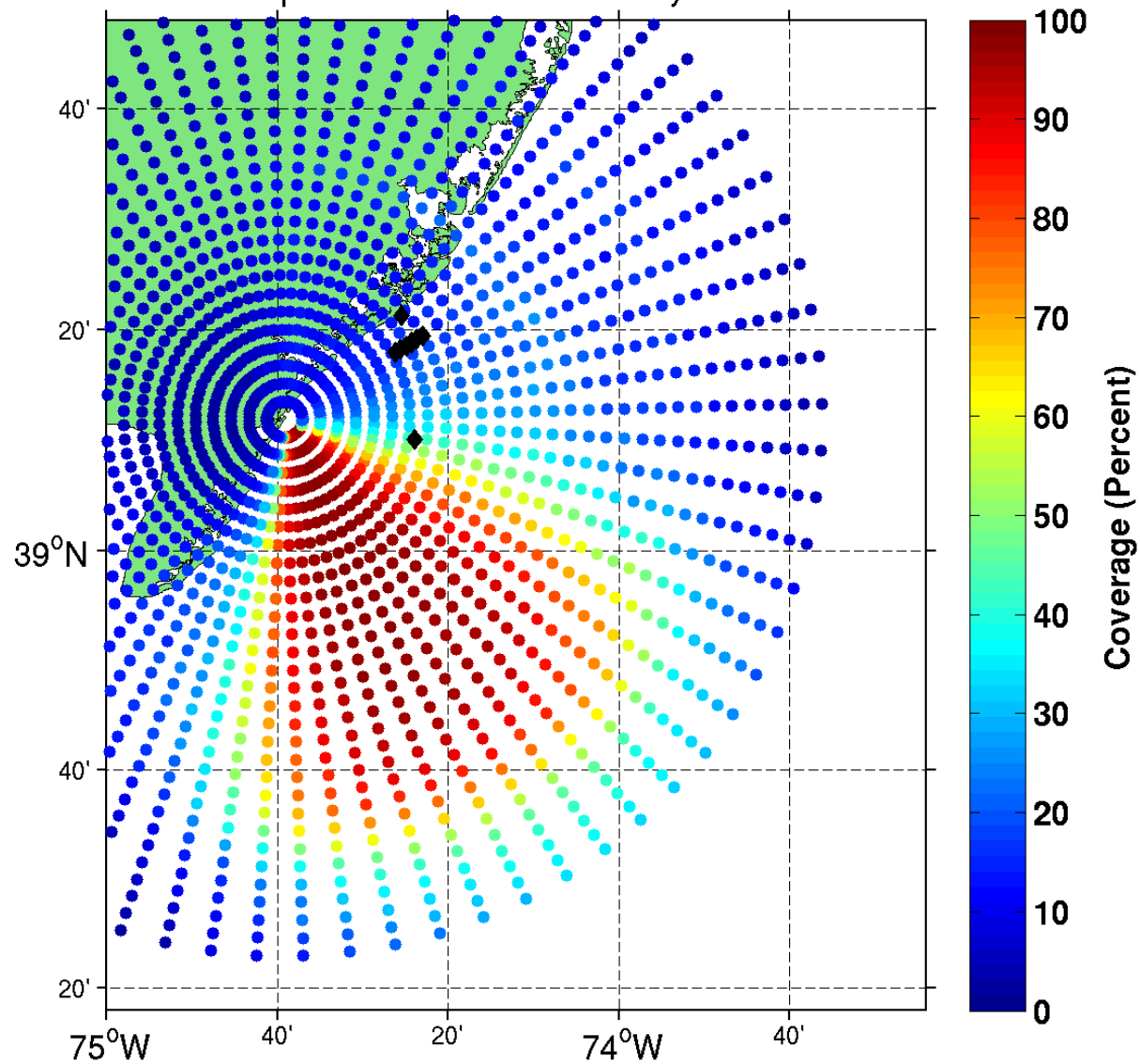


RATH RDLi Coverage, 682 of 745 possible hourly maps  
From 01-Mar-2012 00:00:02 to 01-Apr-2012 00:00:02

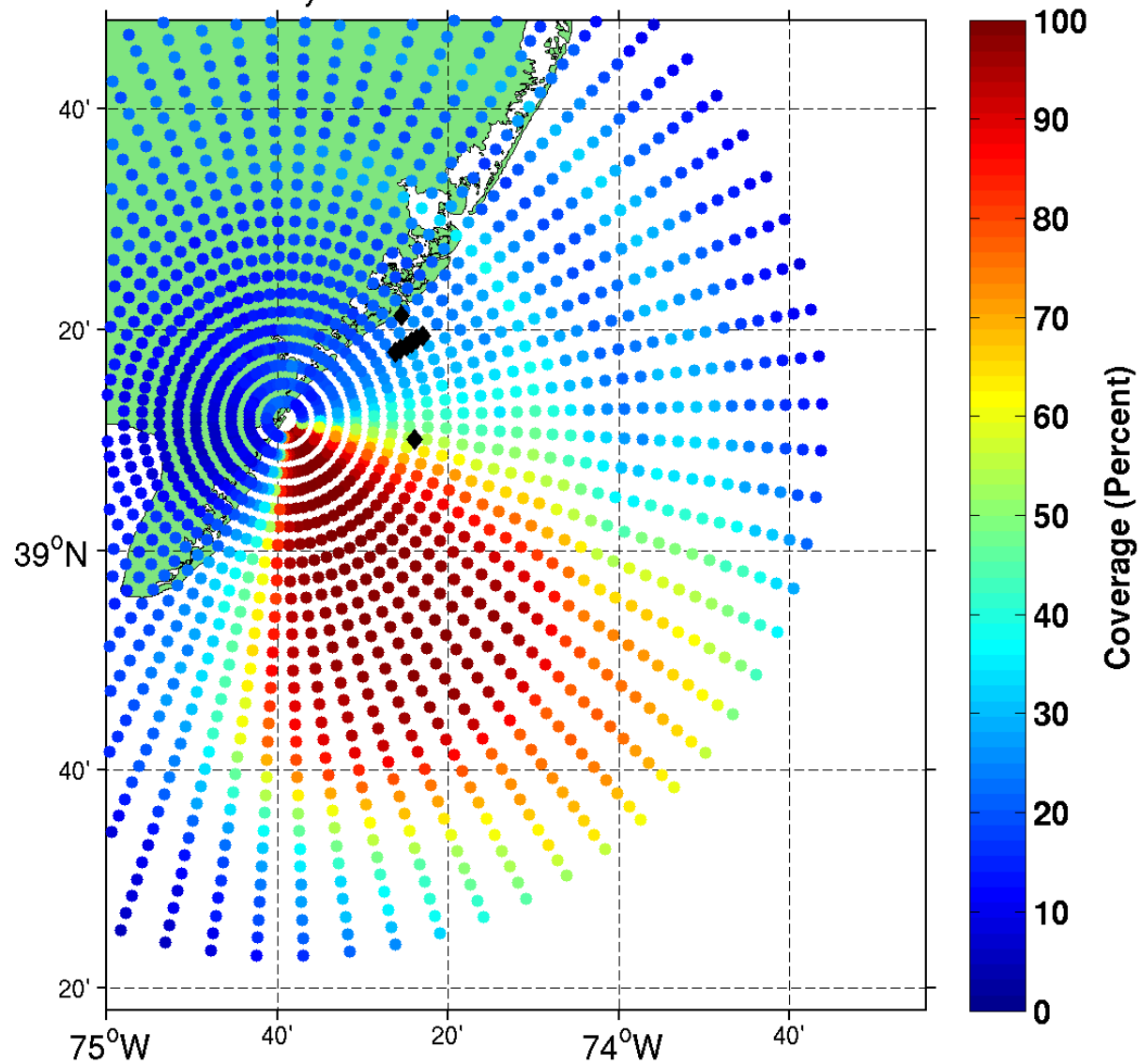




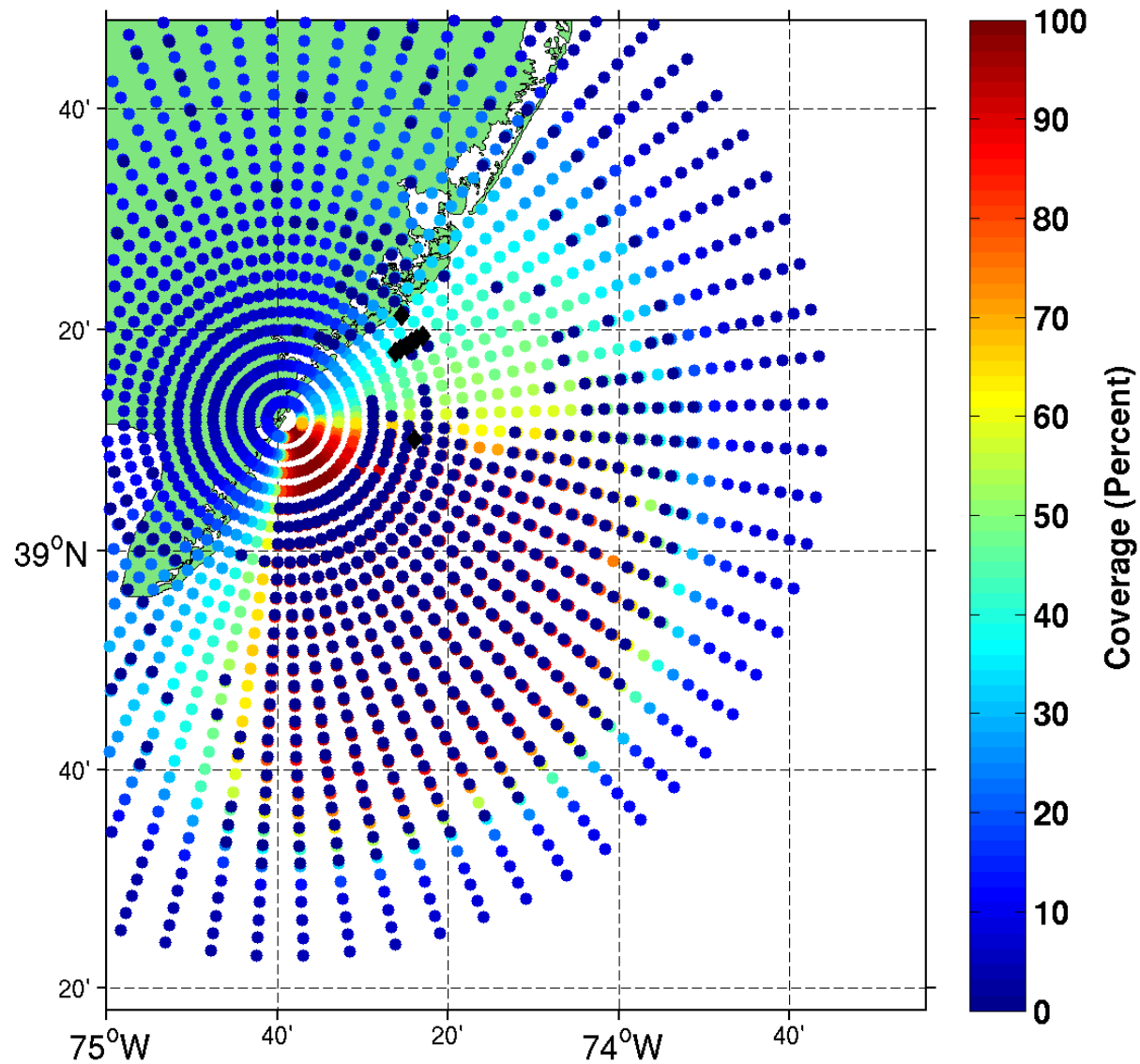
RATH RDLi Coverage, 655 of 721 possible hourly maps  
From 01-Apr-2012 00:00:02 to 01-May-2012 00:00:02



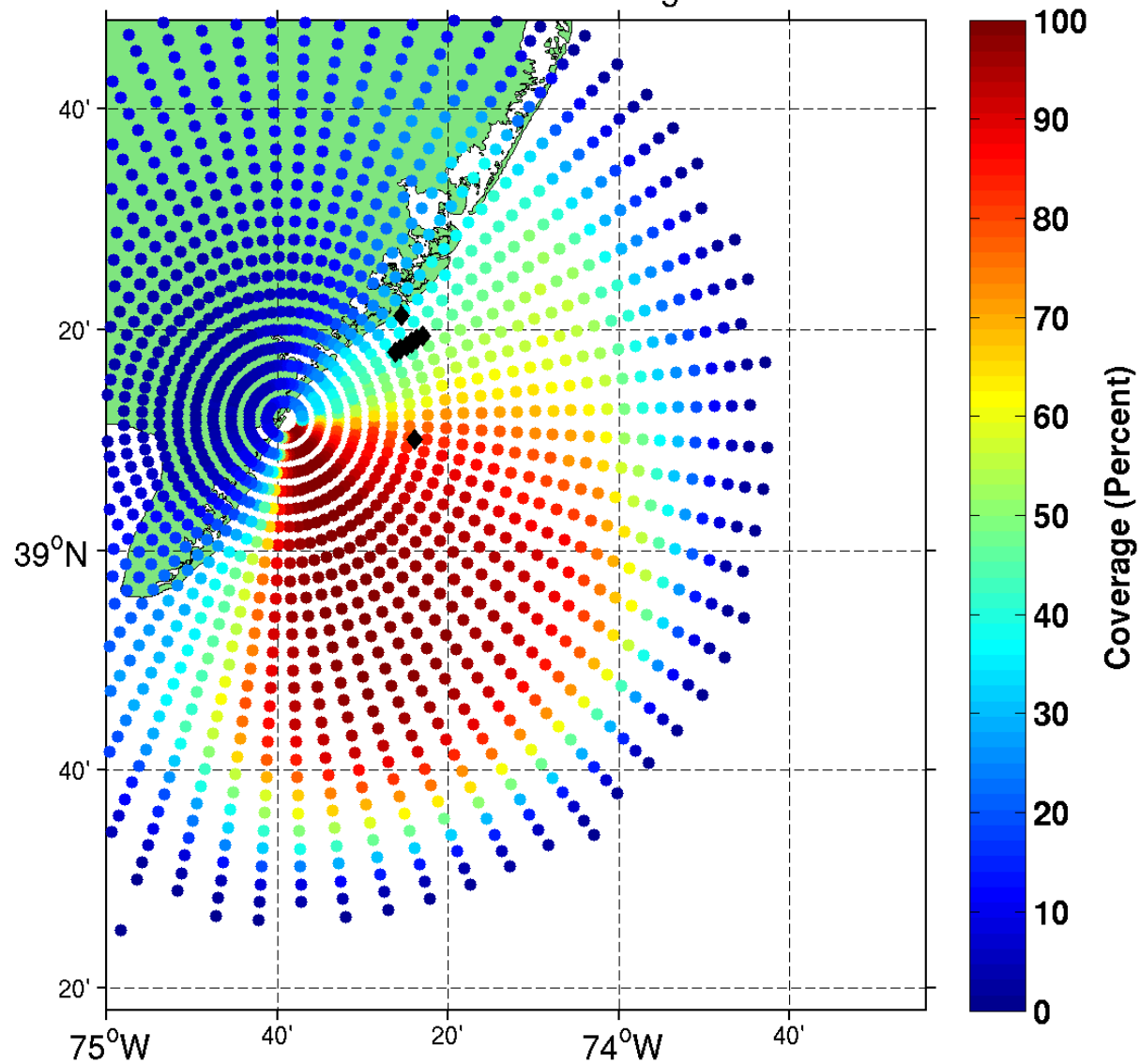
RATH RDLi Coverage, 732 of 745 possible hourly maps  
From 01-May-2012 00:00:02 to 01-Jun-2012 00:00:02



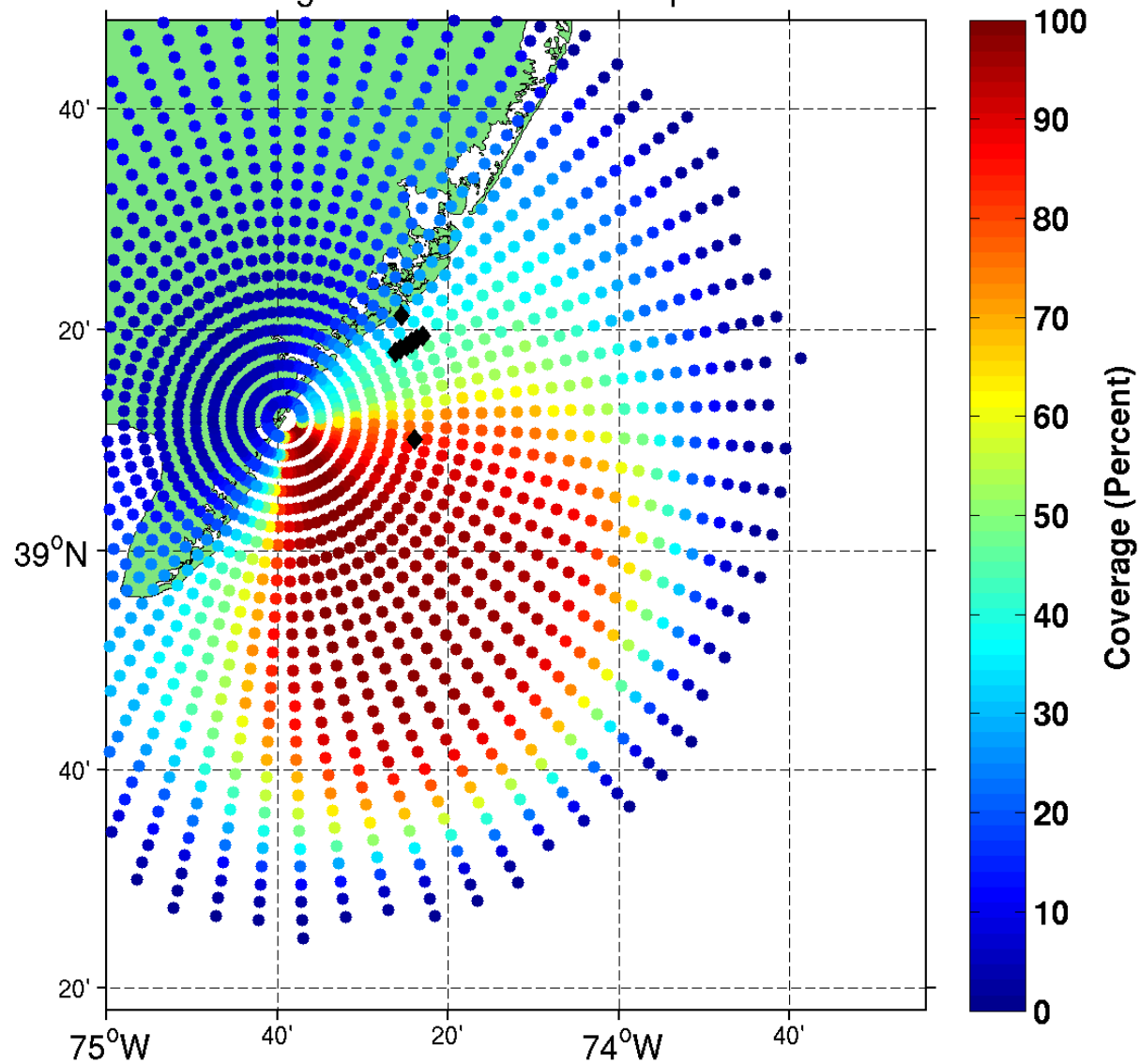
RATH RDLi Coverage, 721 of 721 possible hourly maps  
From 01-Jun-2012 00:00:02 to 01-Jul-2012 00:00:02



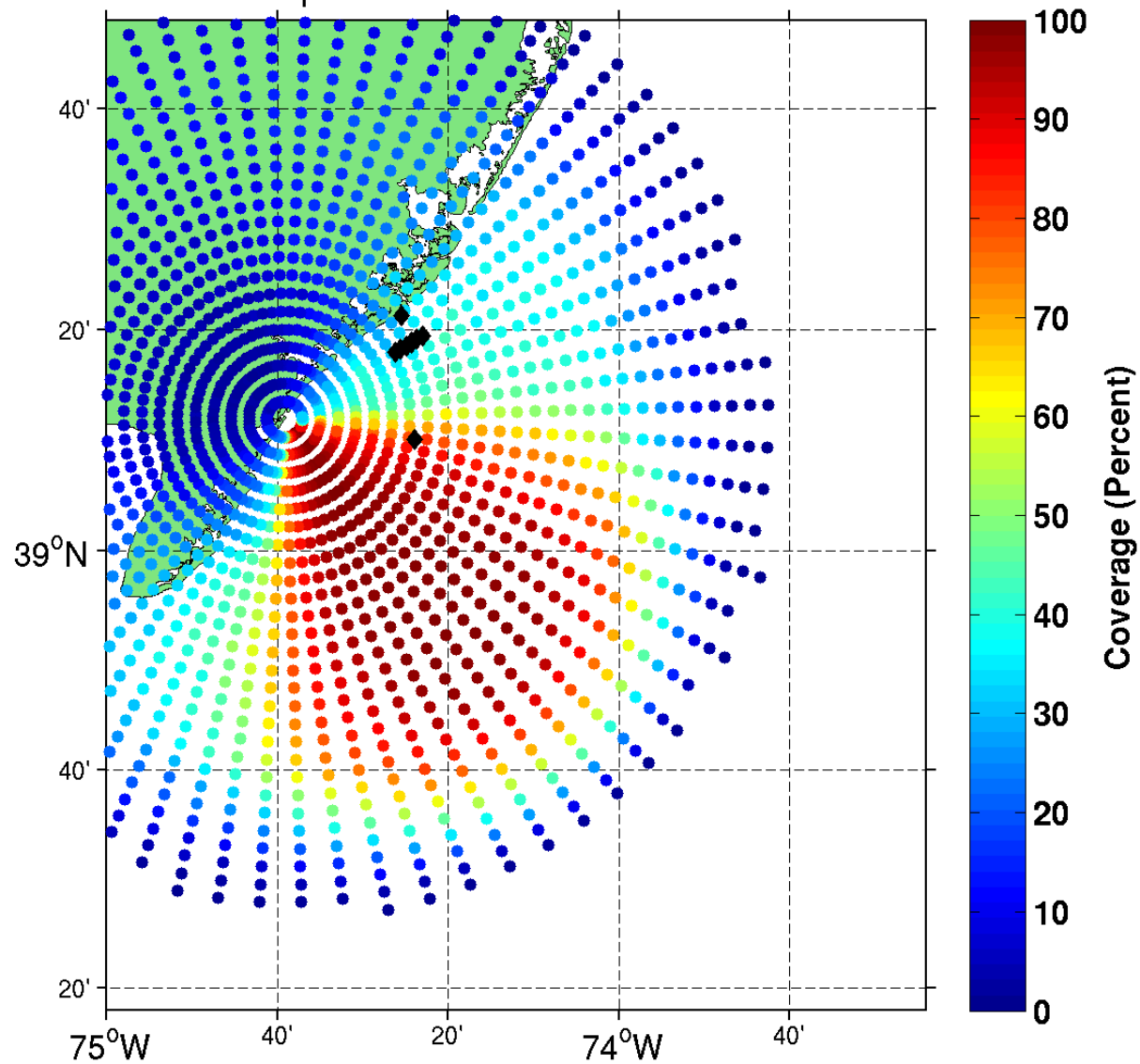
RATH RDLi Coverage, 745 of 745 possible hourly maps  
From 01-Jul-2012 00:00:02 to 01-Aug-2012 00:00:02



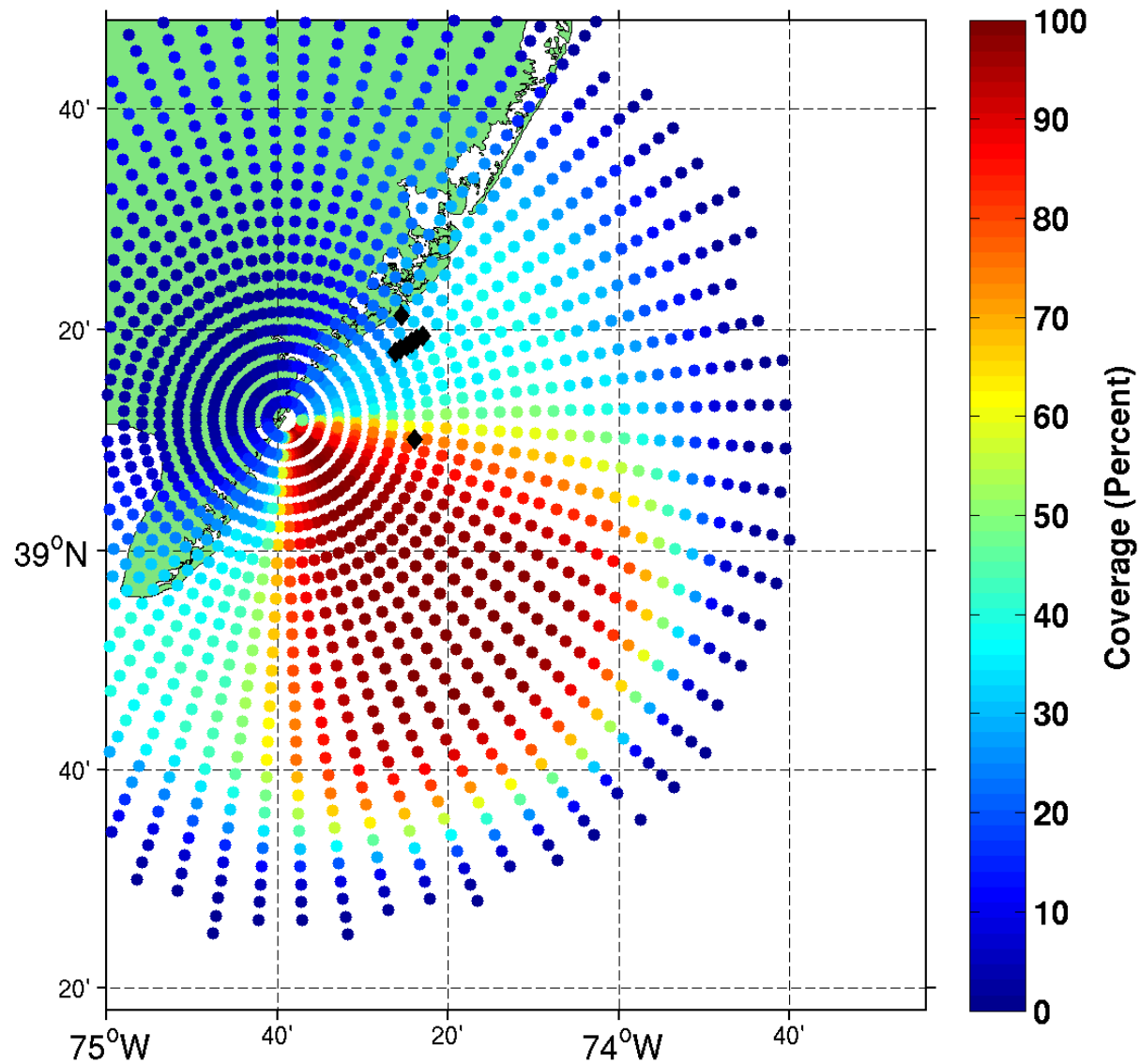
RATH RDLi Coverage, 745 of 745 possible hourly maps  
From 01-Aug-2012 00:00:02 to 01-Sep-2012 00:00:02



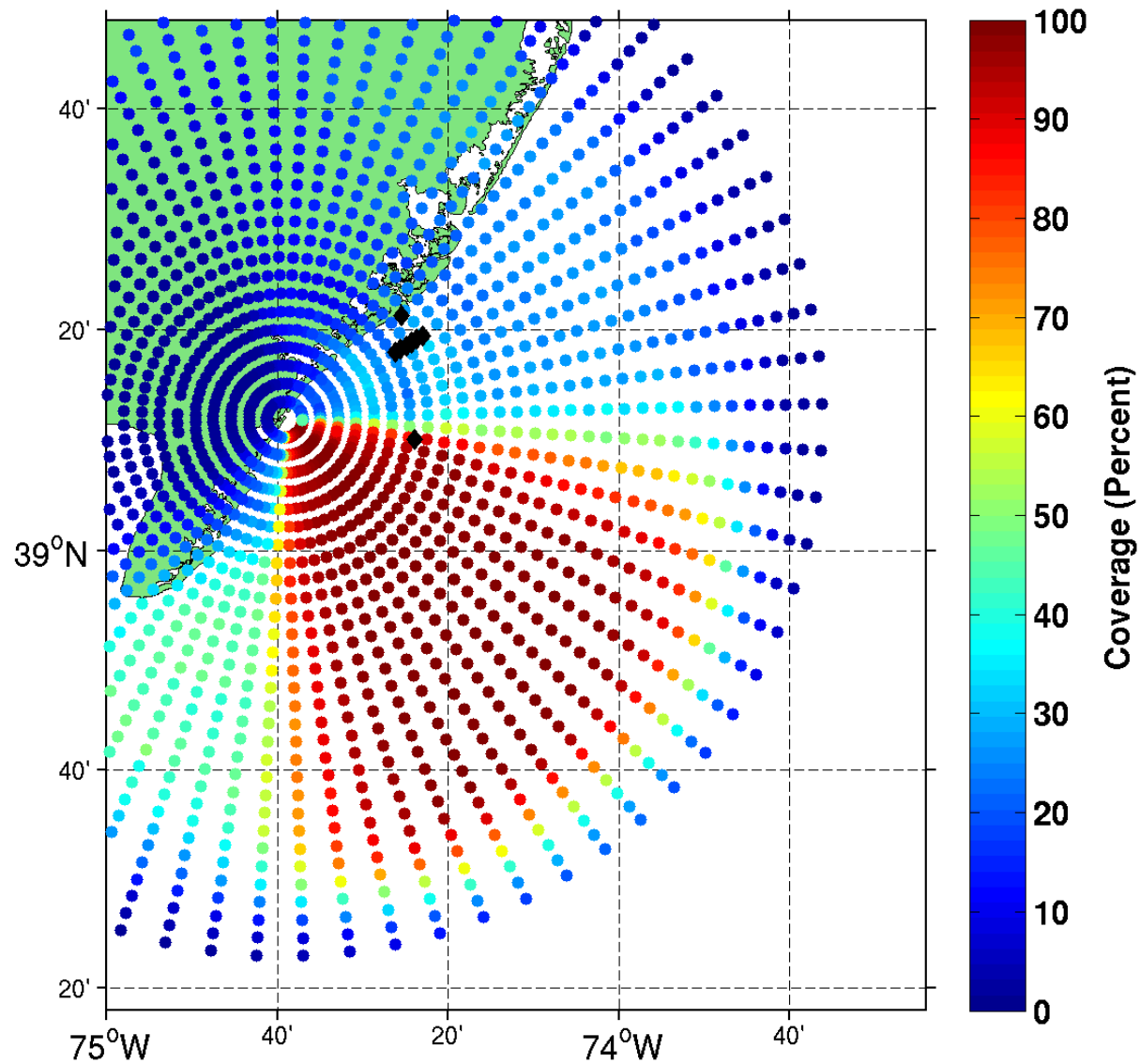
RATH RDLi Coverage, 721 of 721 possible hourly maps  
From 01-Sep-2012 00:00:02 to 01-Oct-2012 00:00:02



RATH RDLi Coverage, 745 of 745 possible hourly maps  
From 01-Oct-2012 00:00:02 to 01-Nov-2012 00:00:02

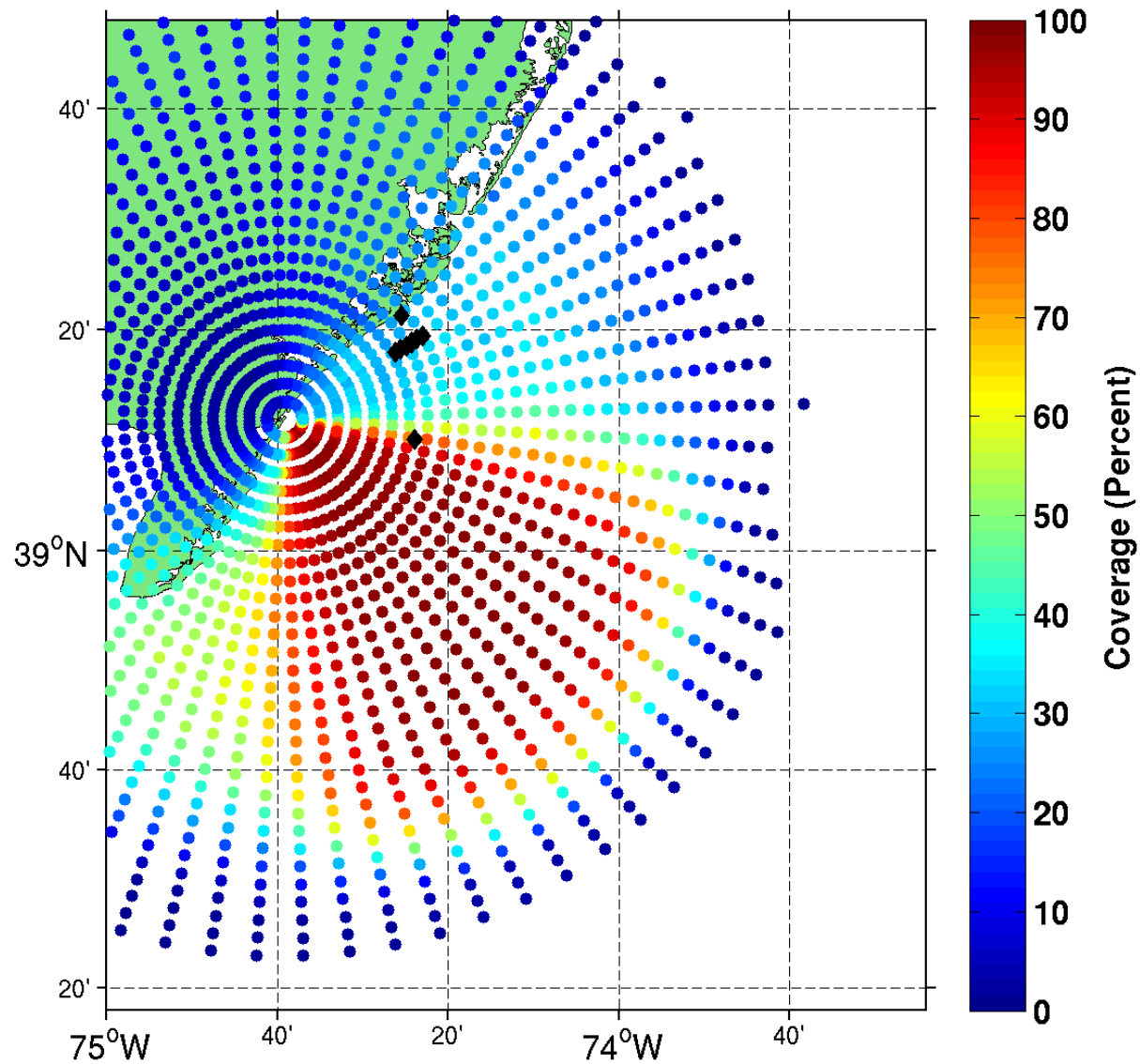


RATH RDLi Coverage, 721 of 721 possible hourly maps  
From 01-Nov-2012 00:00:02 to 01-Dec-2012 00:00:02



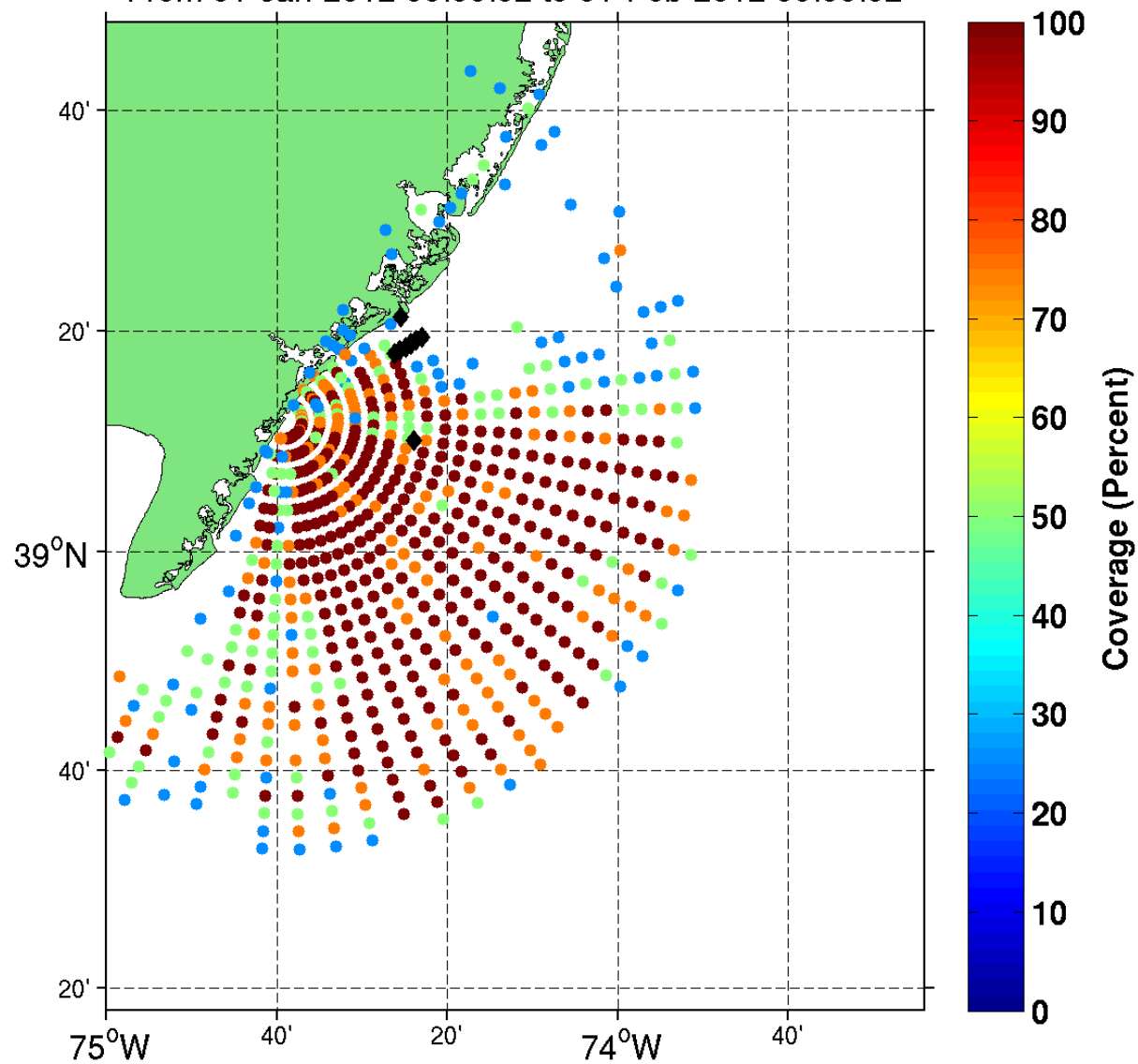


RATH RDLi Coverage, 739 of 745 possible hourly maps  
From 01-Dec-2012 00:00:02 to 01-Jan-2013 00:00:02

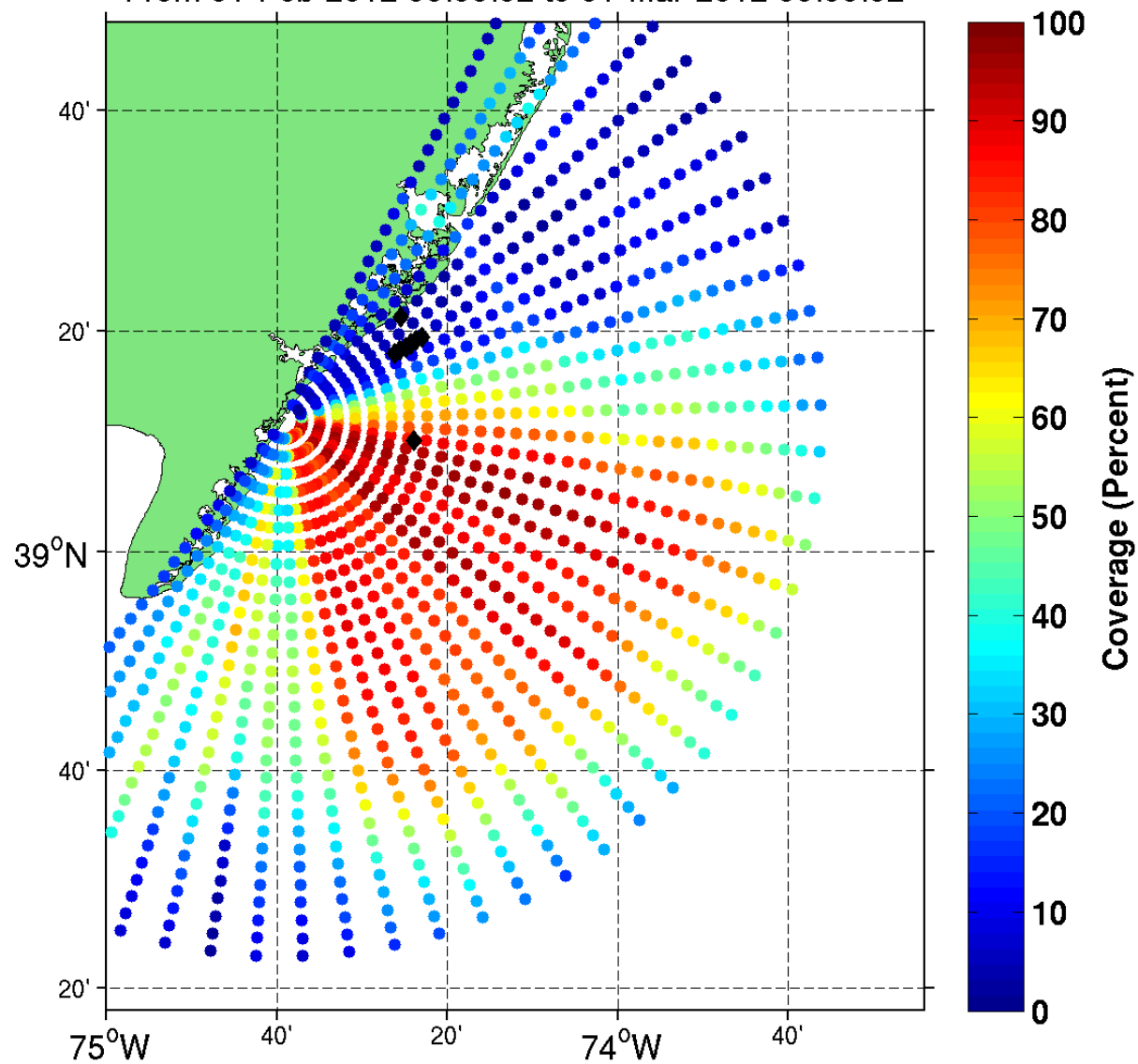


# **STRATHMERE MEASURED RADIALS**

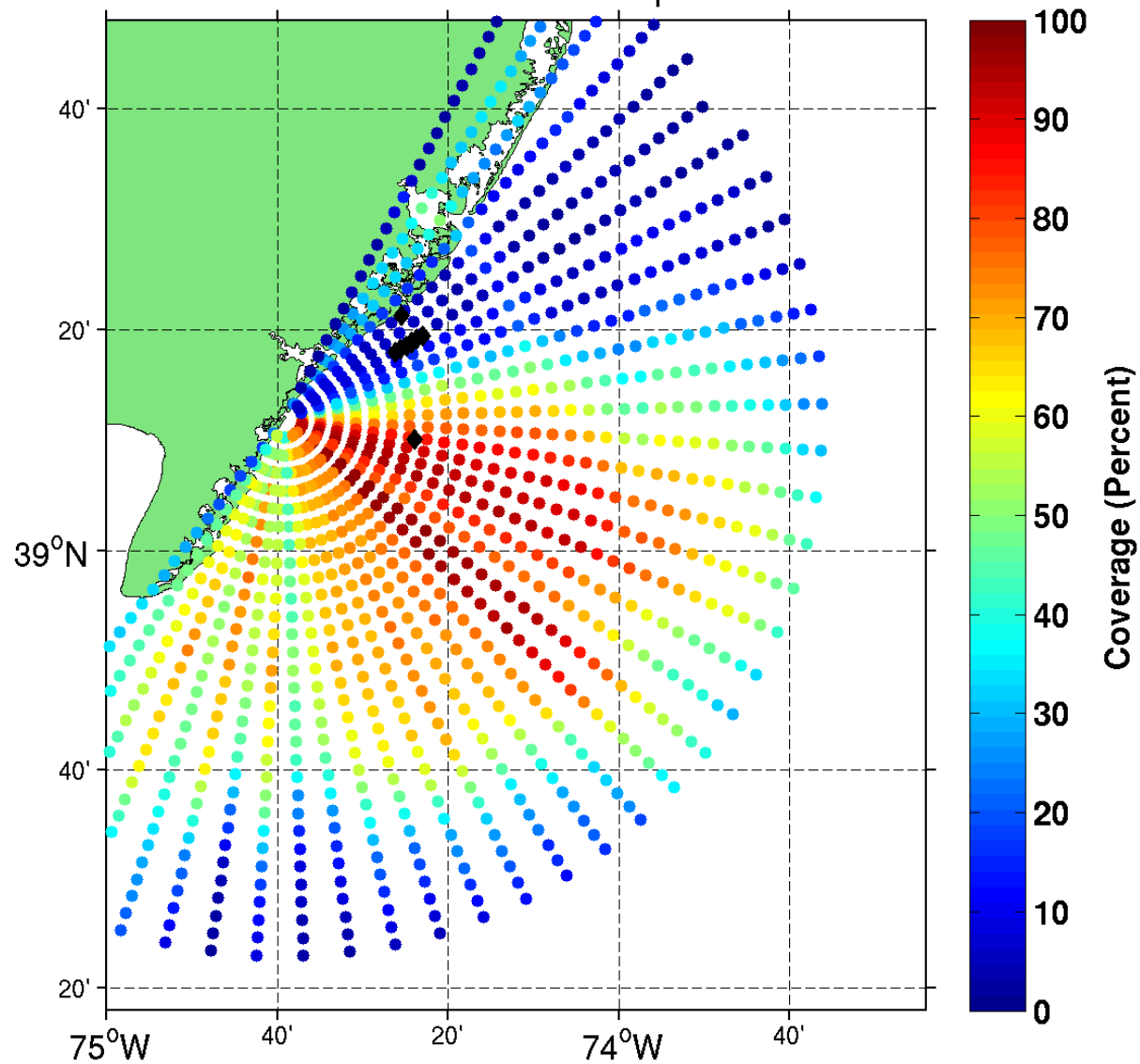
RATH RDLm Coverage, 4 of 745 possible hourly maps  
From 01-Jan-2012 00:00:02 to 01-Feb-2012 00:00:02



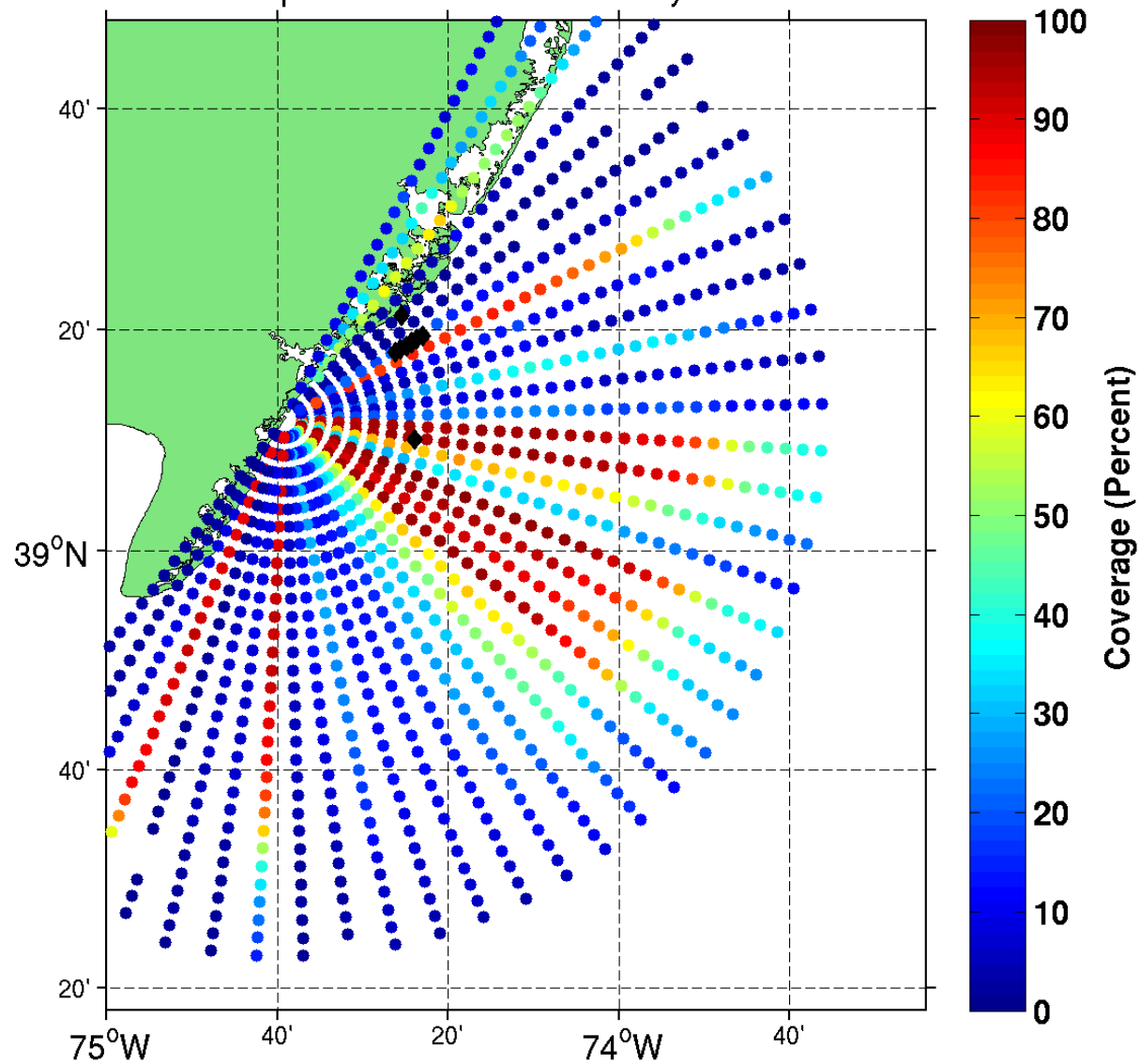
RATH RDLm Coverage, 581 of 697 possible hourly maps  
From 01-Feb-2012 00:00:02 to 01-Mar-2012 00:00:02



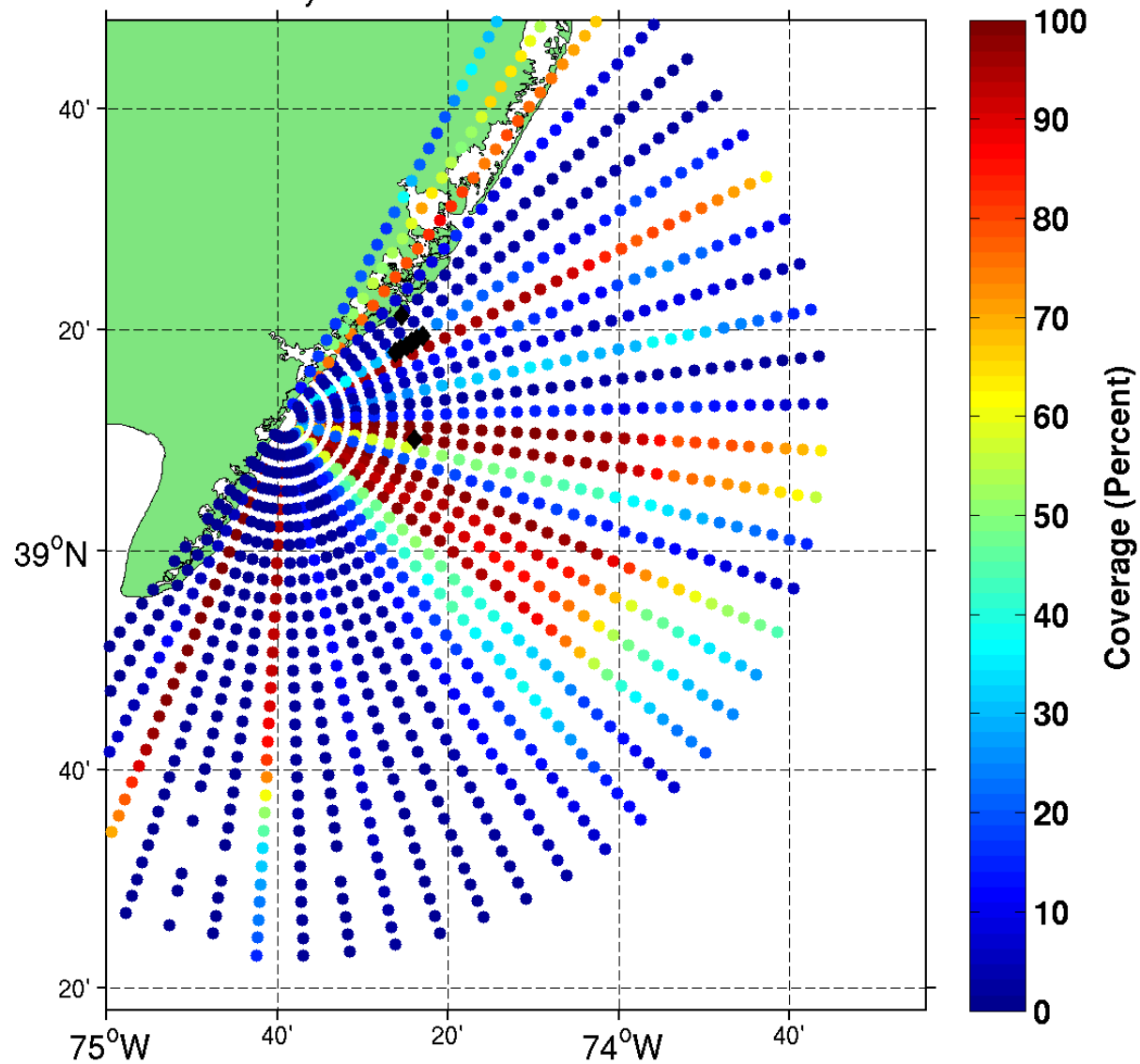
RATH RDLm Coverage, 682 of 745 possible hourly maps  
From 01-Mar-2012 00:00:02 to 01-Apr-2012 00:00:02



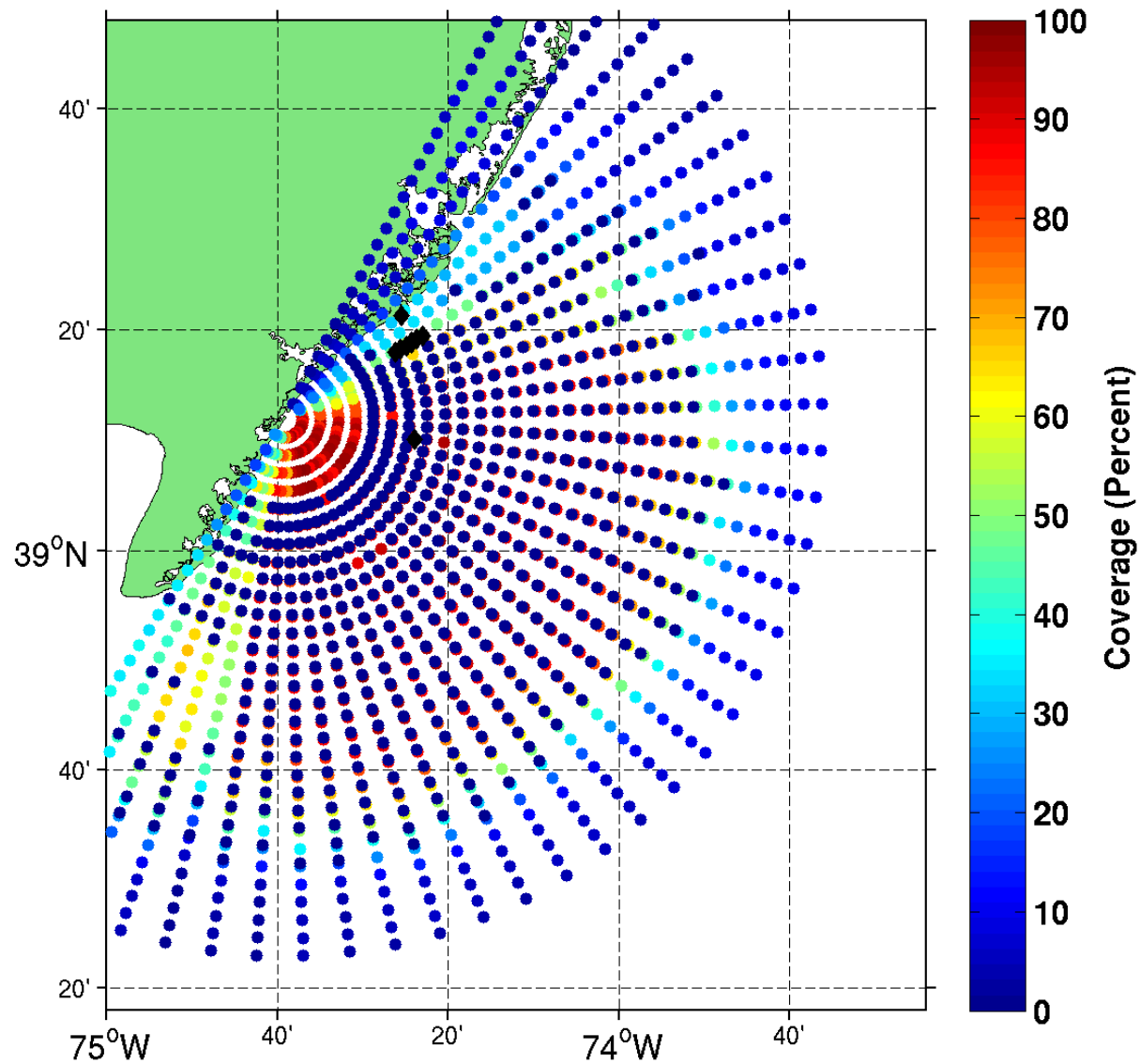
RATH RDLm Coverage, 655 of 721 possible hourly maps  
From 01-Apr-2012 00:00:02 to 01-May-2012 00:00:02



RATH RDLm Coverage, 732 of 745 possible hourly maps  
From 01-May-2012 00:00:02 to 01-Jun-2012 00:00:02

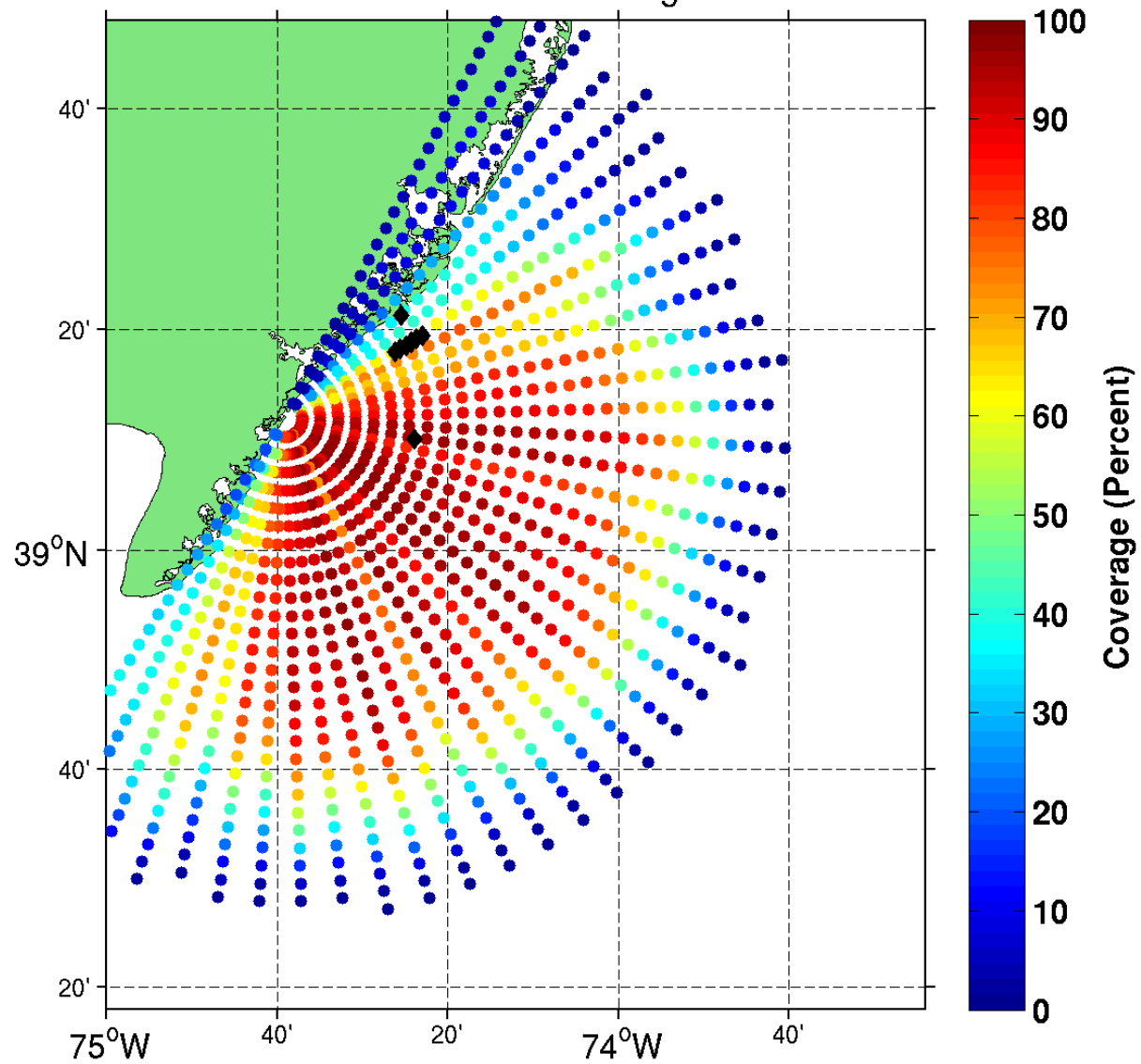


RATH RDLm Coverage, 721 of 721 possible hourly maps  
From 01-Jun-2012 00:00:02 to 01-Jul-2012 00:00:02

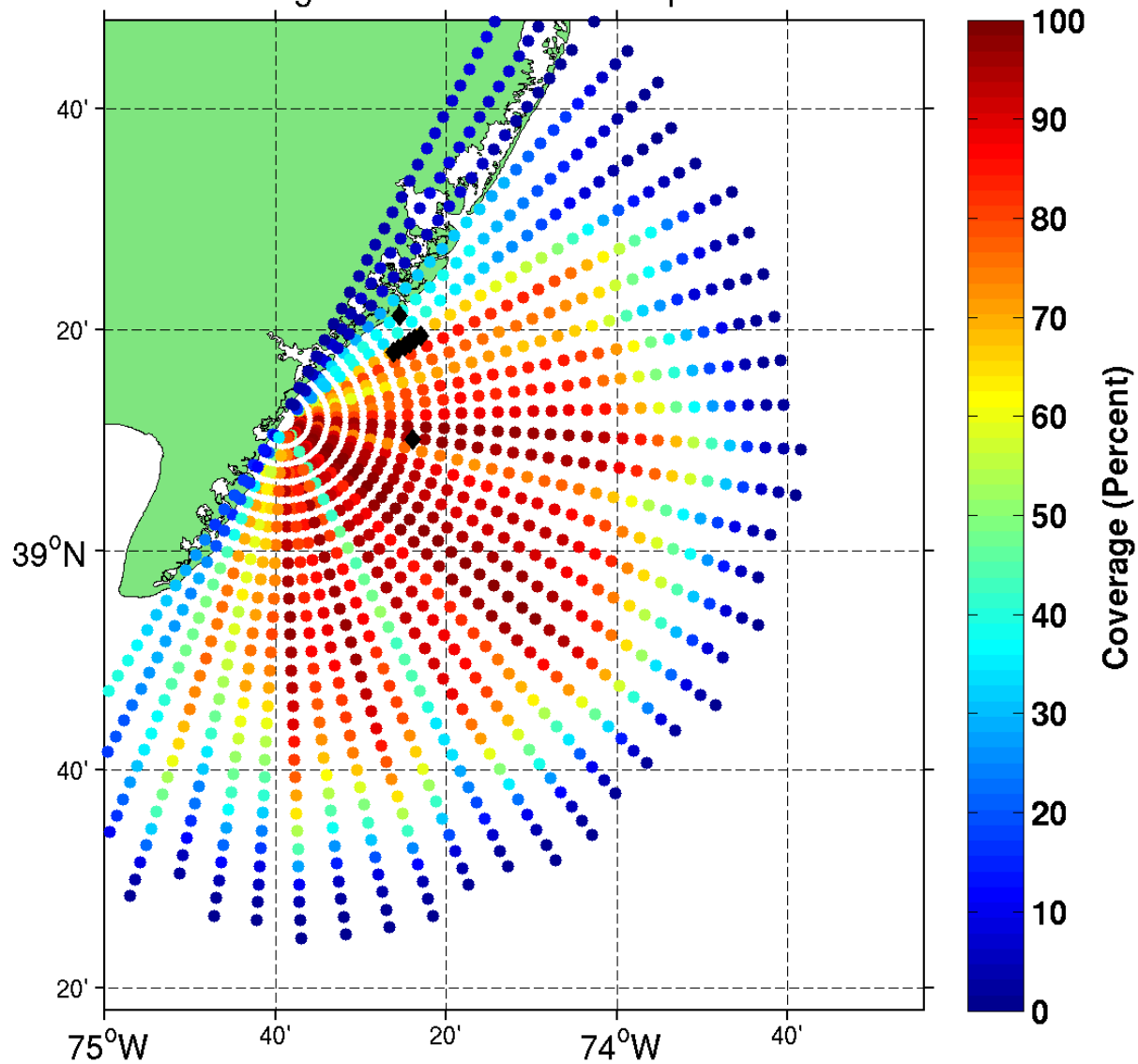




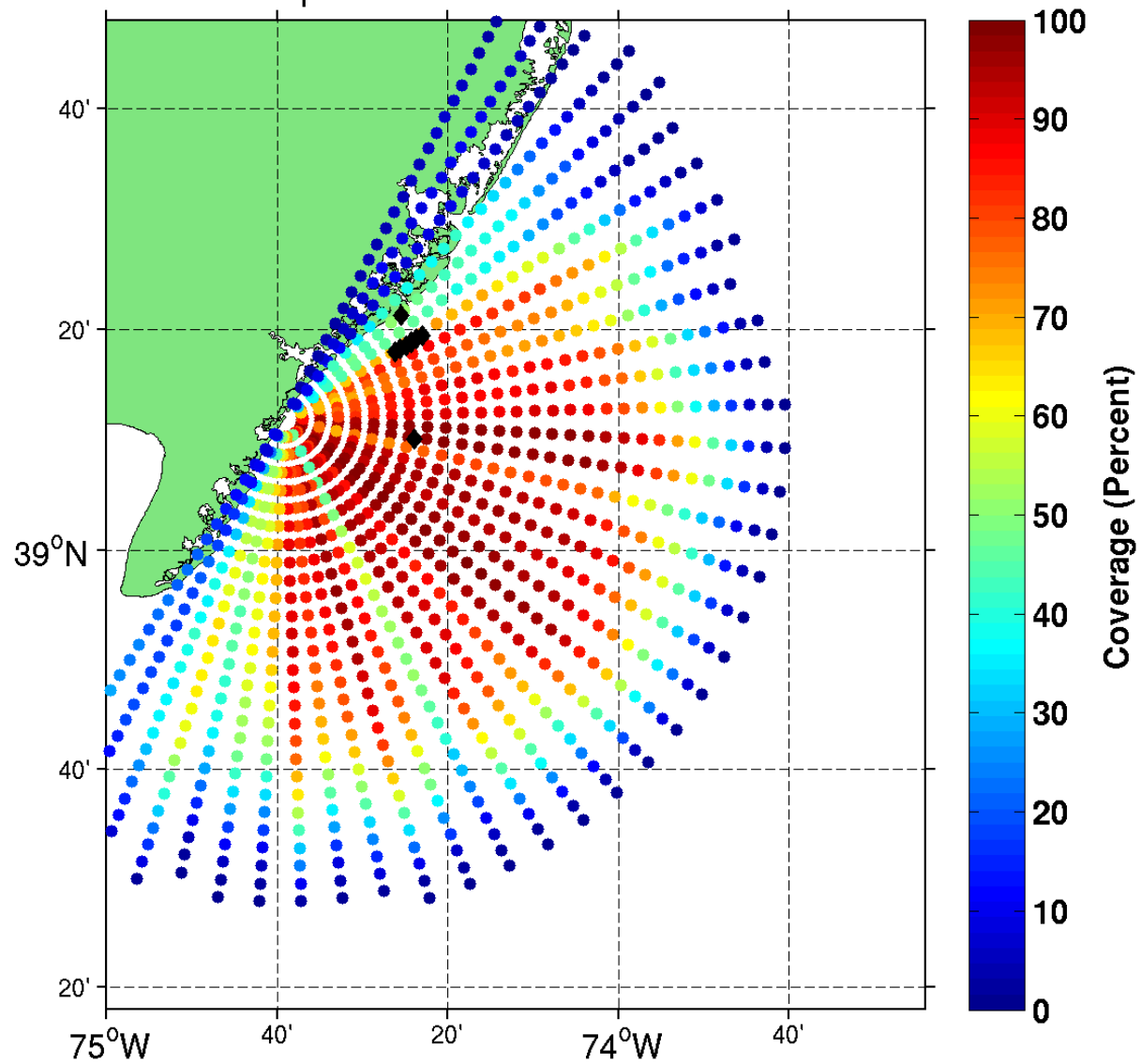
RATH RDLm Coverage, 745 of 745 possible hourly maps  
From 01-Jul-2012 00:00:02 to 01-Aug-2012 00:00:02



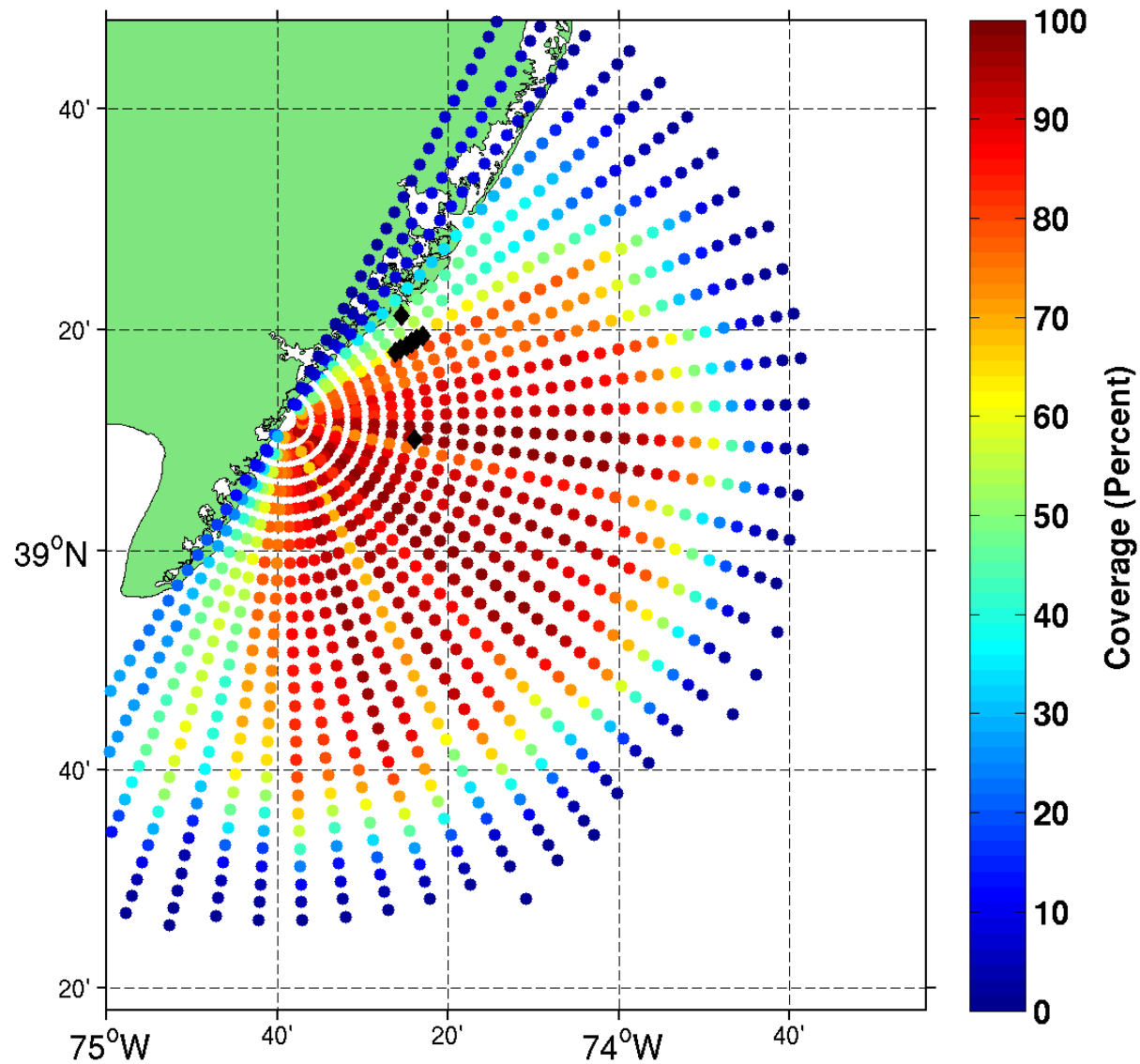
RATH RDLm Coverage, 745 of 745 possible hourly maps  
From 01-Aug-2012 00:00:02 to 01-Sep-2012 00:00:02



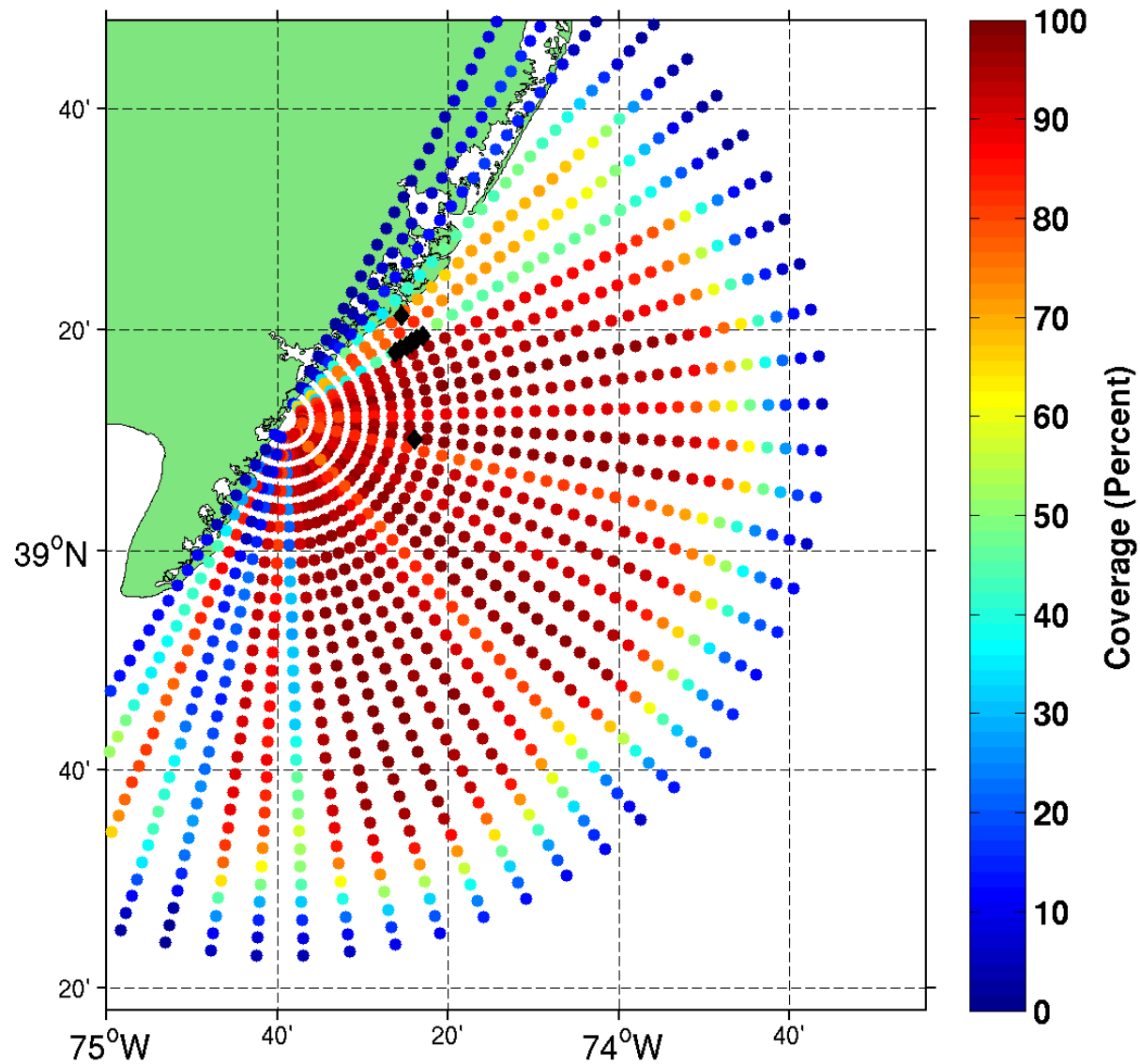
RATH RDLm Coverage, 721 of 721 possible hourly maps  
From 01-Sep-2012 00:00:02 to 01-Oct-2012 00:00:02



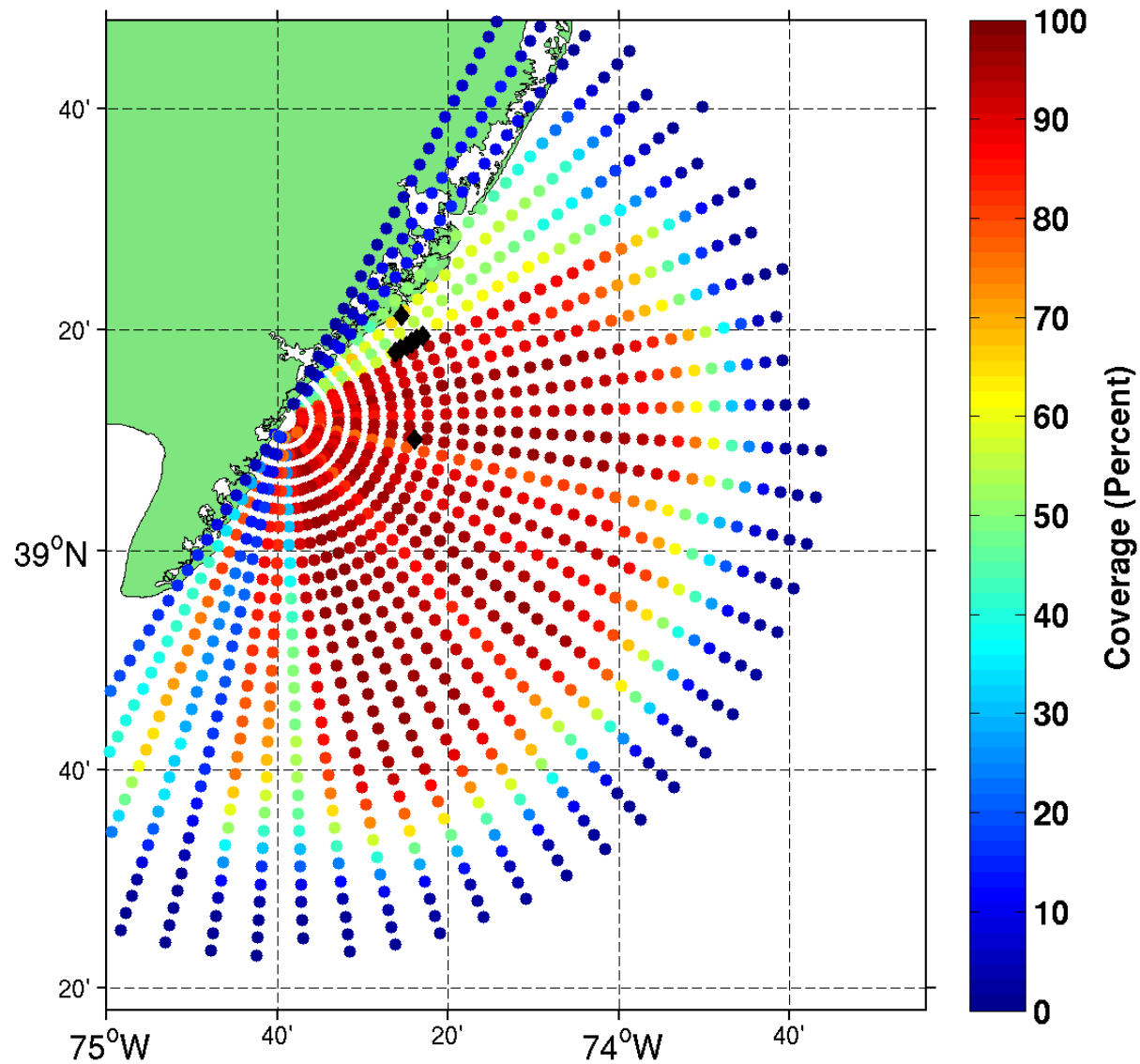
RATH RDLm Coverage, 745 of 745 possible hourly maps  
From 01-Oct-2012 00:00:02 to 01-Nov-2012 00:00:02



RATH RDLm Coverage, 721 of 721 possible hourly maps  
From 01-Nov-2012 00:00:02 to 01-Dec-2012 00:00:02

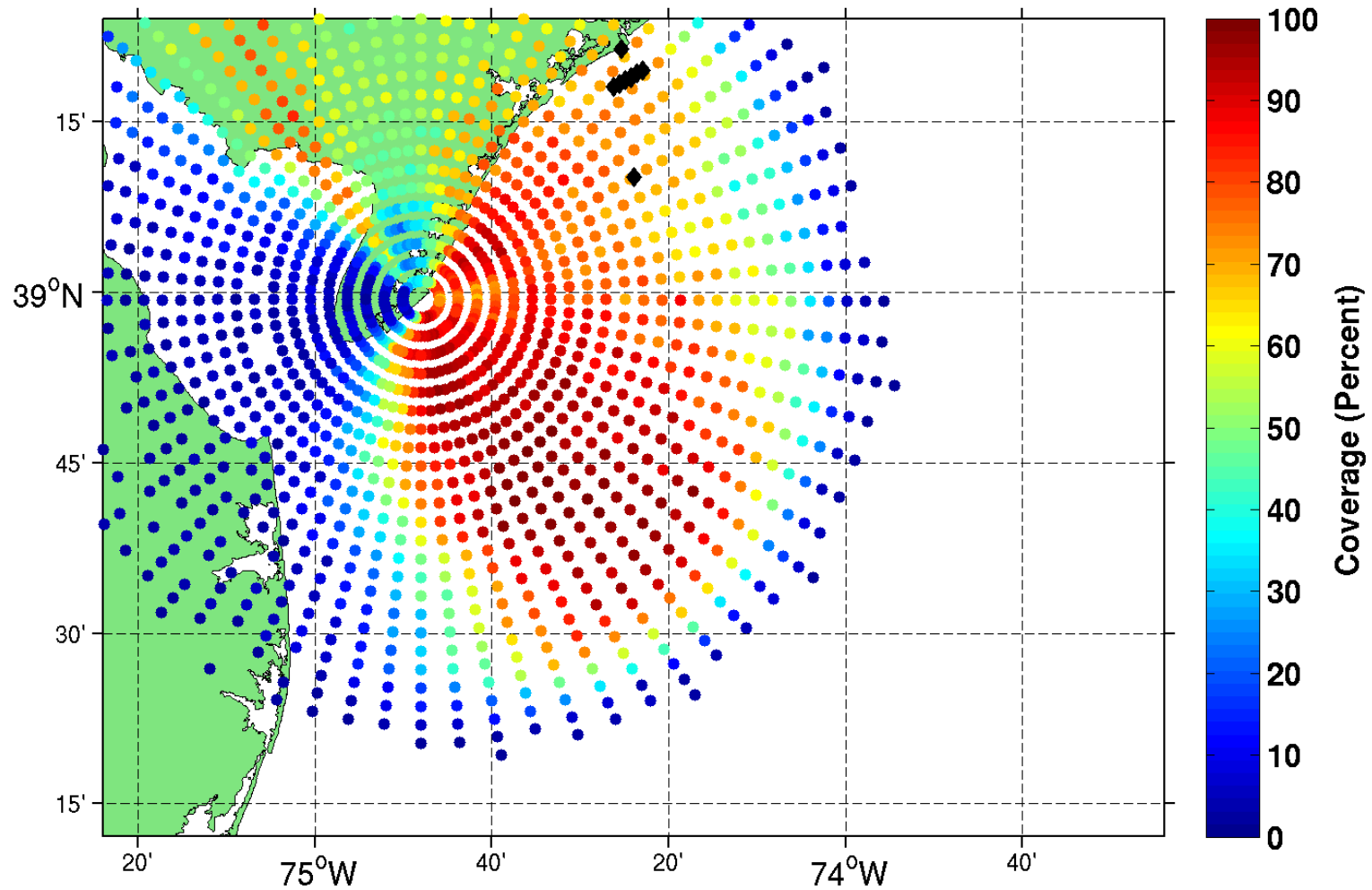


RATH RDLm Coverage, 739 of 745 possible hourly maps  
From 01-Dec-2012 00:00:02 to 01-Jan-2013 00:00:02



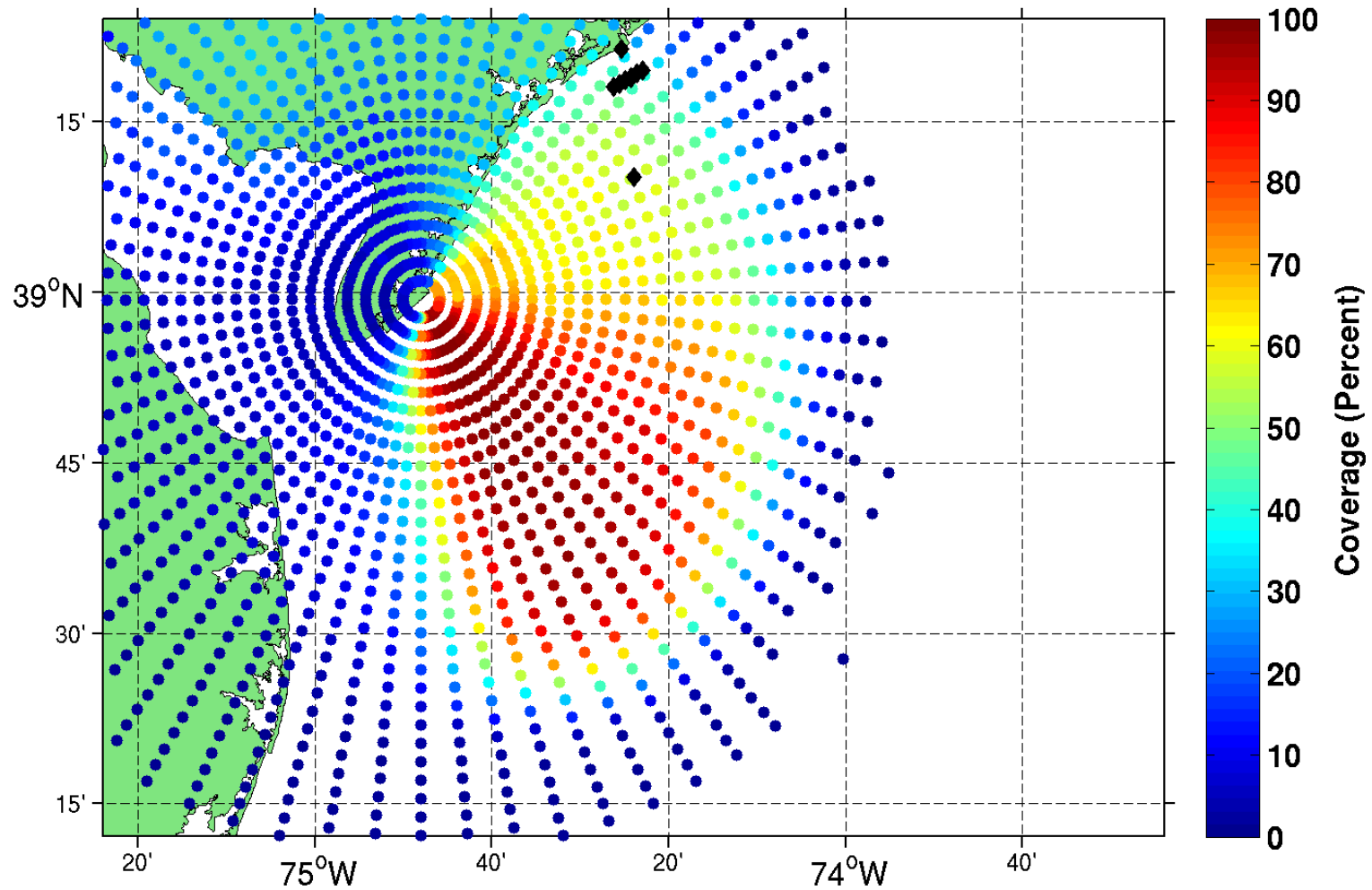
# **NORTH WILDWOOD IDEAL RADIALS**

WOOD RDLi Coverage, 99 of 745 possible hourly maps  
From 01-Jan-2012 00:00:02 to 01-Feb-2012 00:00:02

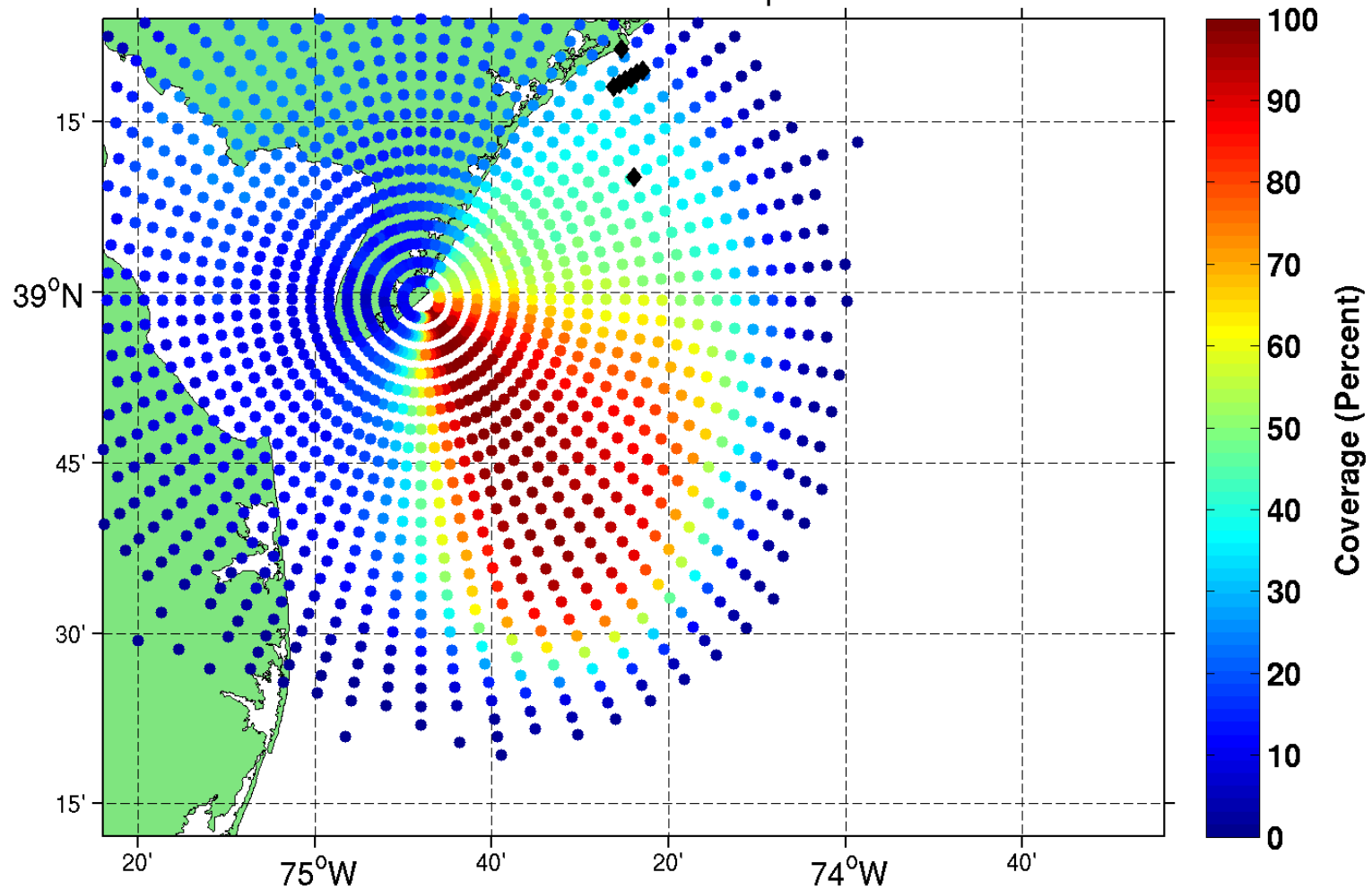




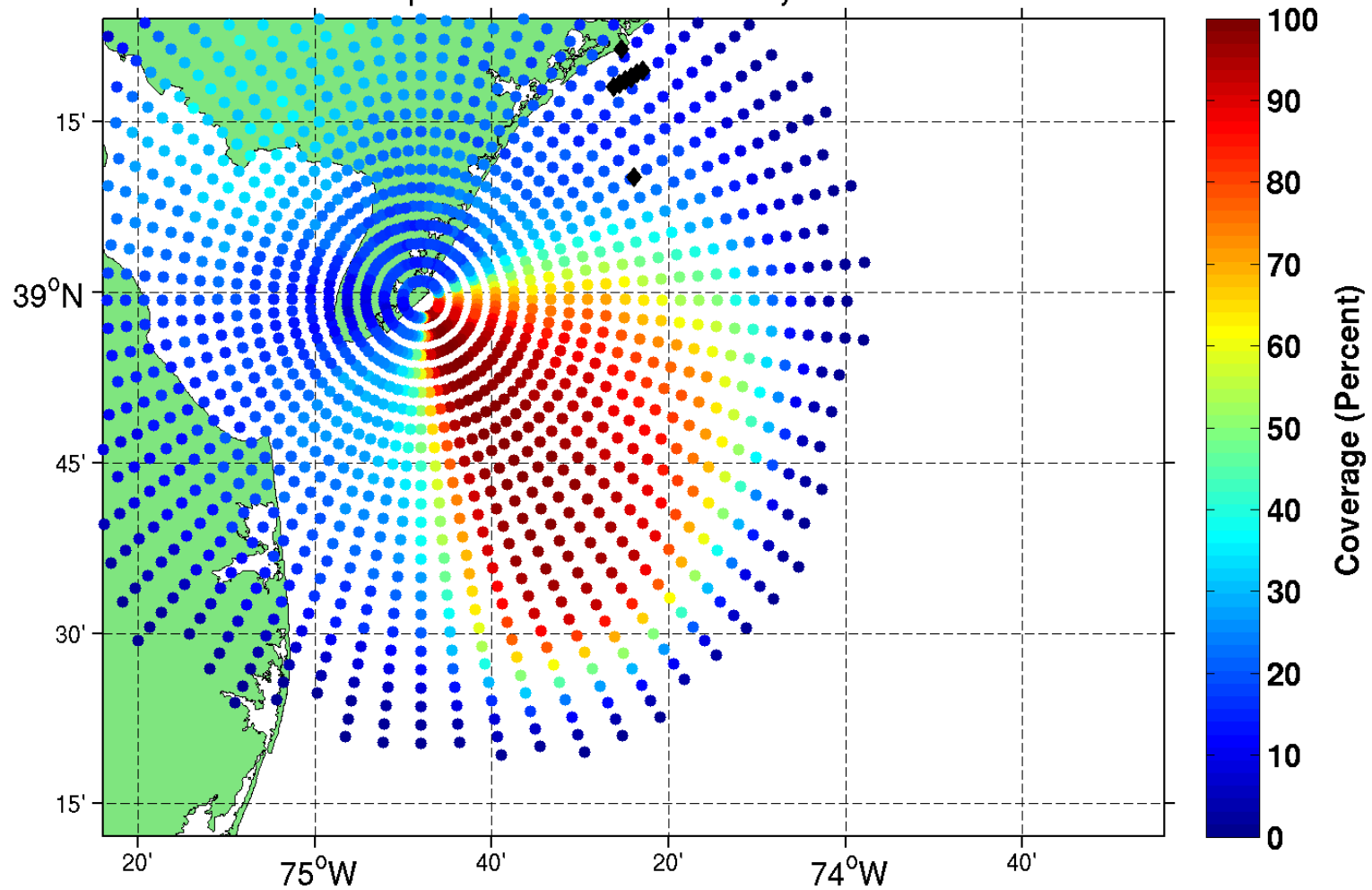
WOOD RDLi Coverage, 591 of 697 possible hourly maps  
From 01-Feb-2012 00:00:02 to 01-Mar-2012 00:00:02



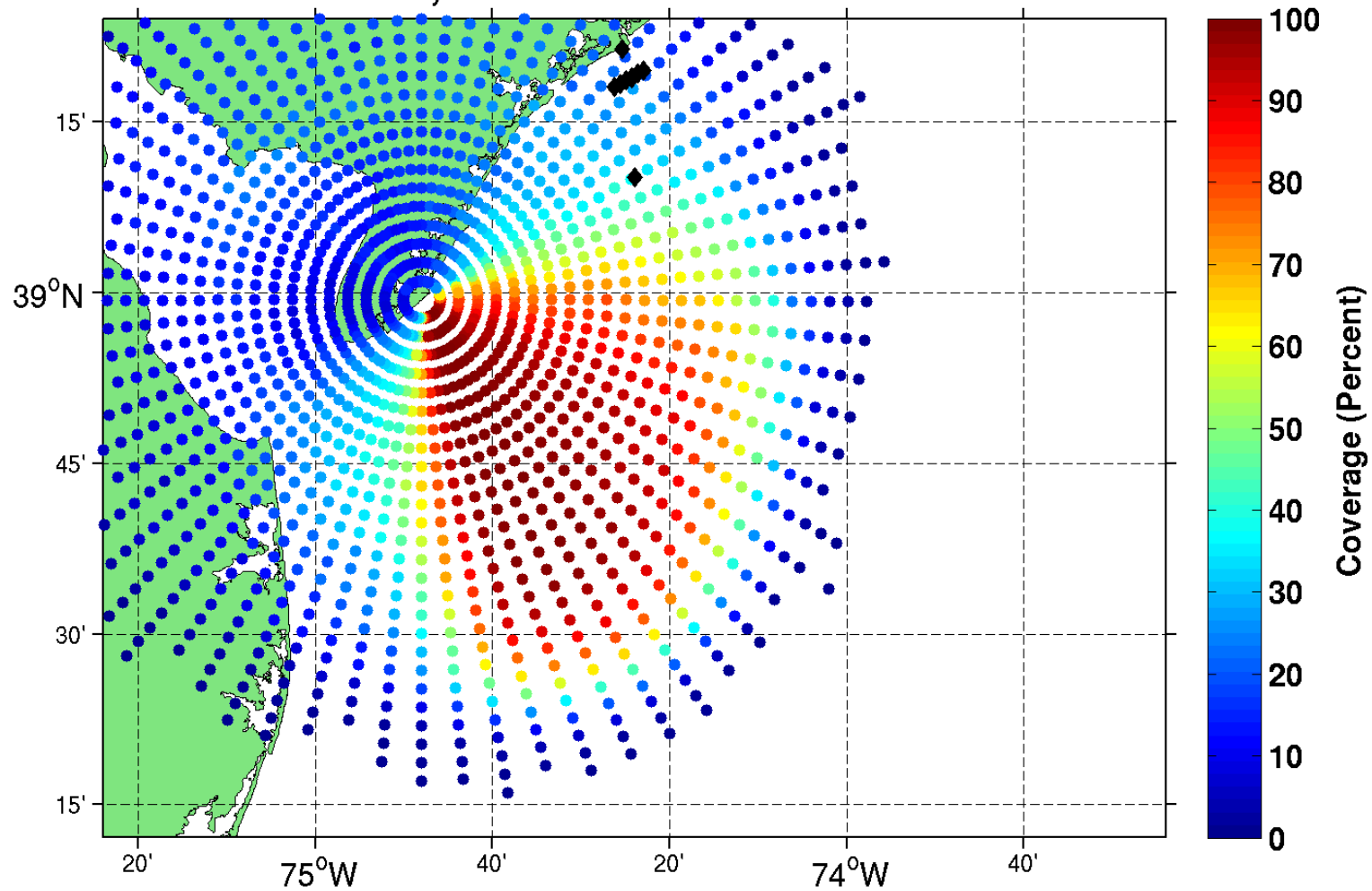
WOOD RDLi Coverage, 507 of 745 possible hourly maps  
From 01-Mar-2012 00:00:02 to 01-Apr-2012 00:00:02



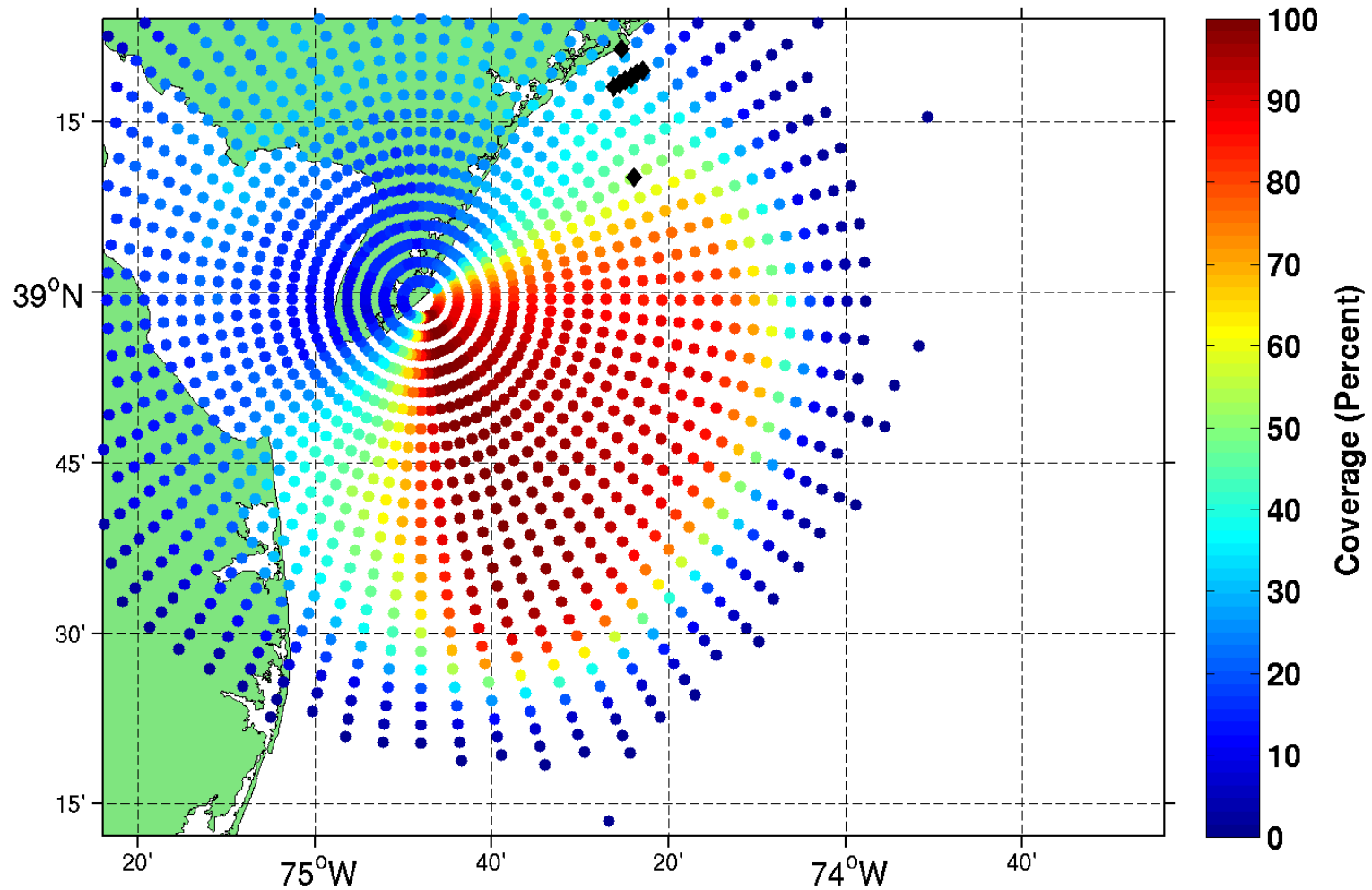
WOOD RDLi Coverage, 622 of 721 possible hourly maps  
From 01-Apr-2012 00:00:02 to 01-May-2012 00:00:02



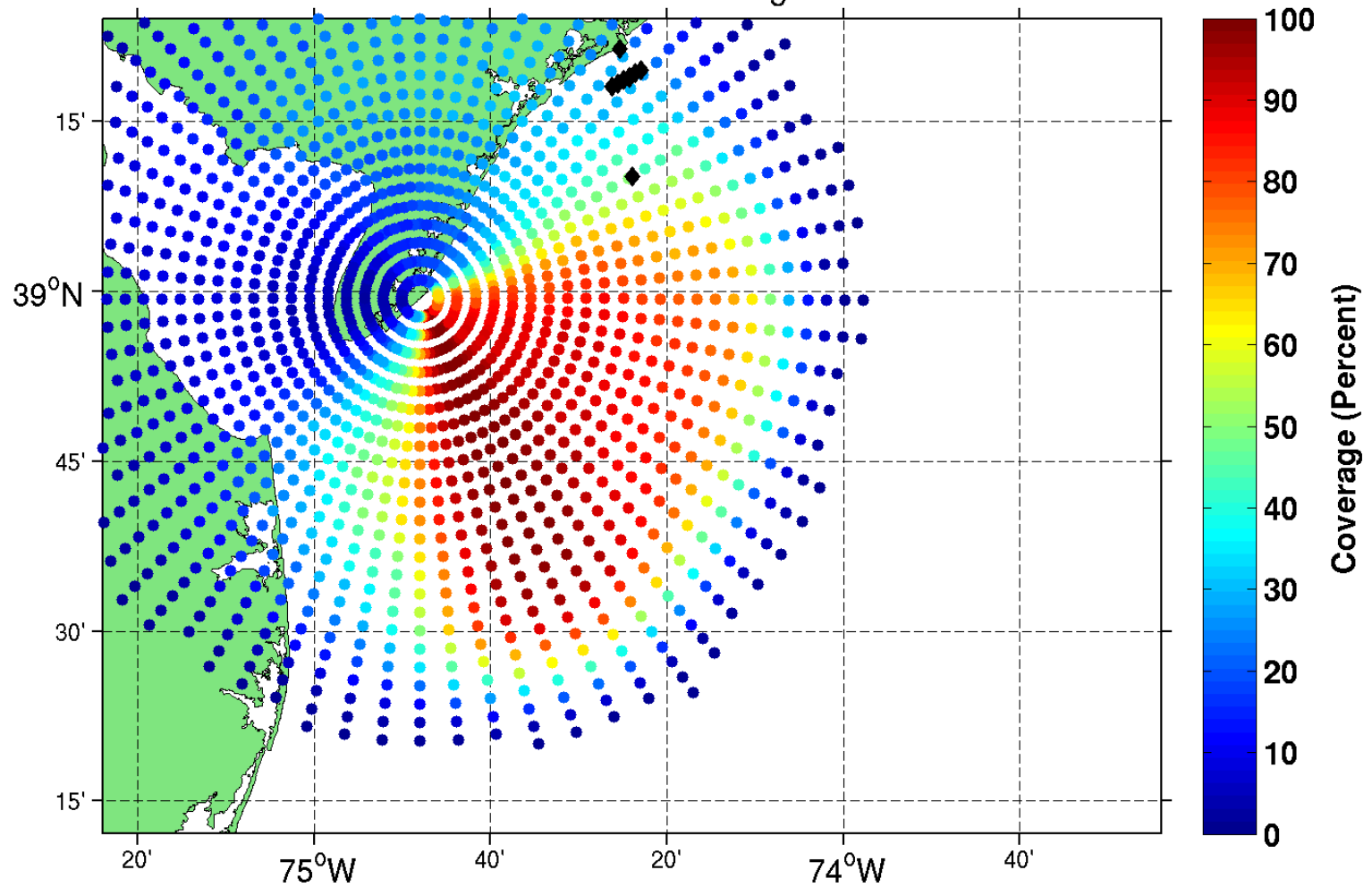
WOOD RDLi Coverage, 735 of 745 possible hourly maps  
From 01-May-2012 00:00:02 to 01-Jun-2012 00:00:02



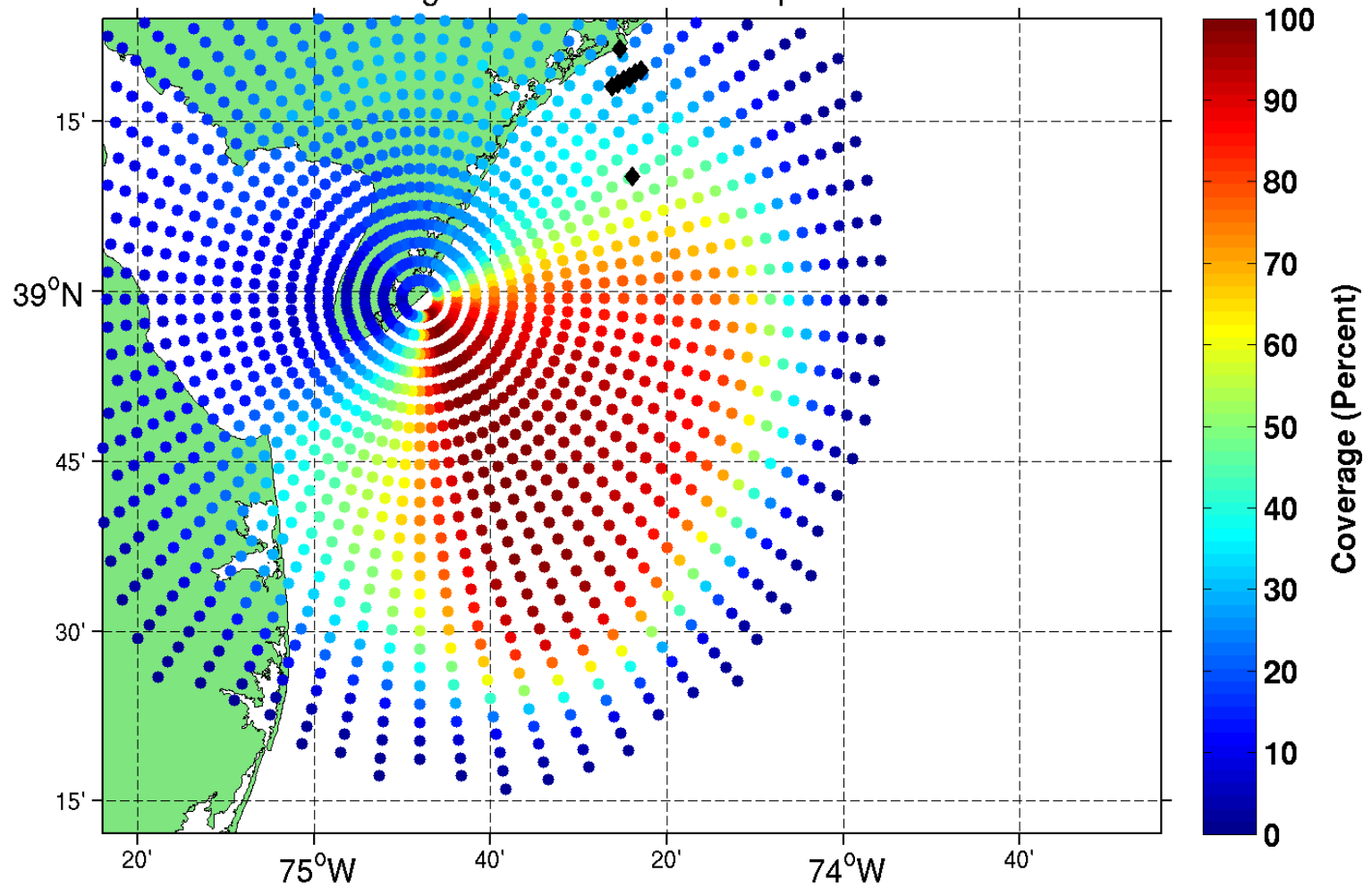
WOOD RDLi Coverage, 719 of 721 possible hourly maps  
From 01-Jun-2012 00:00:02 to 01-Jul-2012 00:00:02



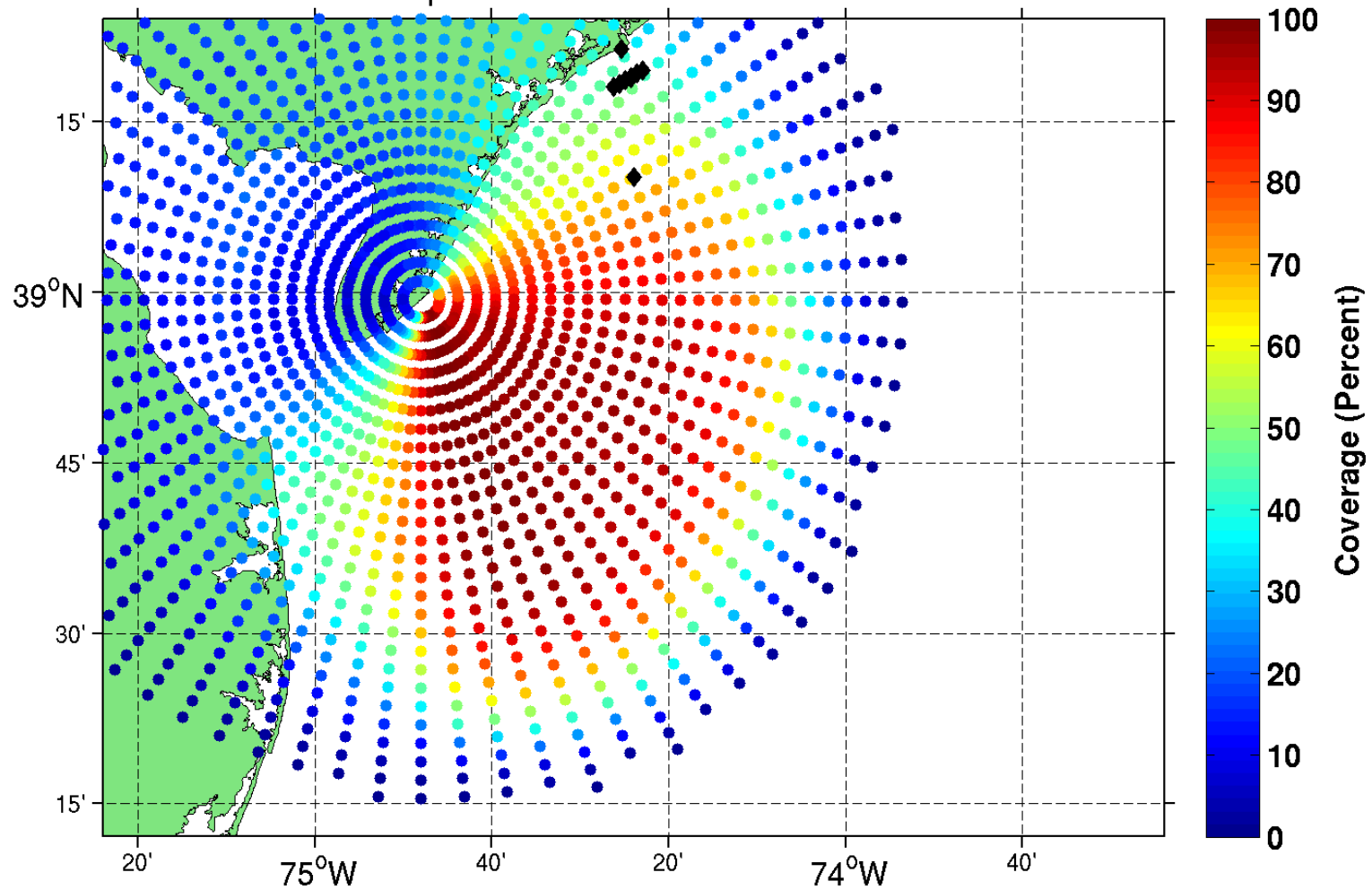
WOOD RDLi Coverage, 745 of 745 possible hourly maps  
From 01-Jul-2012 00:00:02 to 01-Aug-2012 00:00:02



WOOD RDLi Coverage, 745 of 745 possible hourly maps  
From 01-Aug-2012 00:00:02 to 01-Sep-2012 00:00:02

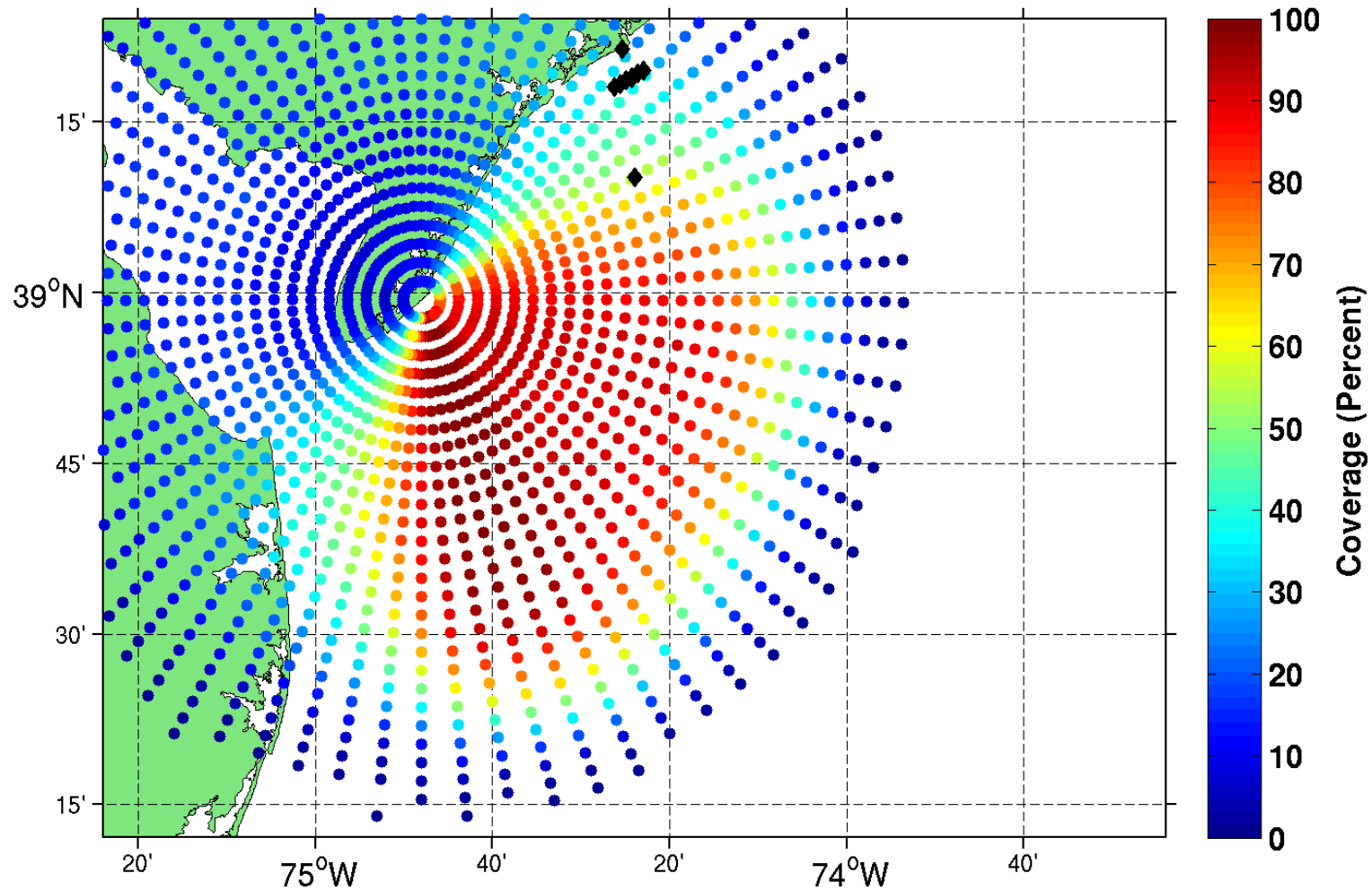


WOOD RDLi Coverage, 721 of 721 possible hourly maps  
From 01-Sep-2012 00:00:02 to 01-Oct-2012 00:00:02

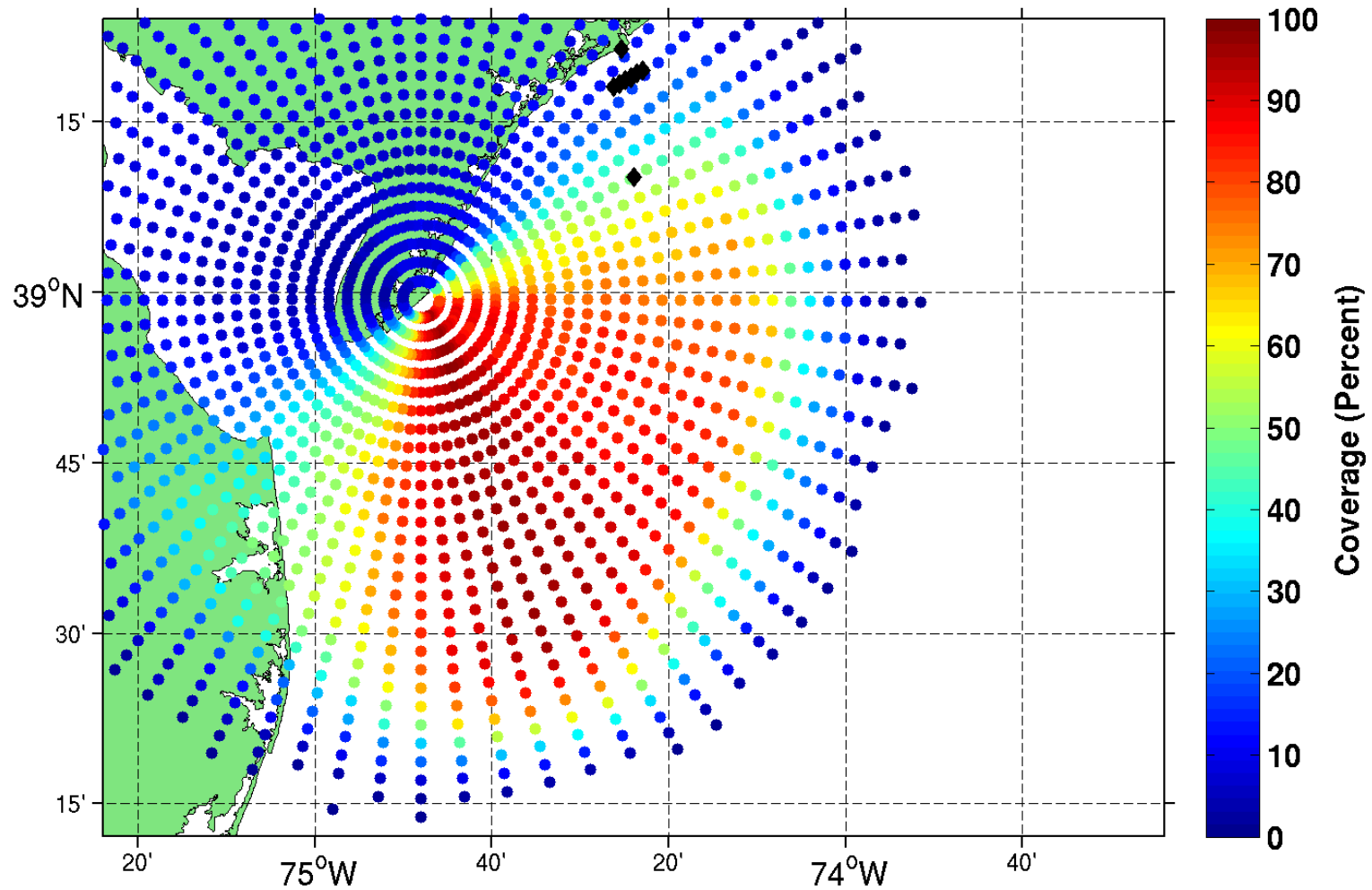




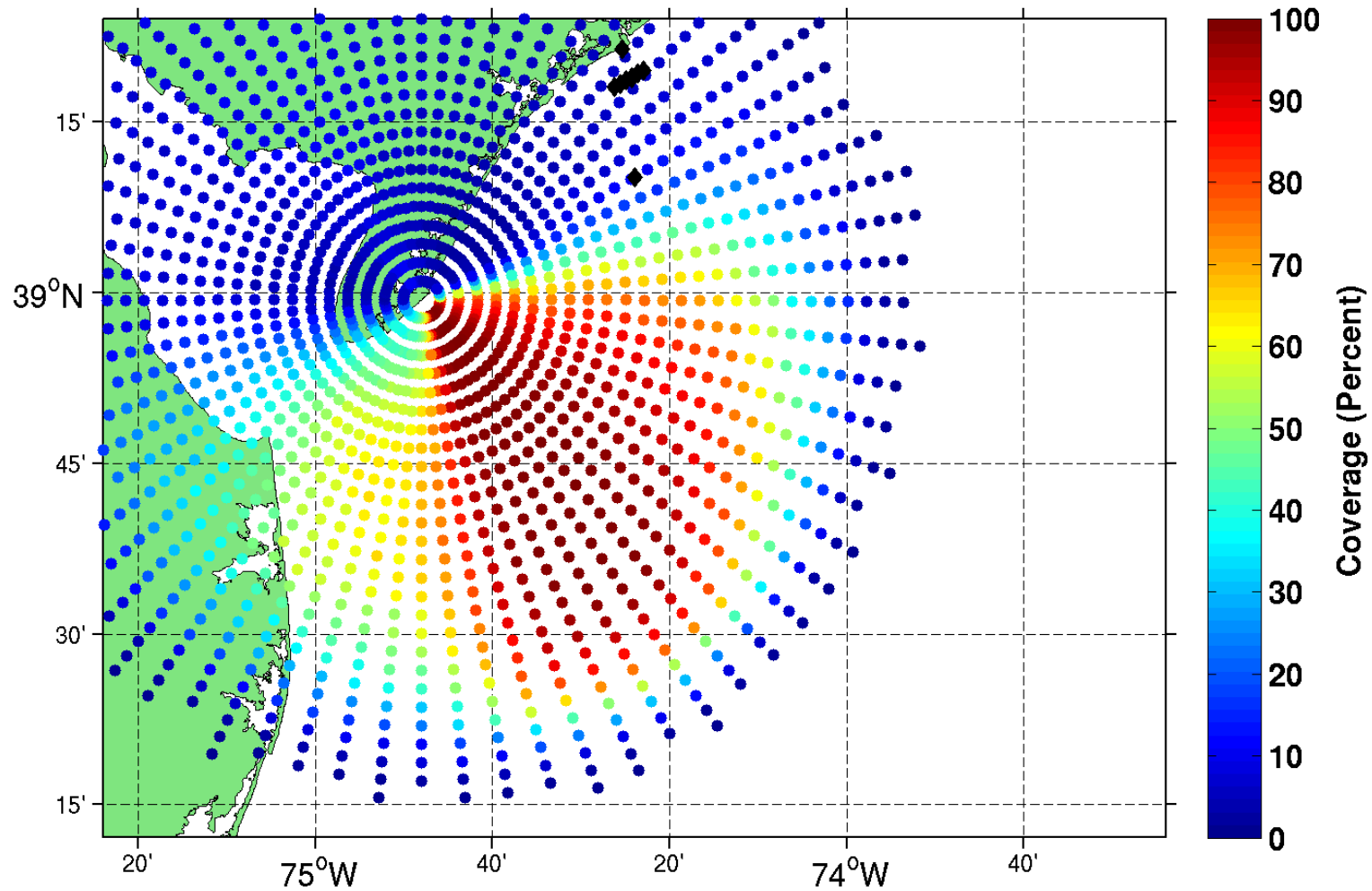
WOOD RDLi Coverage, 745 of 745 possible hourly maps  
From 01-Oct-2012 00:00:02 to 01-Nov-2012 00:00:02



WOOD RDLi Coverage, 392 of 721 possible hourly maps  
From 01-Nov-2012 00:00:02 to 01-Dec-2012 00:00:02

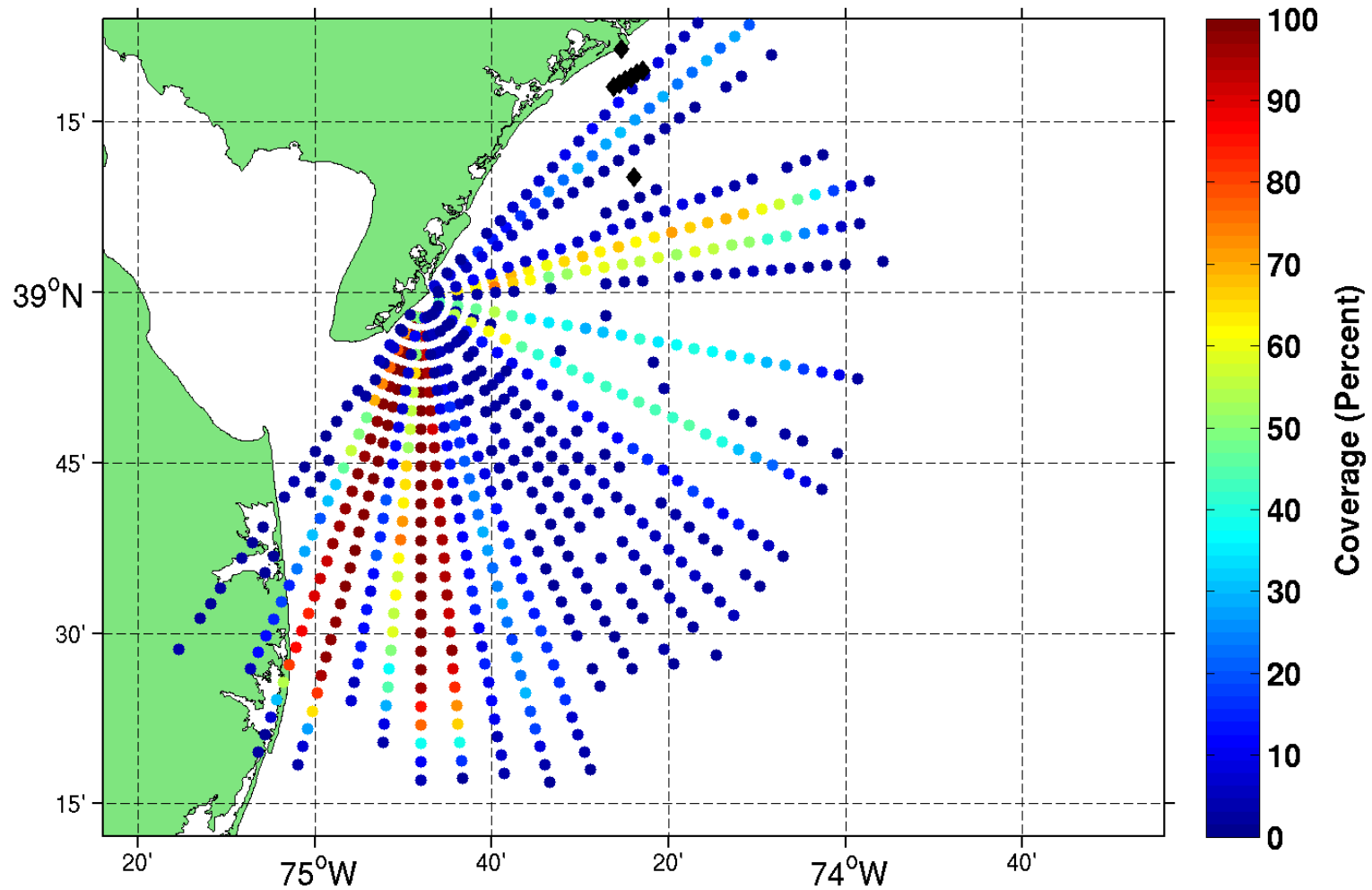


WOOD RDLi Coverage, 745 of 745 possible hourly maps  
From 01-Dec-2012 00:00:02 to 01-Jan-2013 00:00:02

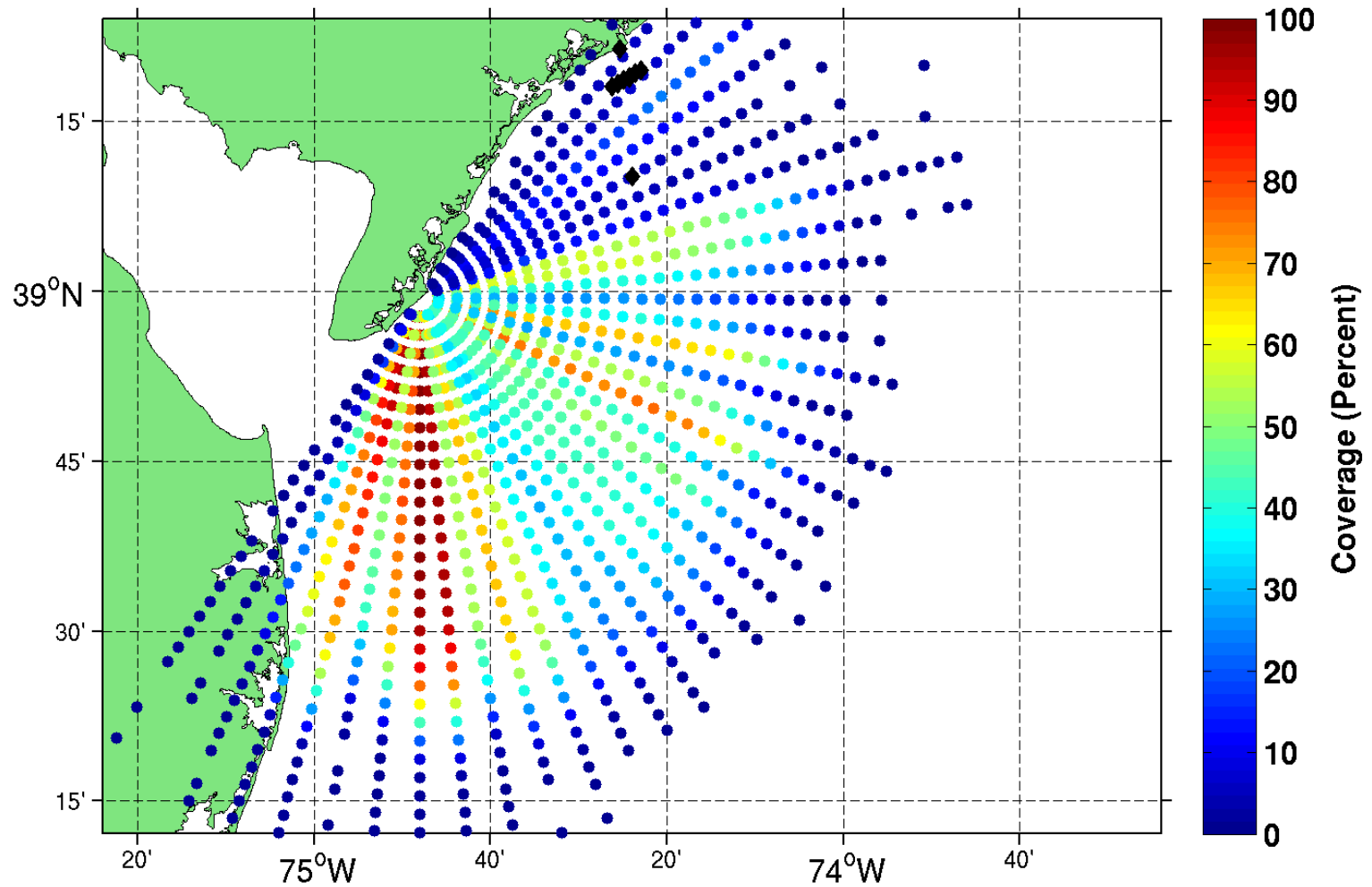


# **NORTH WILDWOOD MEASURED RADIALS**

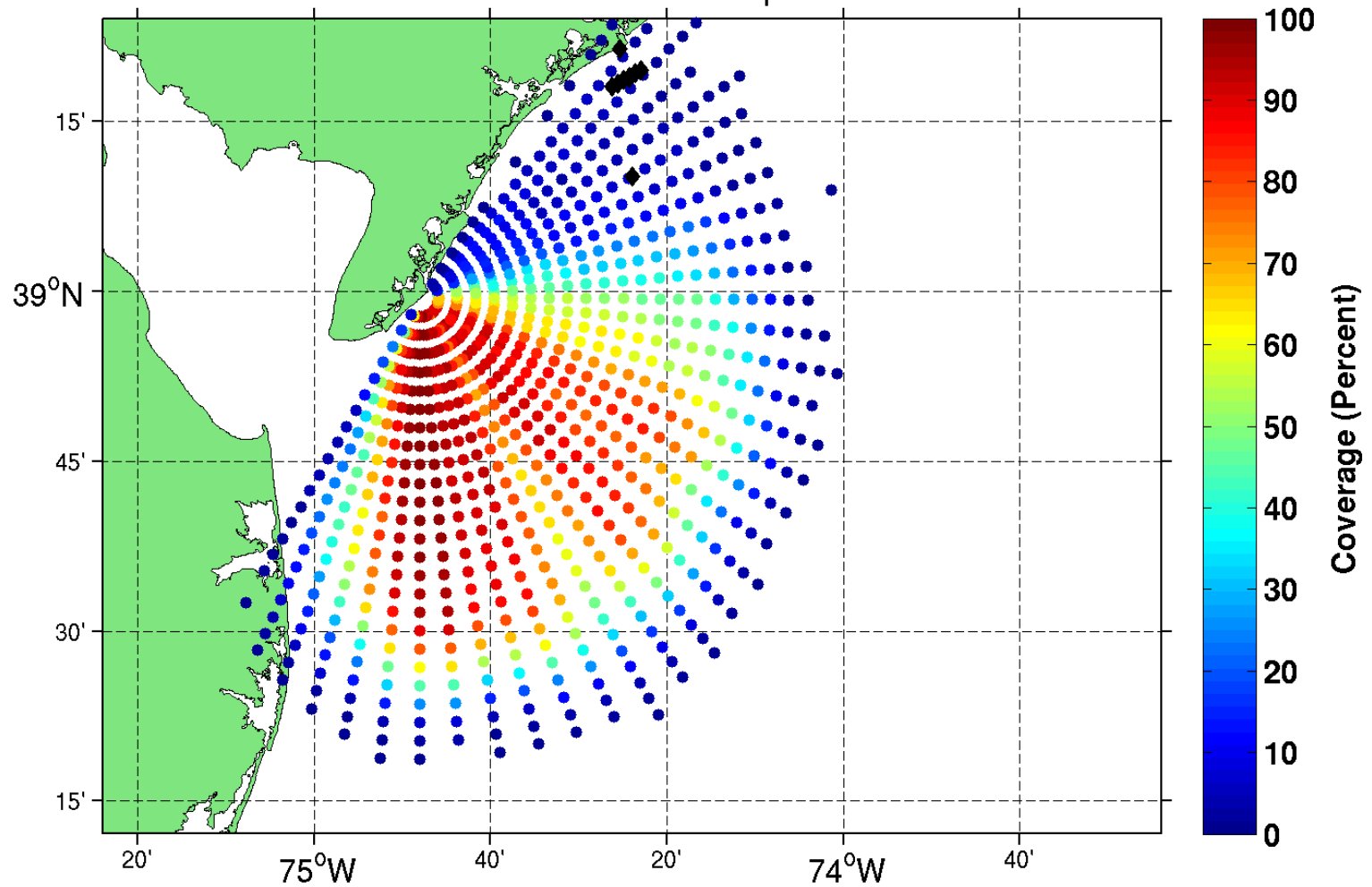
WOOD RDLm Coverage, 119 of 745 possible hourly maps  
From 01-Jan-2012 00:00:02 to 01-Feb-2012 00:00:02



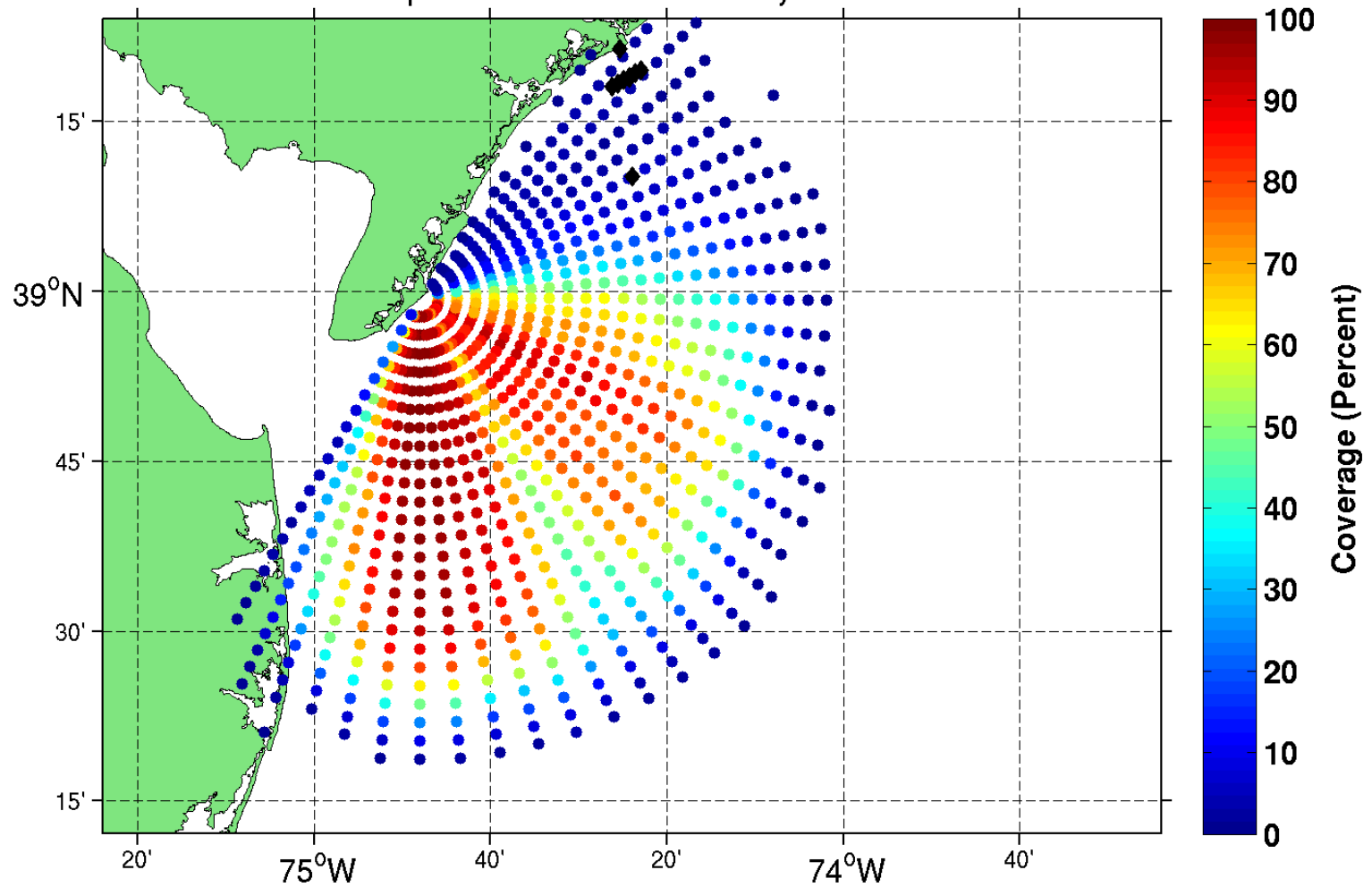
WOOD RDLm Coverage, 591 of 697 possible hourly maps  
From 01-Feb-2012 00:00:02 to 01-Mar-2012 00:00:02



WOOD RDLm Coverage, 507 of 745 possible hourly maps  
From 01-Mar-2012 00:00:02 to 01-Apr-2012 00:00:02

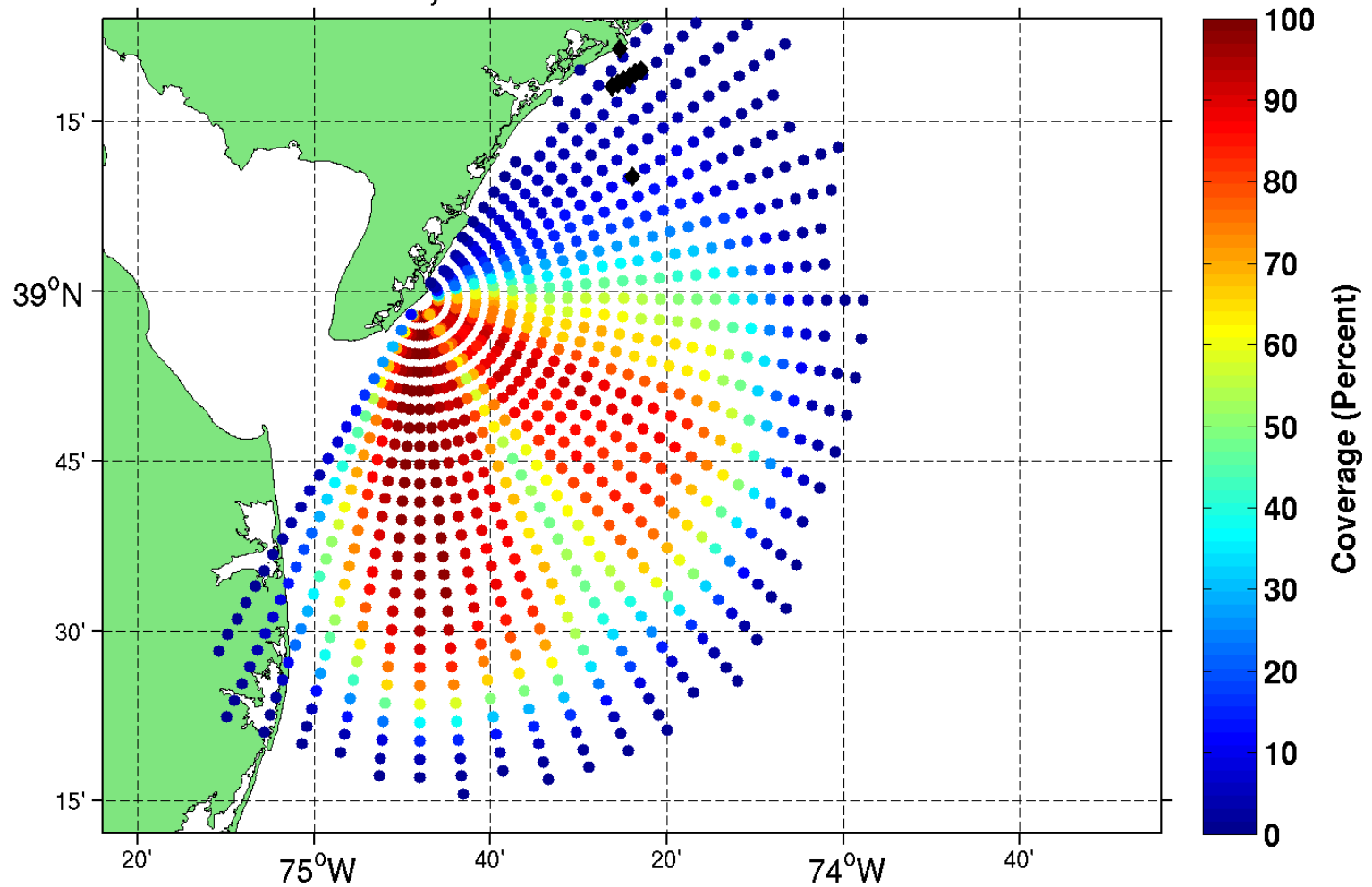


WOOD RDLm Coverage, 622 of 721 possible hourly maps  
From 01-Apr-2012 00:00:02 to 01-May-2012 00:00:02

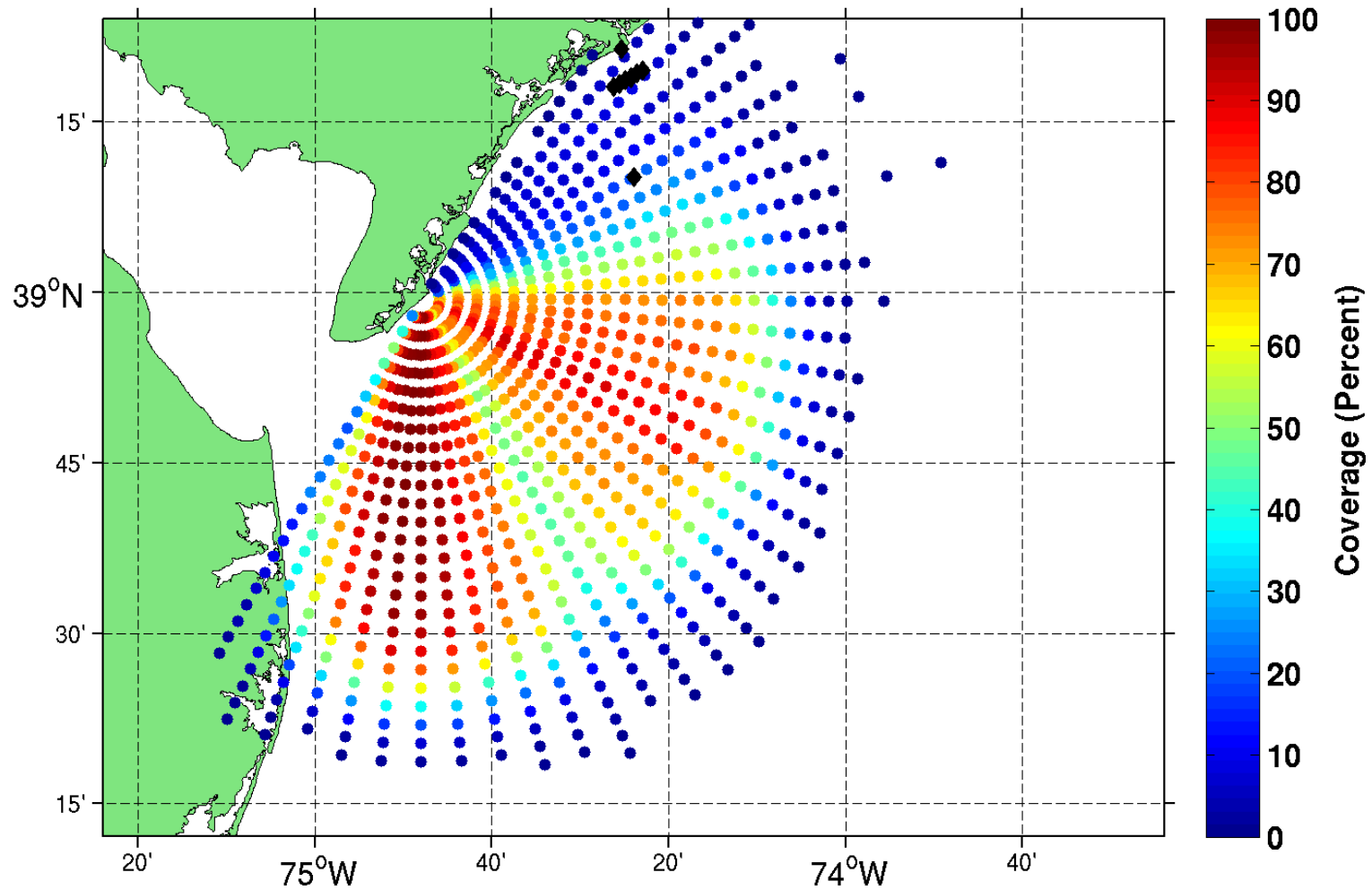




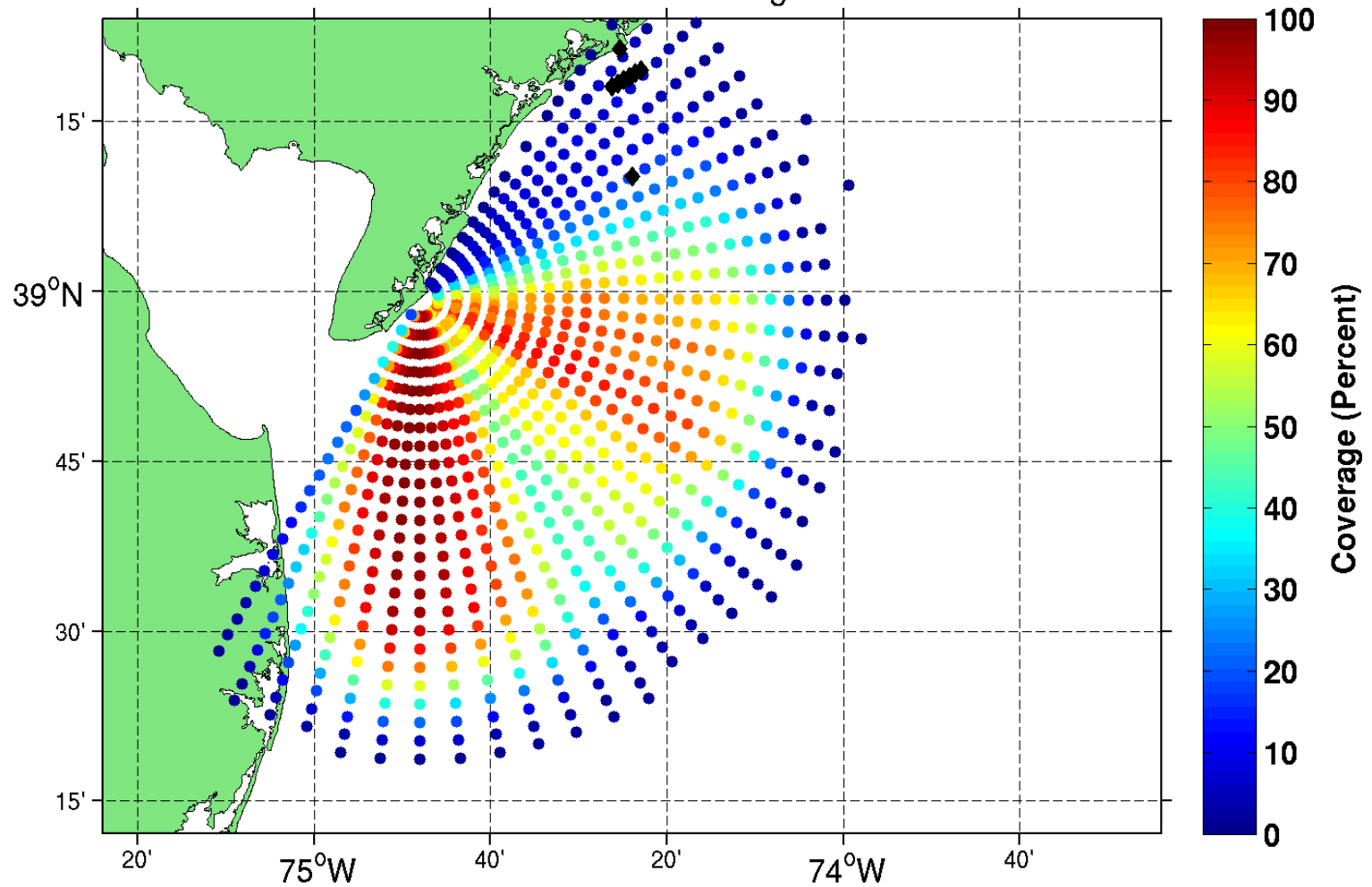
WOOD RDLm Coverage, 735 of 745 possible hourly maps  
From 01-May-2012 00:00:02 to 01-Jun-2012 00:00:02



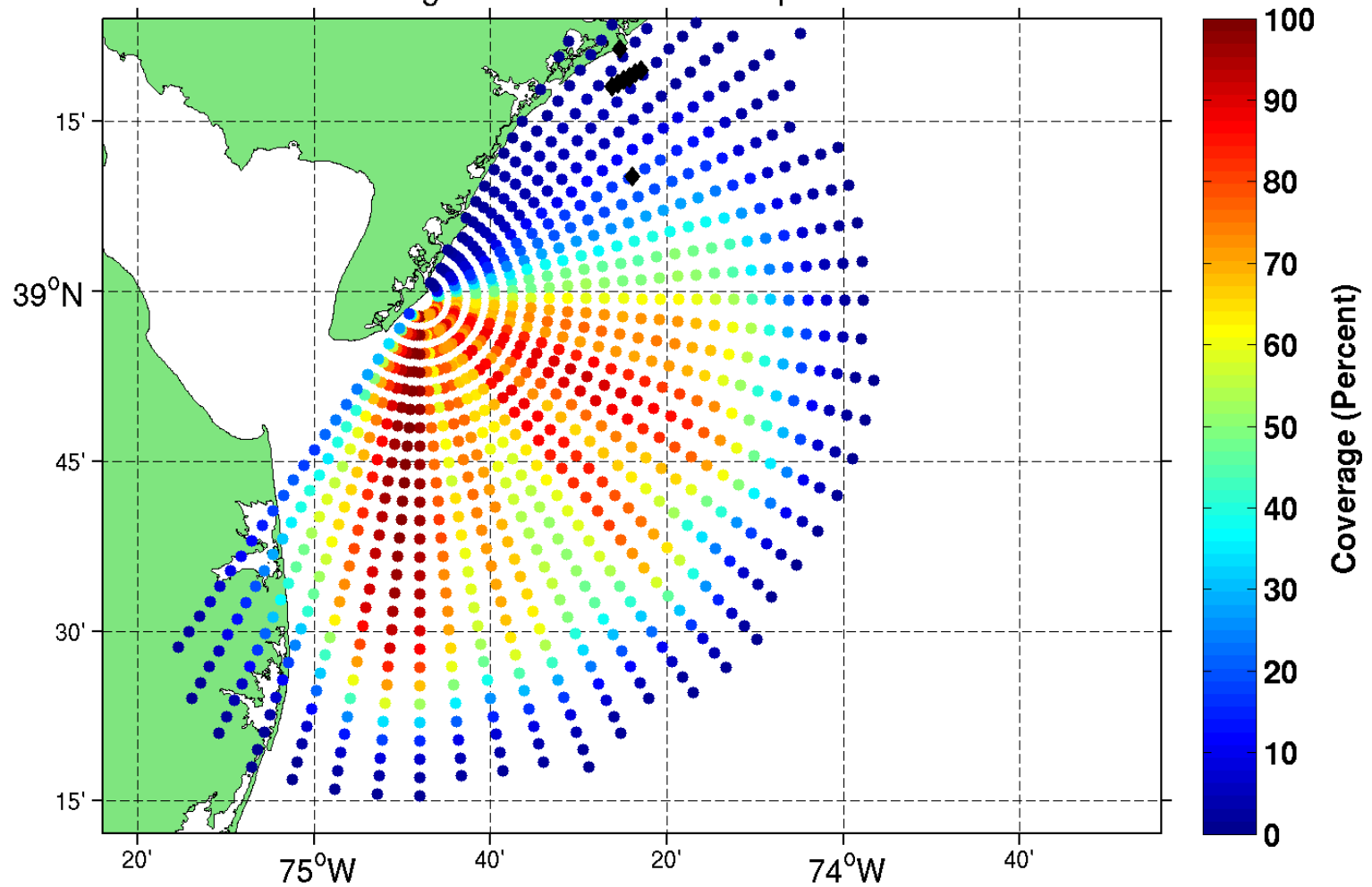
WOOD RDLm Coverage, 719 of 721 possible hourly maps  
From 01-Jun-2012 00:00:02 to 01-Jul-2012 00:00:02



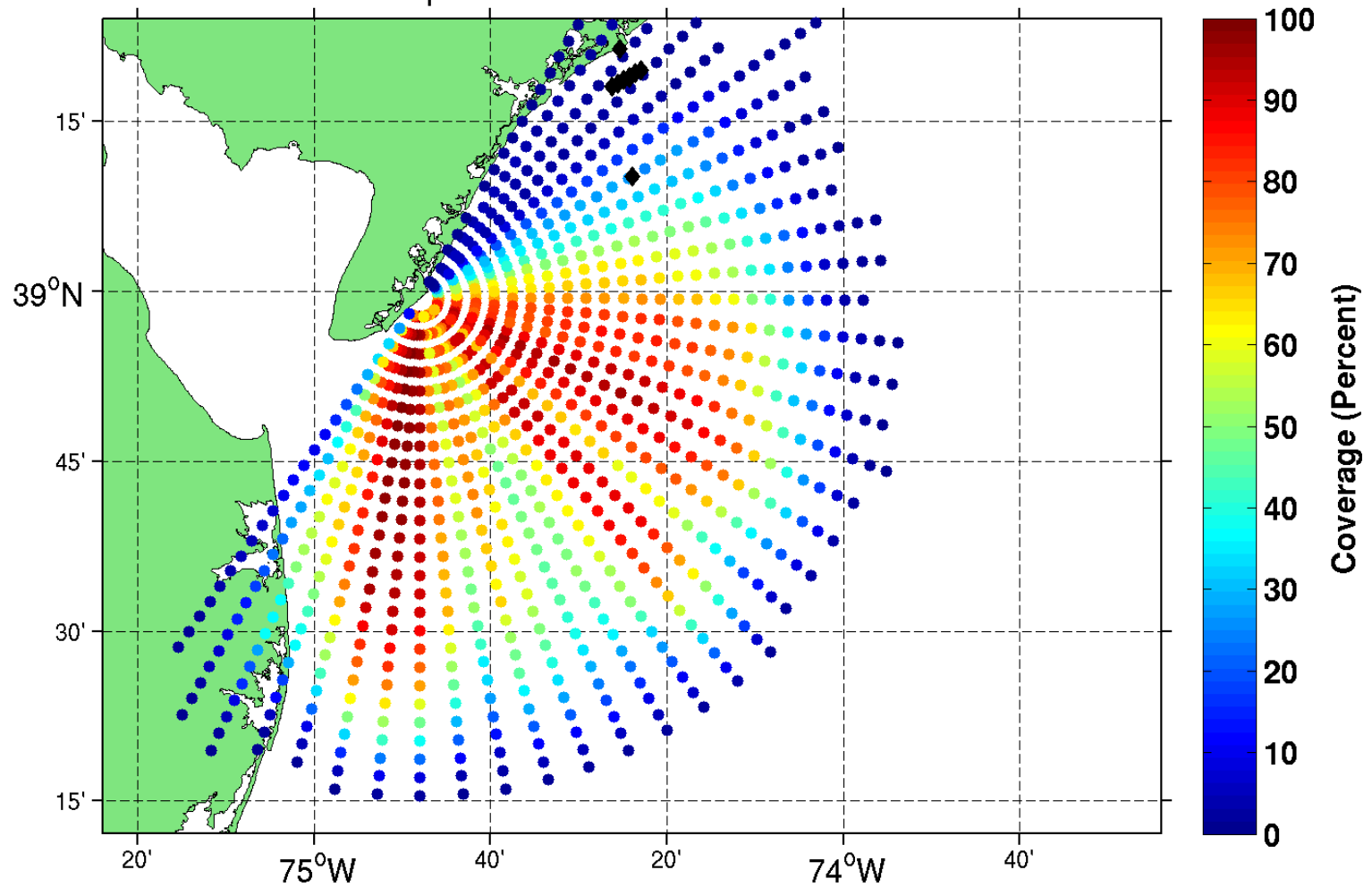
WOOD RDLm Coverage, 745 of 745 possible hourly maps  
From 01-Jul-2012 00:00:02 to 01-Aug-2012 00:00:02



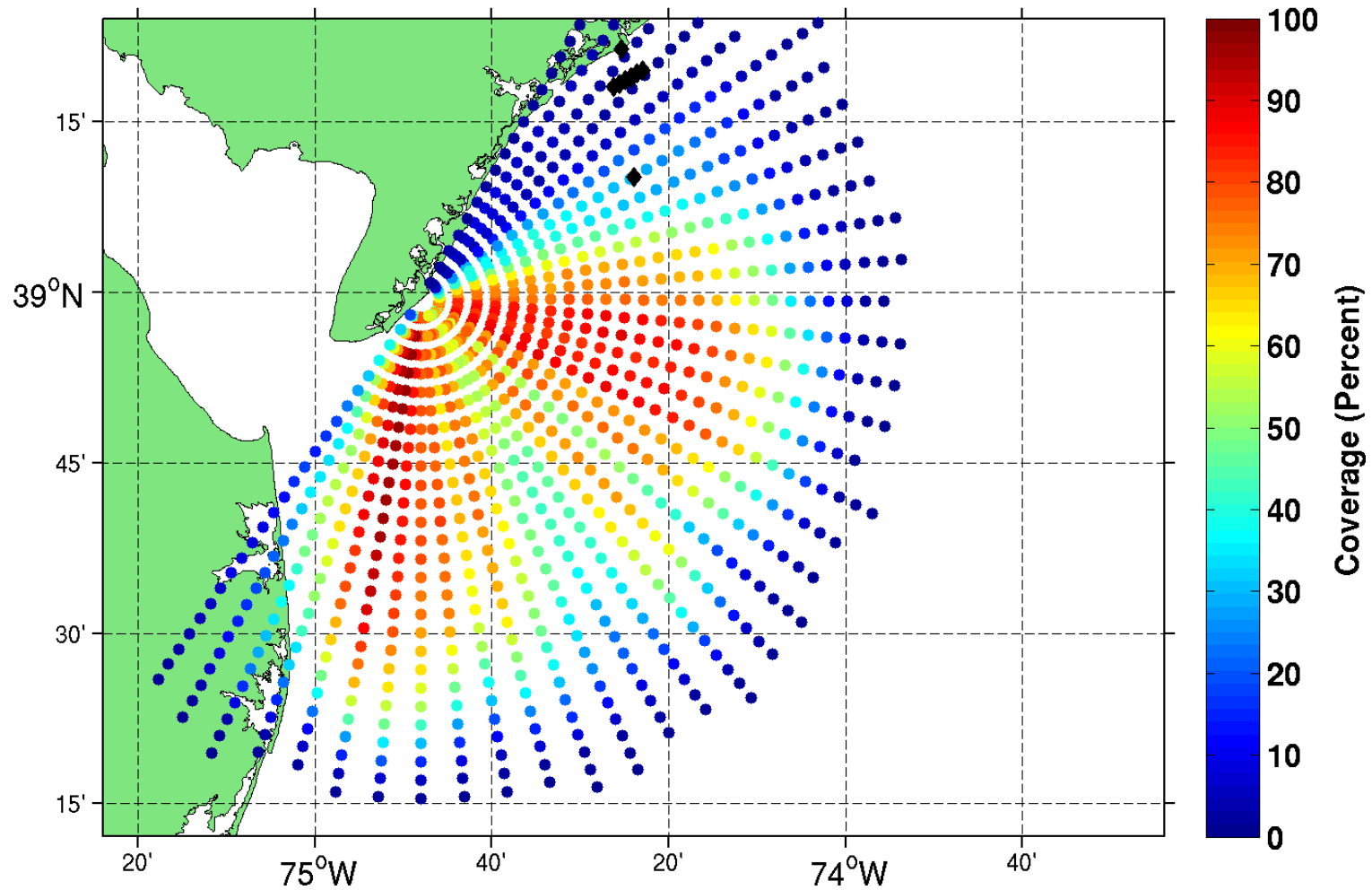
WOOD RDLm Coverage, 745 of 745 possible hourly maps  
From 01-Aug-2012 00:00:02 to 01-Sep-2012 00:00:02



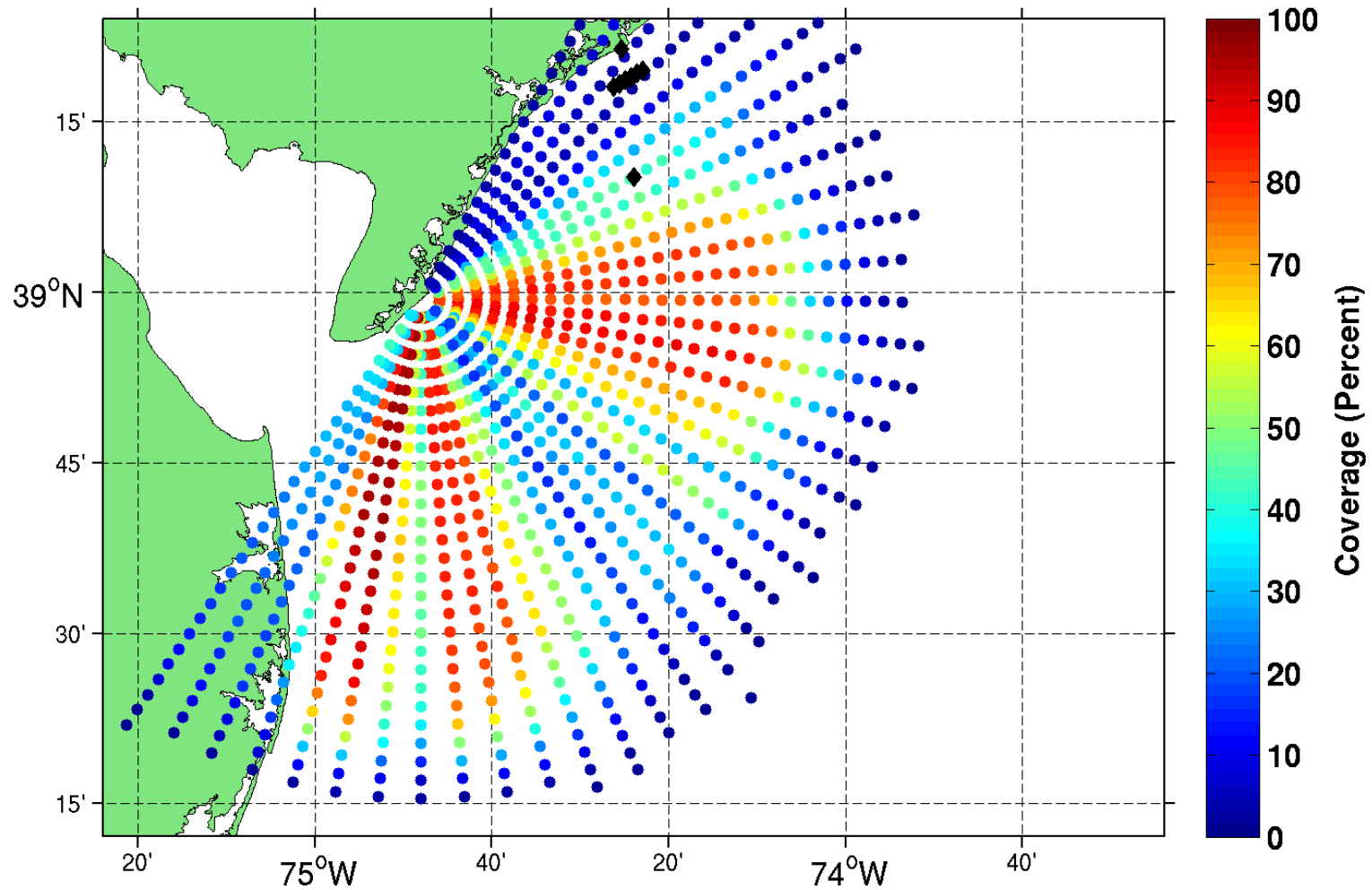
WOOD RDLm Coverage, 721 of 721 possible hourly maps  
From 01-Sep-2012 00:00:02 to 01-Oct-2012 00:00:02



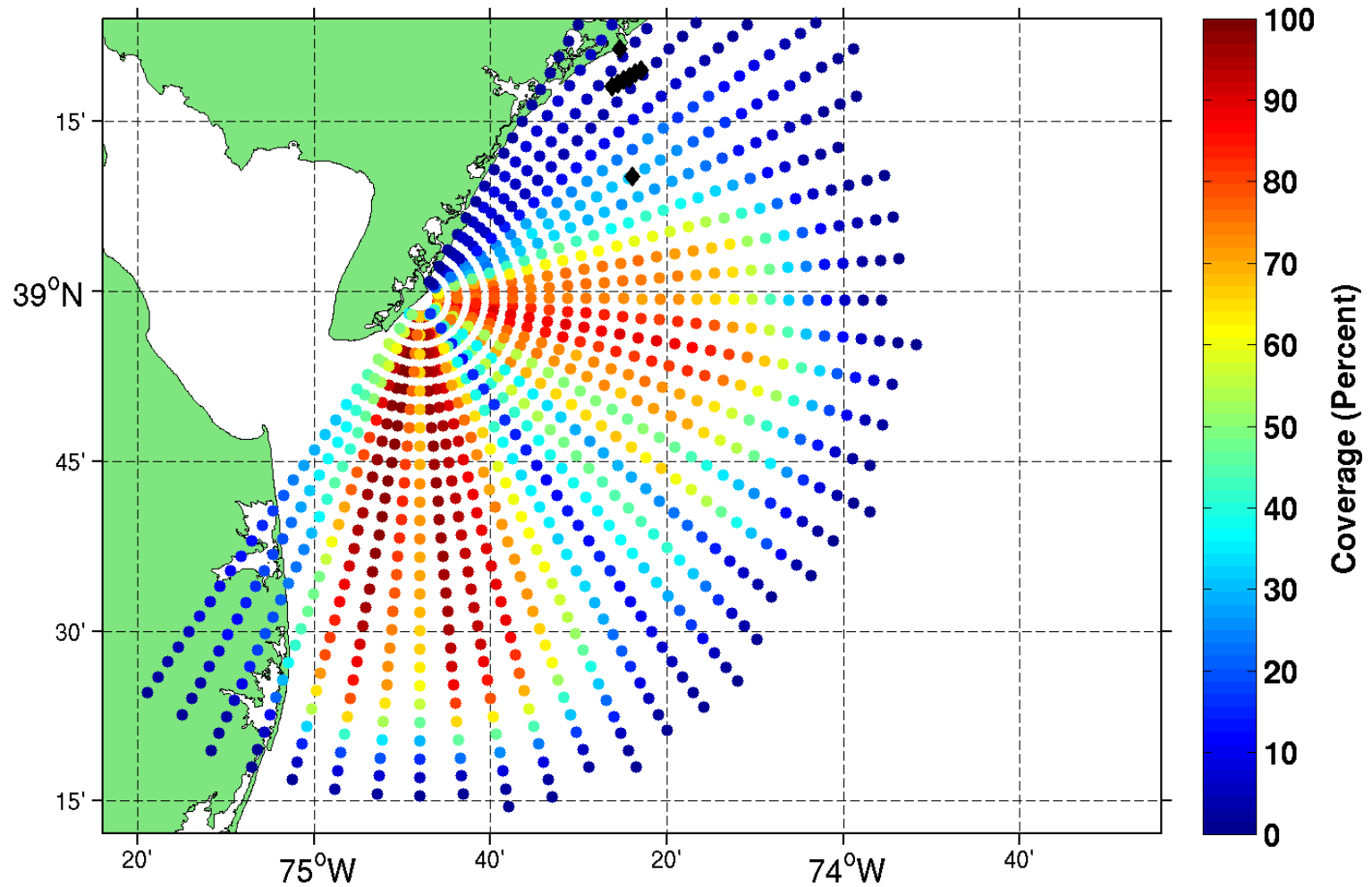
WOOD RDLm Coverage, 745 of 745 possible hourly maps  
From 01-Oct-2012 00:00:02 to 01-Nov-2012 00:00:02



WOOD RDLm Coverage, 391 of 721 possible hourly maps  
From 01-Nov-2012 00:00:02 to 01-Dec-2012 00:00:02



WOOD RDLm Coverage, 745 of 745 possible hourly maps  
From 01-Dec-2012 00:00:02 to 01-Jan-2013 00:00:02





Section 07 (January to June):

# BPU

## Average Radial Velocity

January 1, 2012 to June 30, 2012

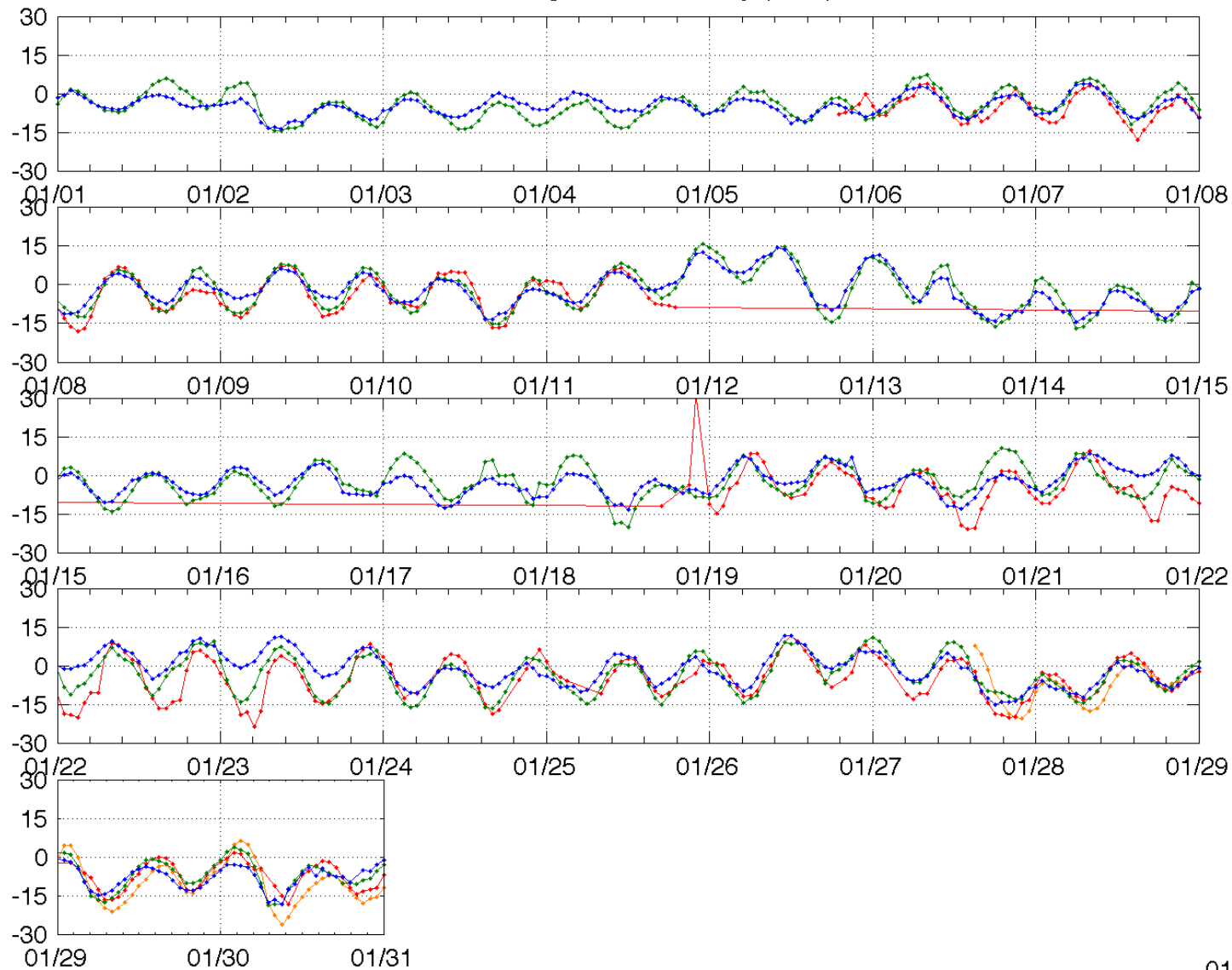
BRNT - RDLm

BRMR- RDLi

RATH- RDLi

WOOD- RDLi

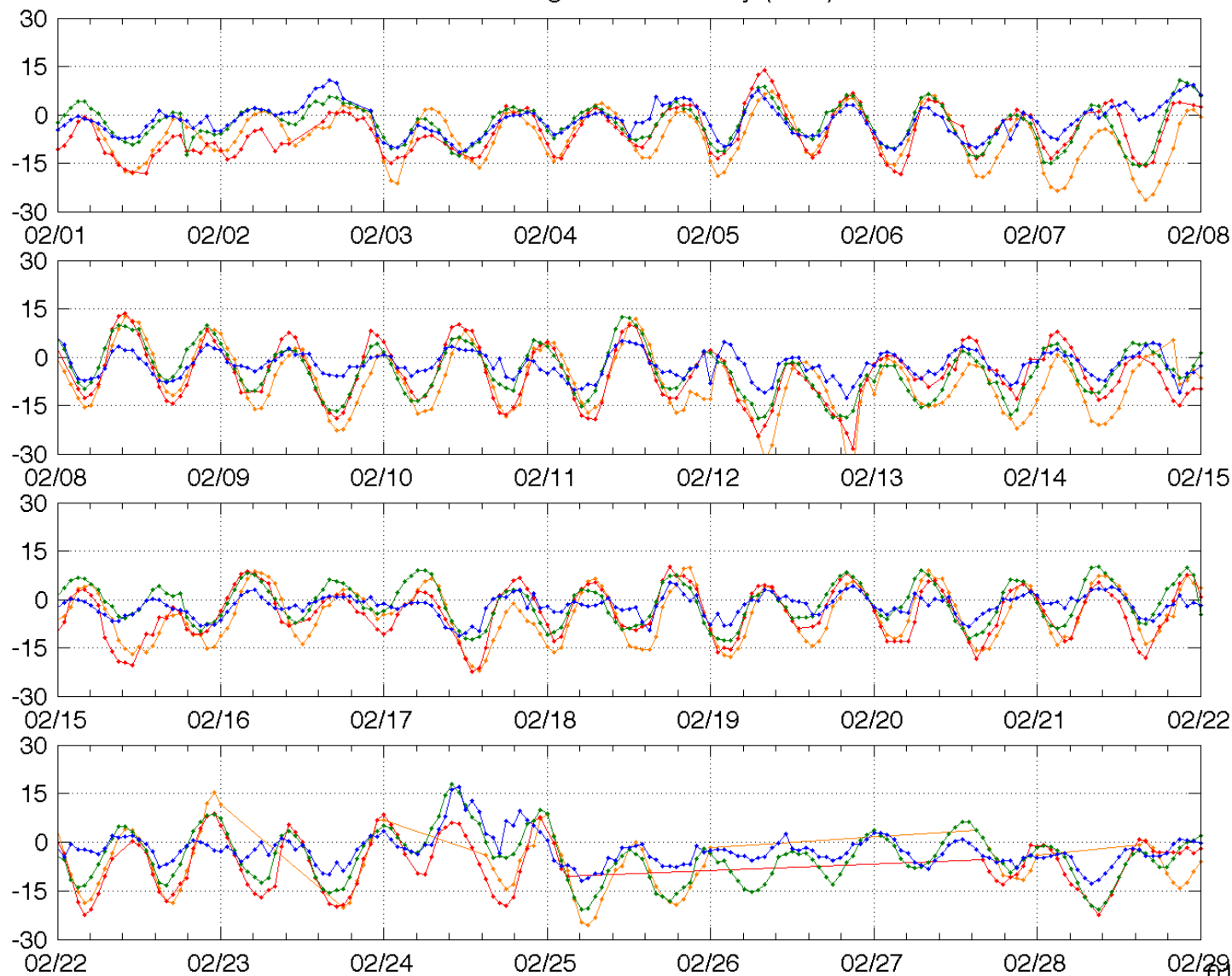
2012 Average Radial Velocity (cm/s)

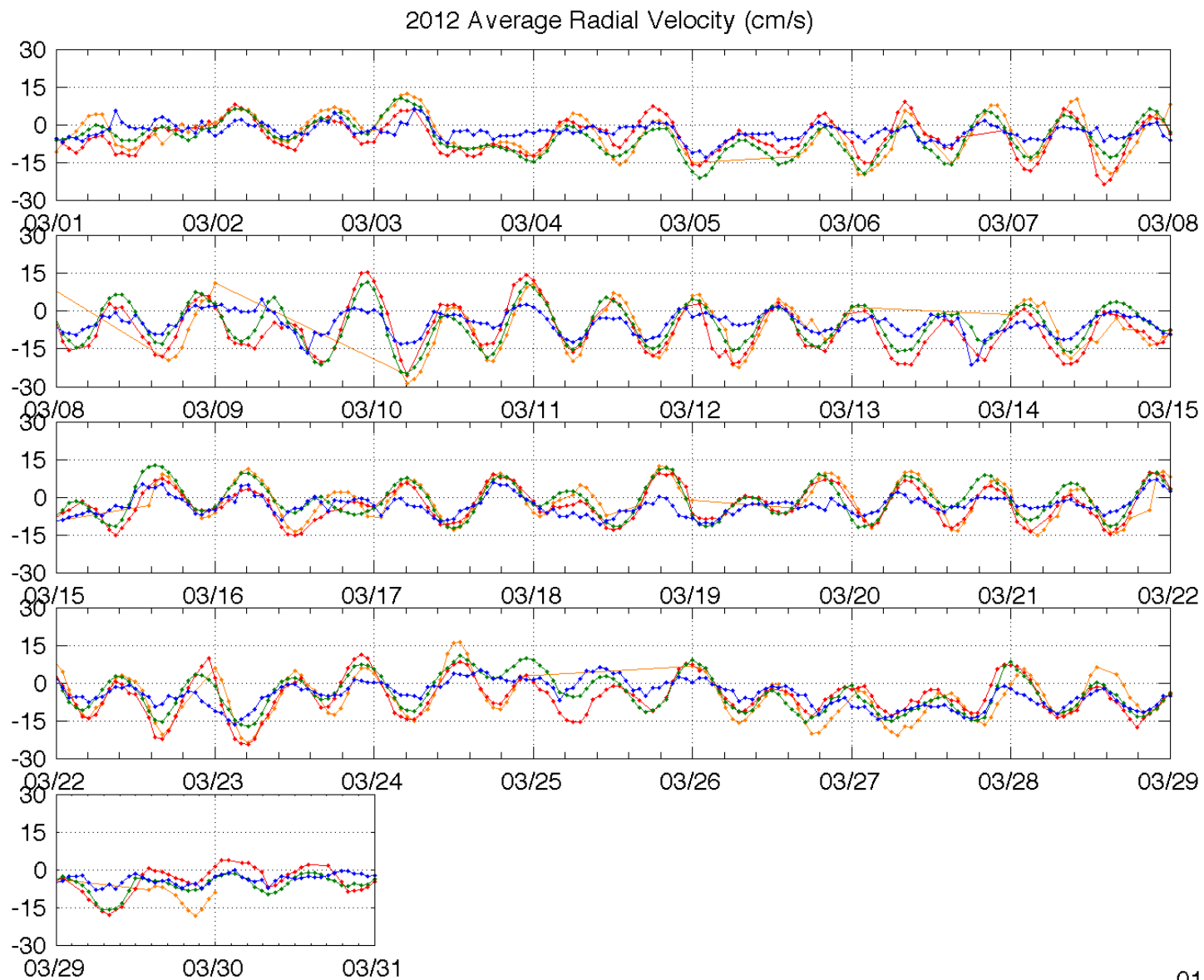


01/23/13

/home/hroarty/codar/BPU/average\_radial\_plots/wrapper\_avg\_rad\_vel\_monthly.m

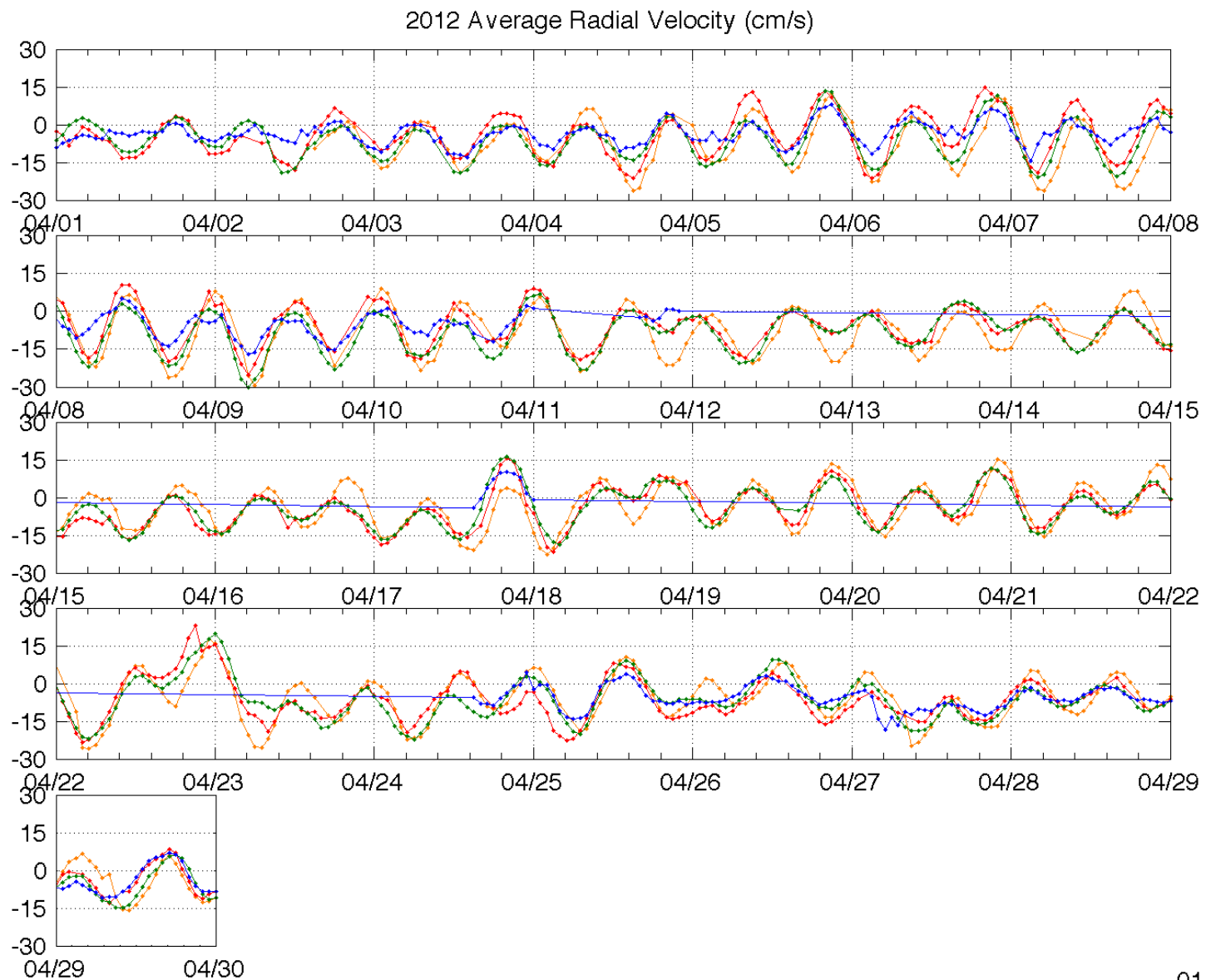
2012 Average Radial Velocity (cm/s)





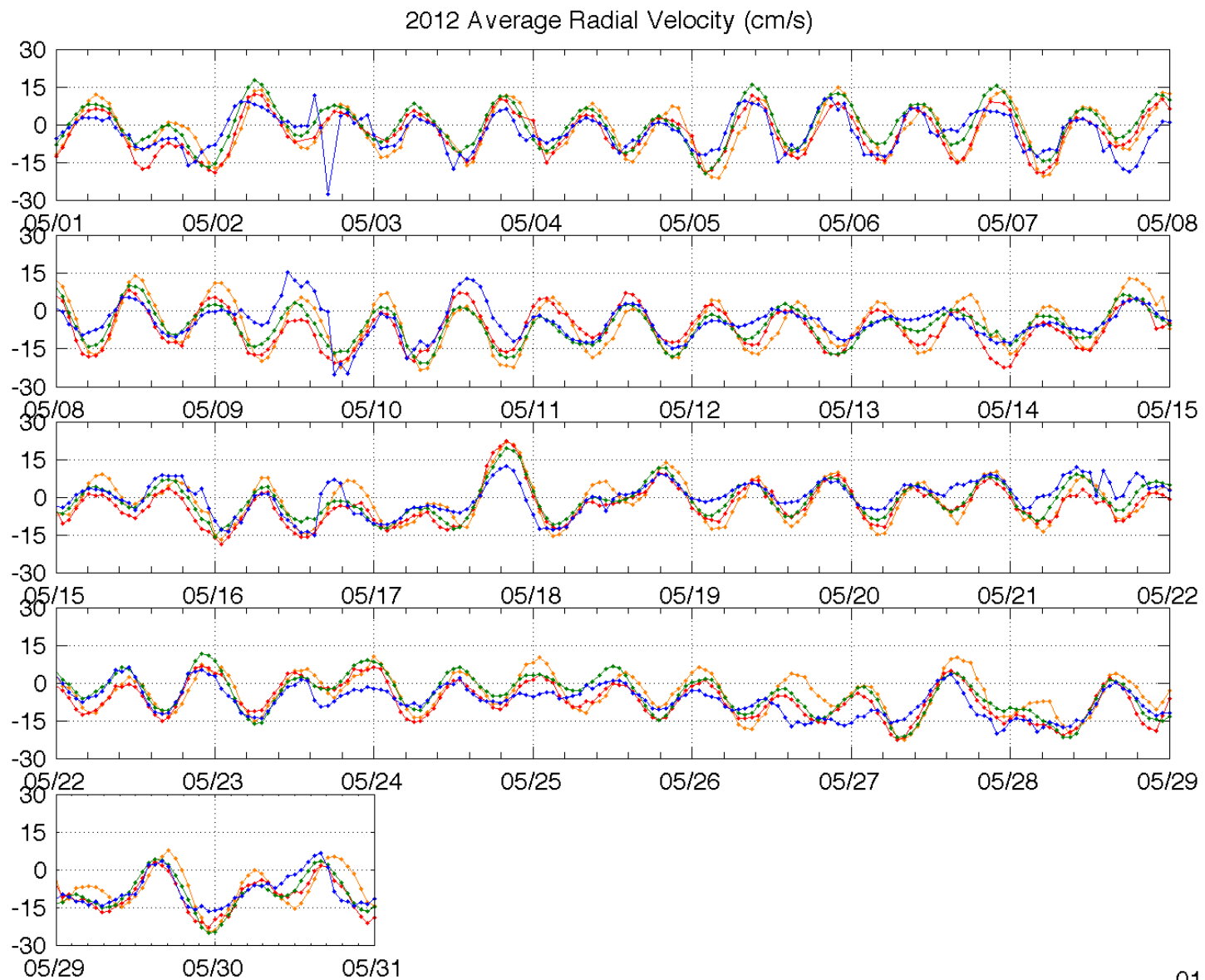
01/23/13

/home/hroarty/codar/BPU/average\_radial\_plots/wrapper\_avg\_rad\_vel\_monthly.m



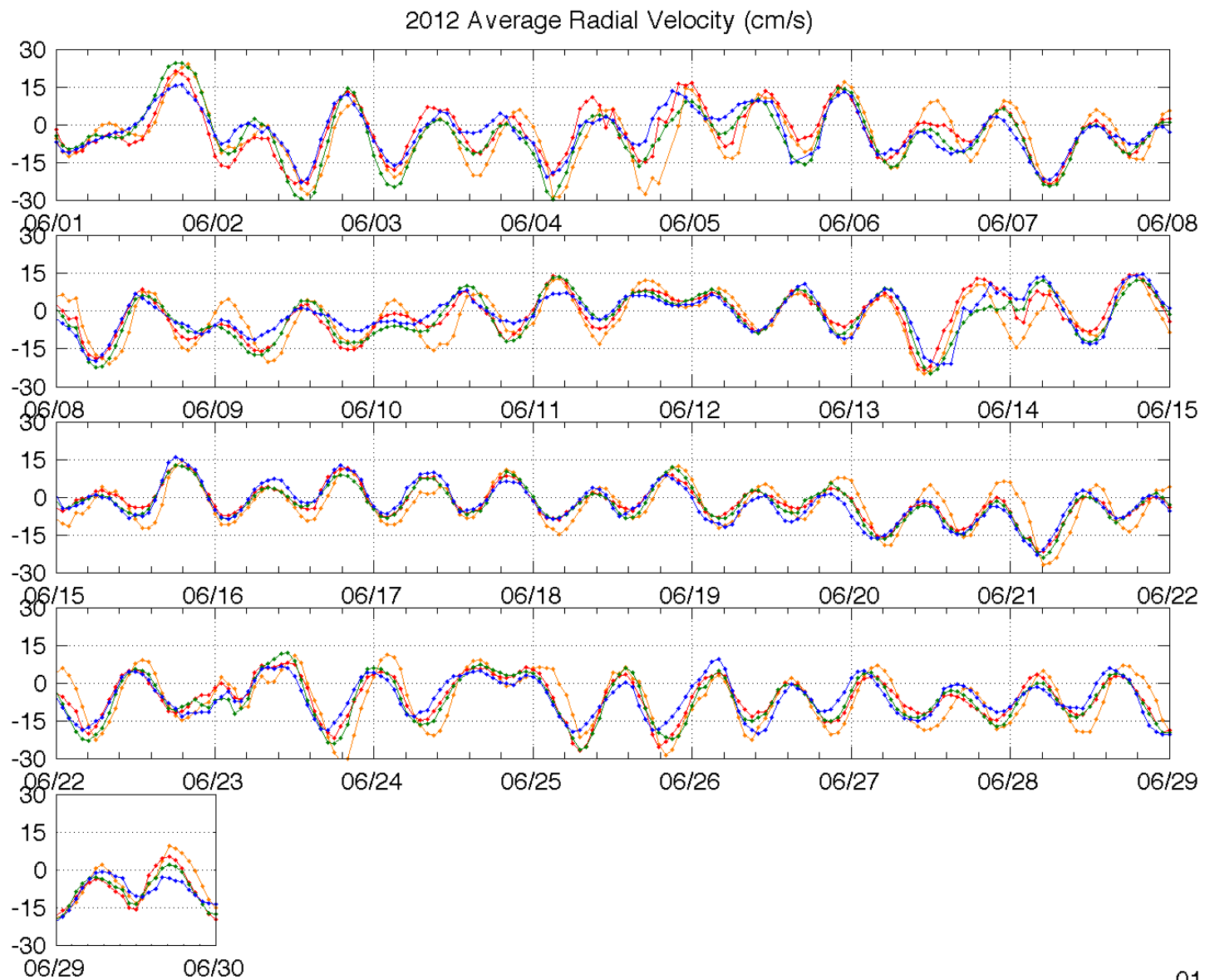
01/23/13

/home/hroarty/codar/BPU/average\_radial\_plots/wrapper\_avg\_rad\_vel\_monthly.m



01/23/13

/home/hroarty/codar/BPU/average\_radial\_plots/wrapper\_avg\_rad\_vel\_monthly.m



01/23/13

/home/hroarty/codar/BPU/average\_radial\_plots/wrapper\_avg\_rad\_vel\_monthly.m

Section 07 (June to October):

**BPU**

# Average Radial Velocity

June 1, 2012 to October 31, 2012

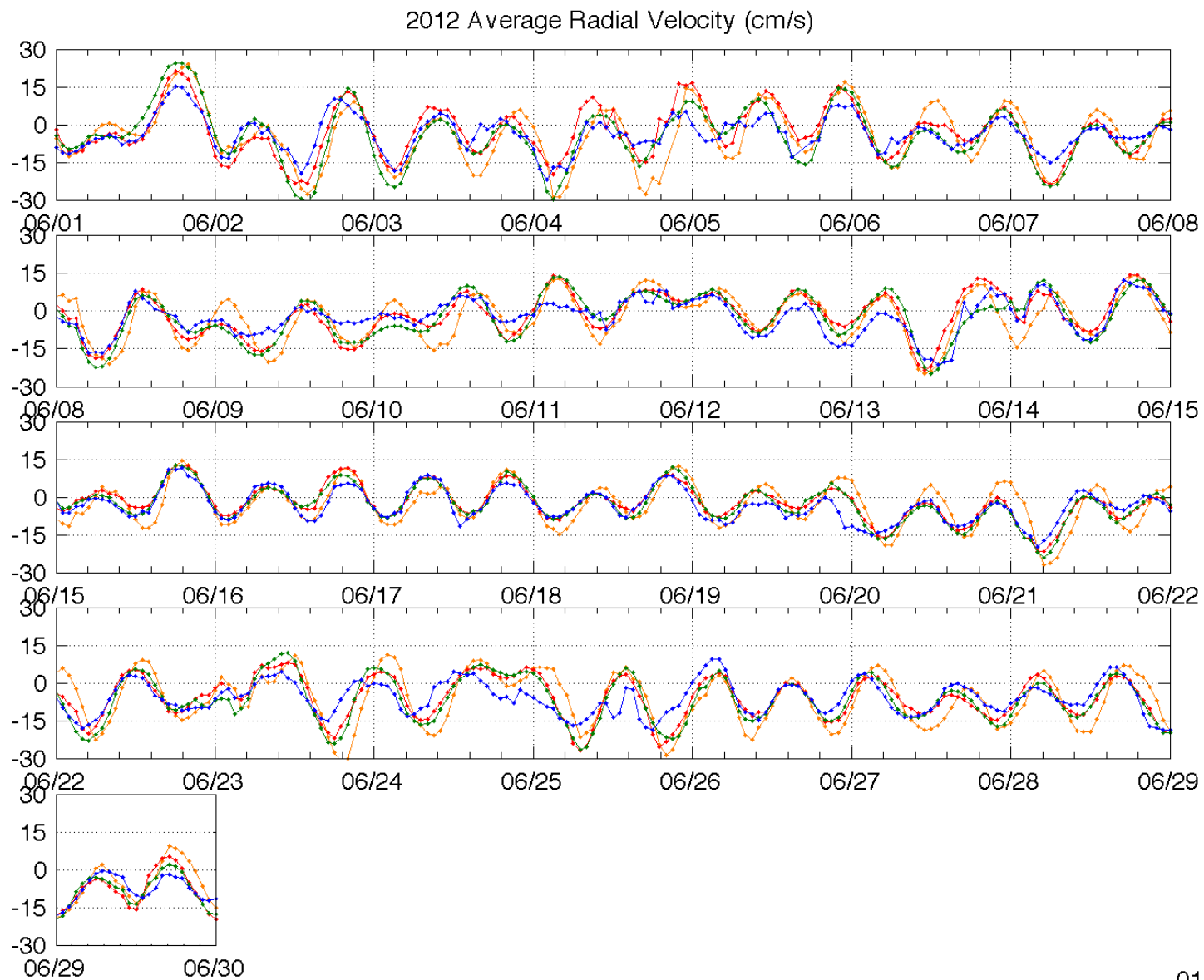
BRNT - RDLi

BRMR- RDLi

RATH- RDLi

WOOD- RDLi

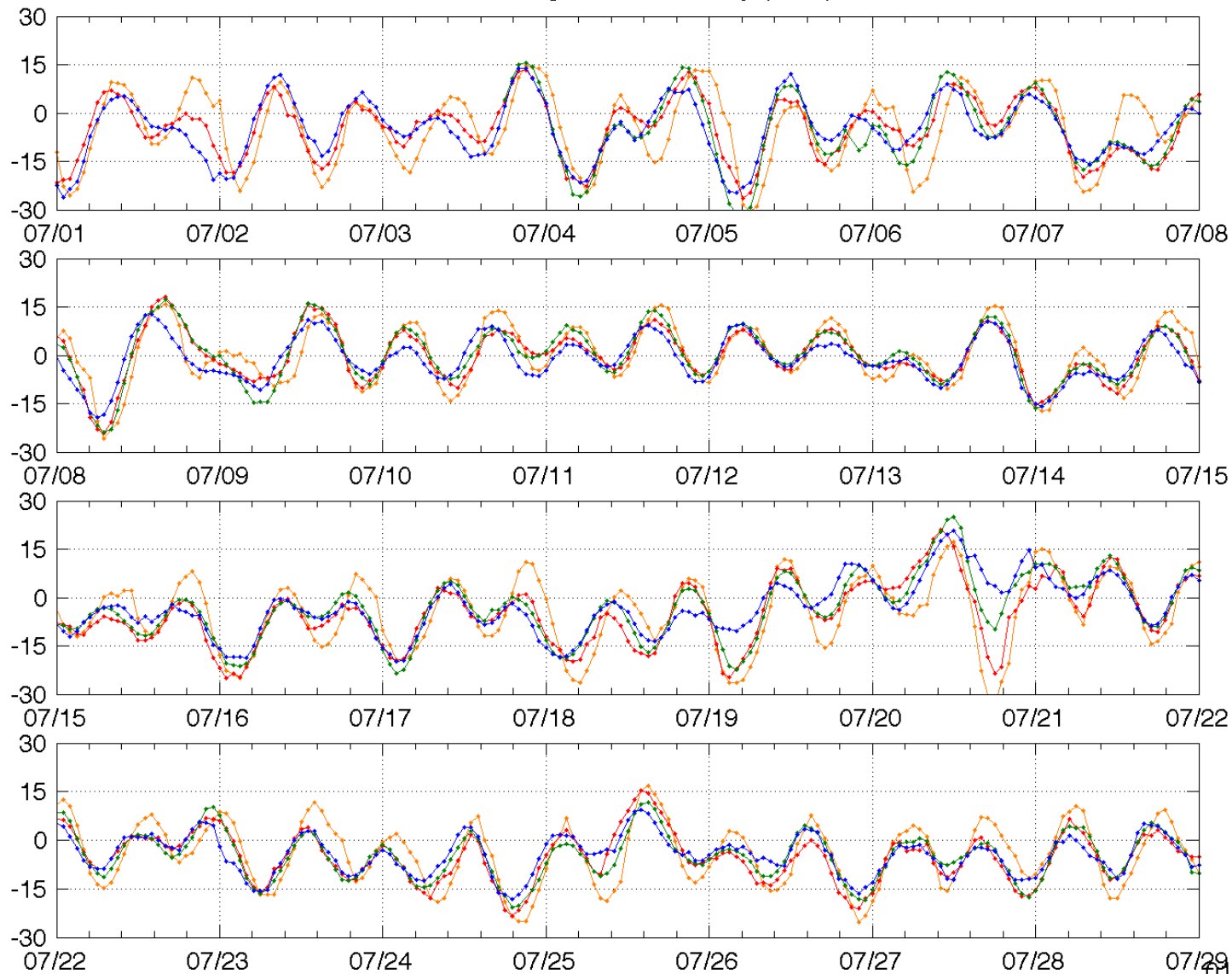


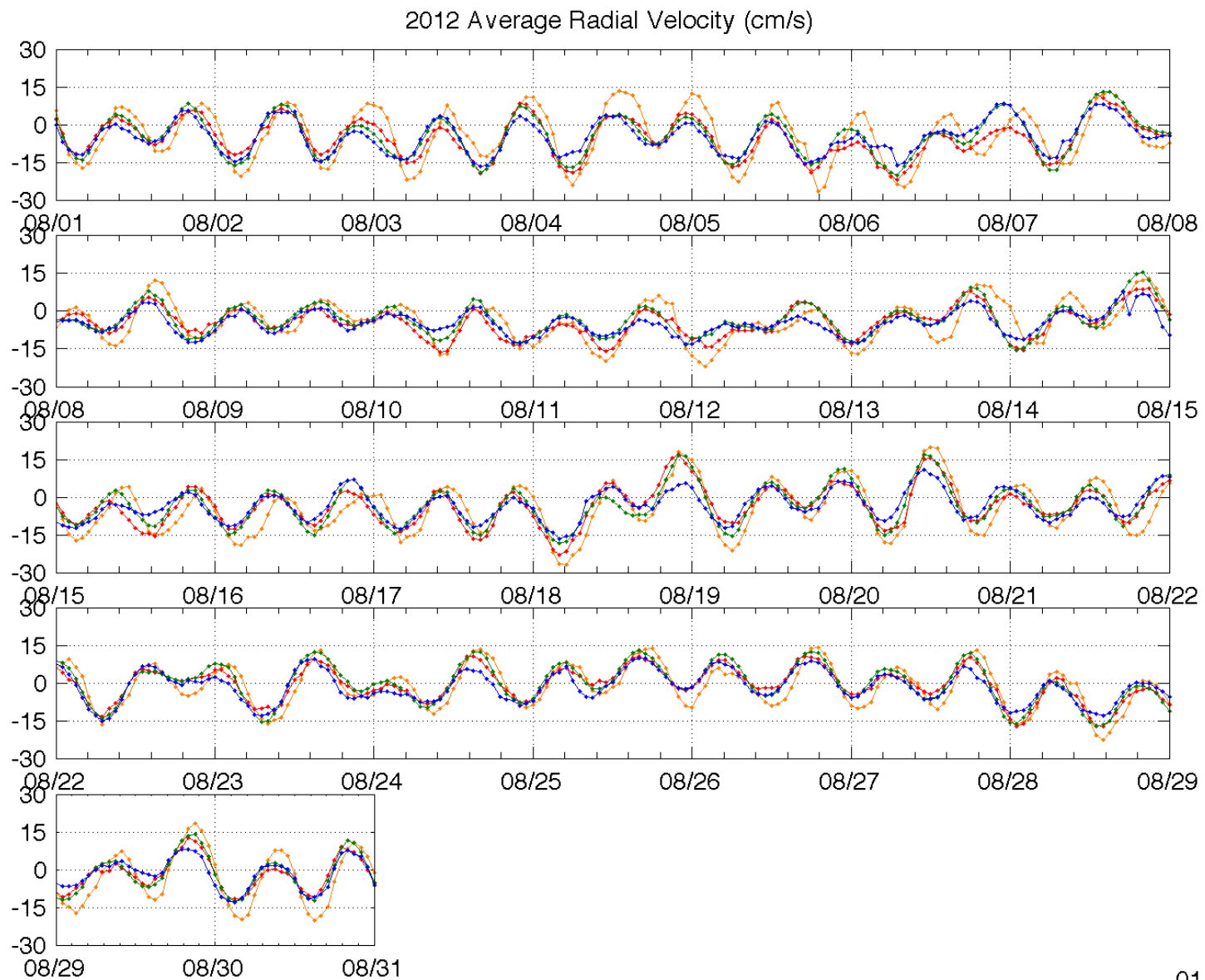


01/23/13

/home/hroarty/codar/BPU/average\_radial\_plots/wrapper\_avg\_rad\_vel\_monthly\_June\_on.m

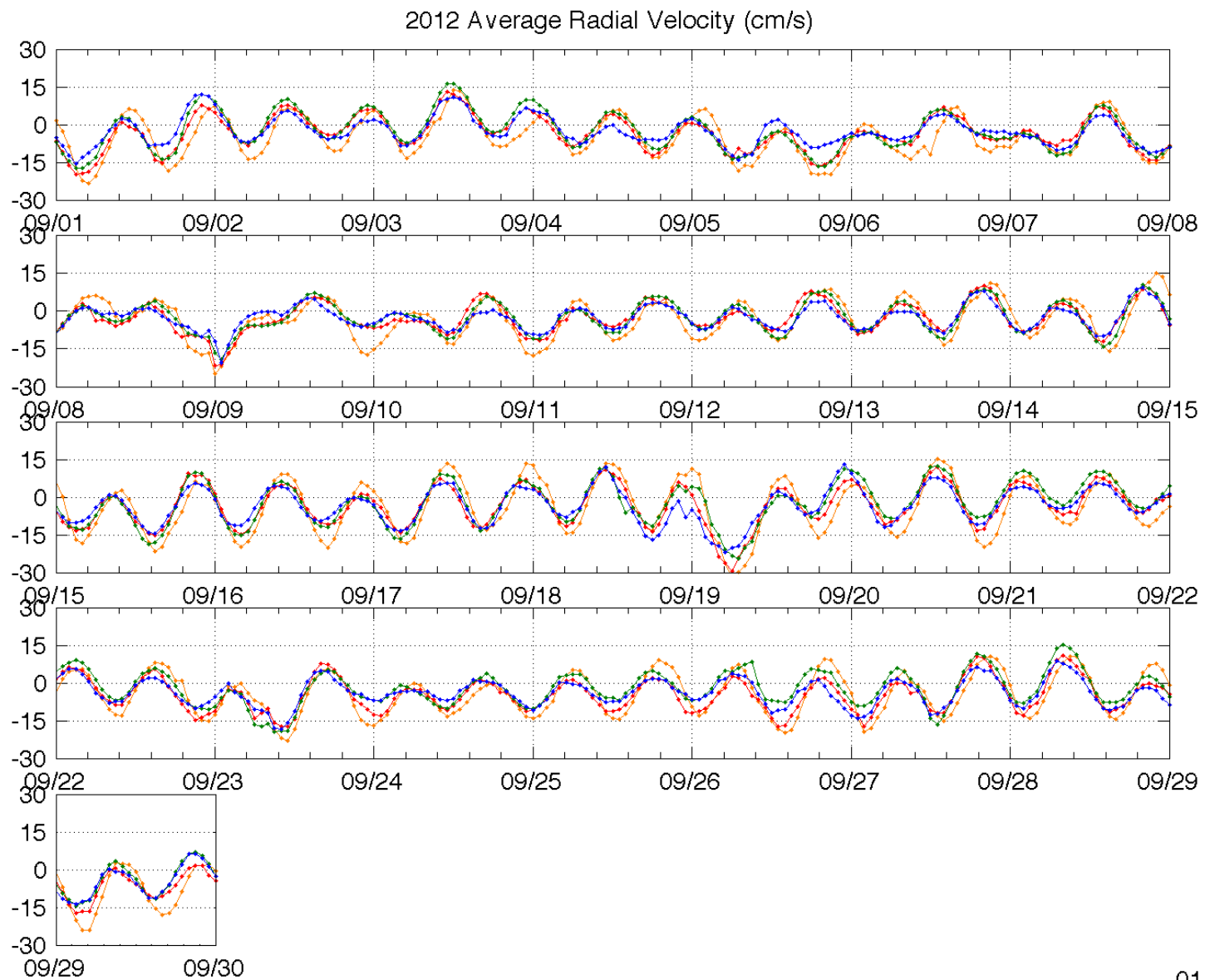
2012 Average Radial Velocity (cm/s)





01/23/13

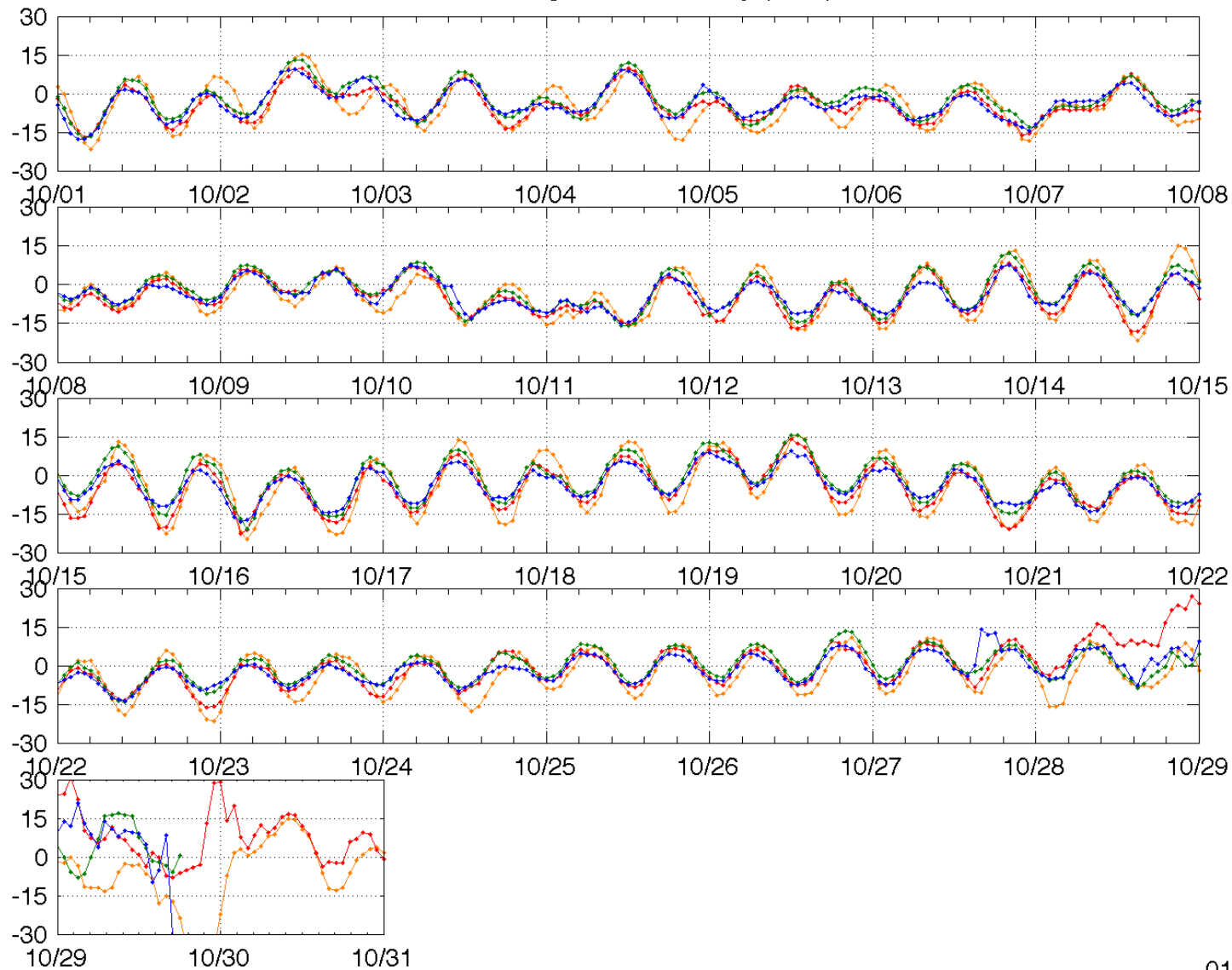
/home/hroarty/codar/BPU/average\_radial\_plots/wrapper\_avg\_rad\_vel\_monthly\_June\_on.m



01/23/13

/home/hroarty/codar/BPU/average\_radial\_plots/wrapper\_avg\_rad\_vel\_monthly\_June\_on.m

2012 Average Radial Velocity (cm/s)



01/23/13

/home/hroarty/codar/BPU/average\_radial\_plots/wrapper\_avg\_rad\_vel\_monthly\_June\_on.m

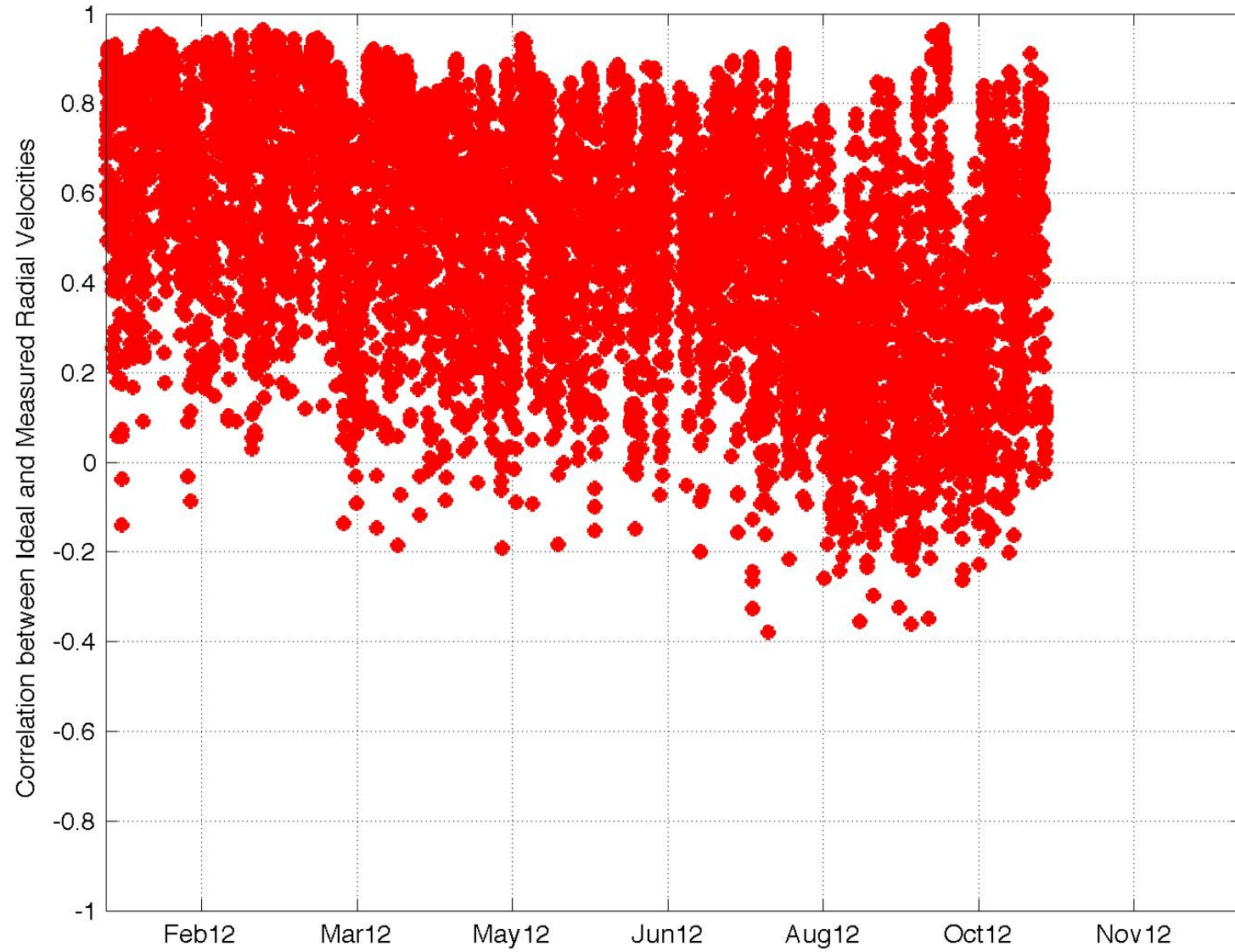
Section 08:

**BPU**

# **Ideal and Measured Radial Correlation Time Series Plots**

January 1, 2012 to December 31, 2012

# BRMR Ideal/Measured Radial Correlation 2012

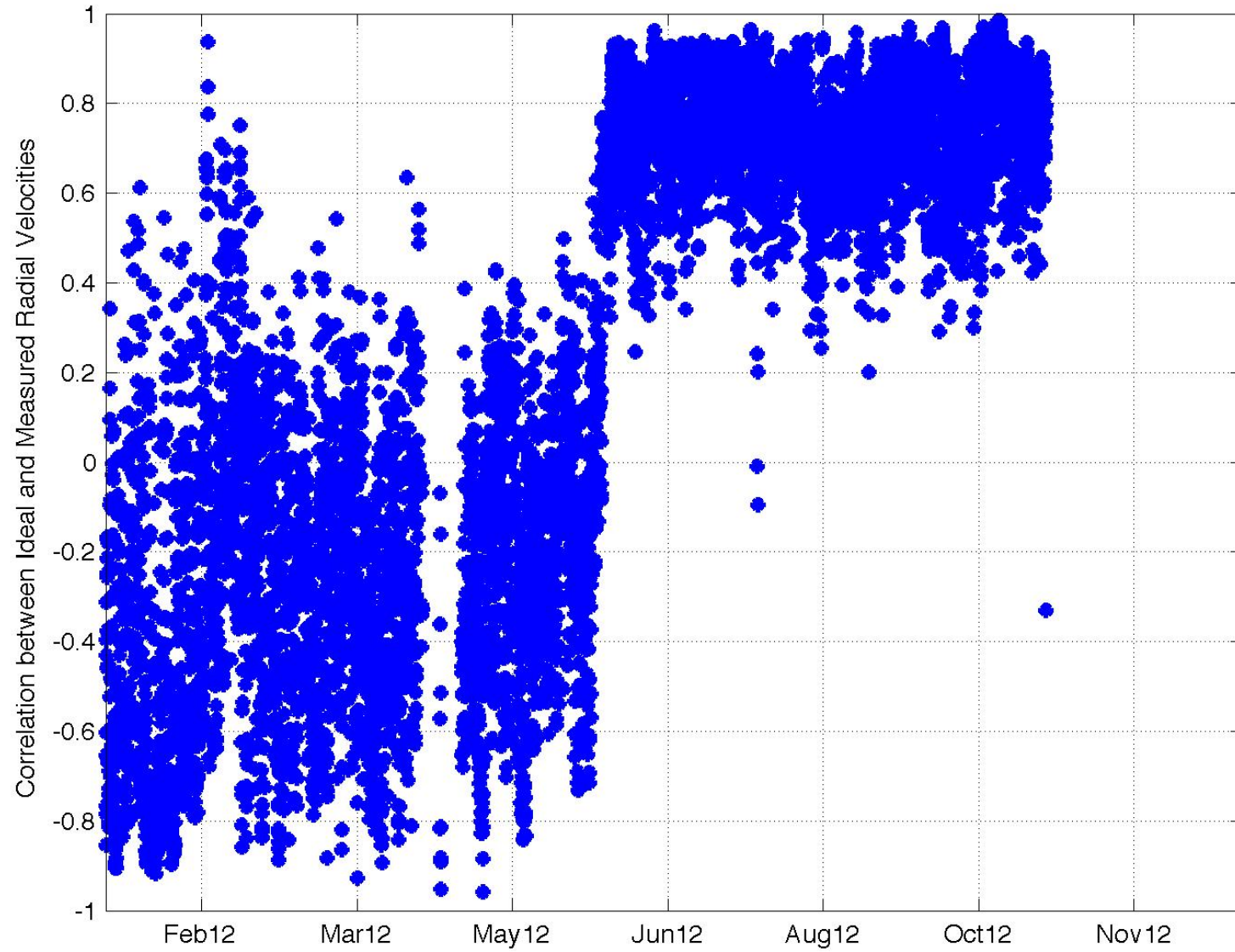


01/28/13

Volumes/COLINUSB/Scripts/corrIdealMeasRadials.m



# BRNT Ideal/Measured Radial Correlation 2012

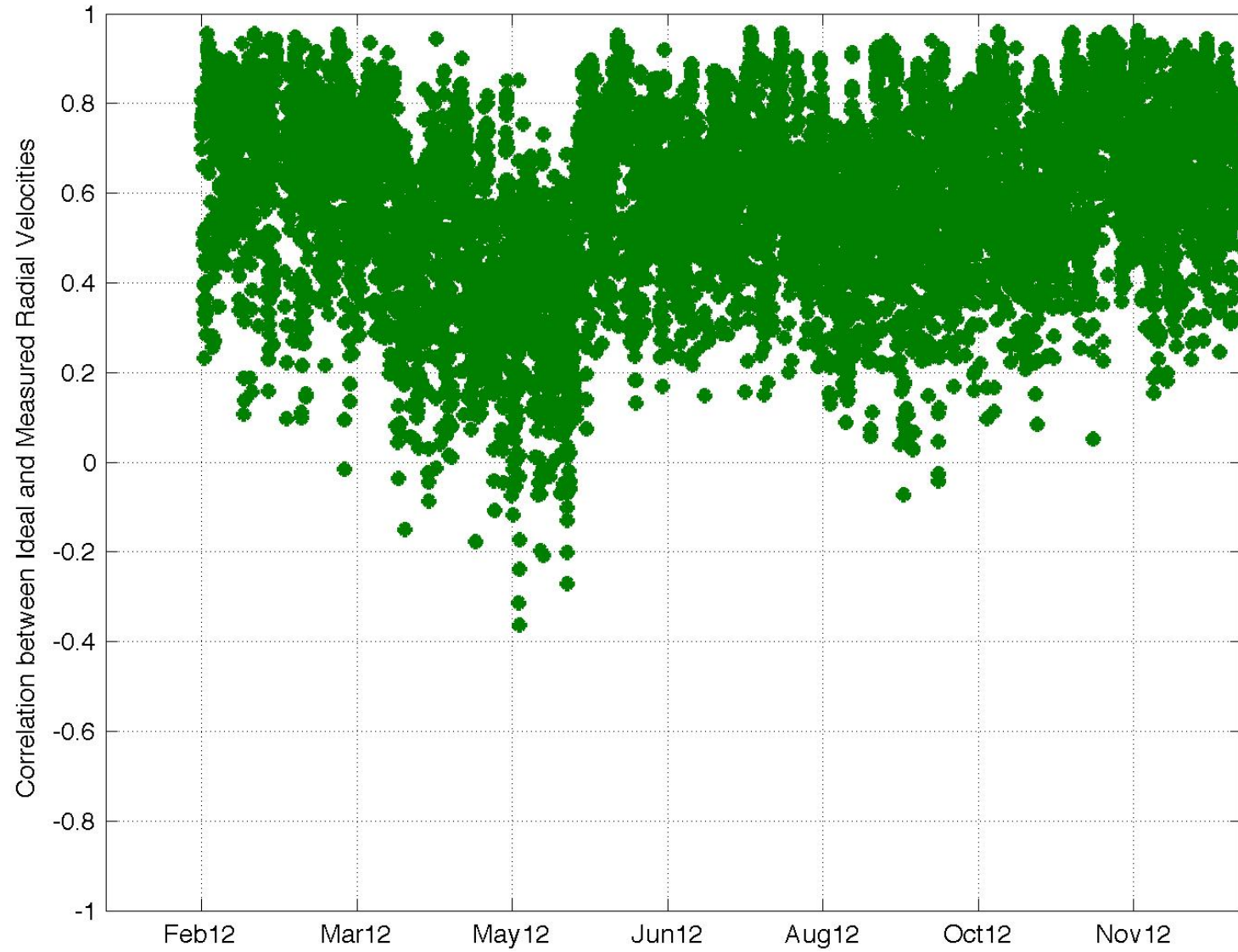


01/28/13

Volumes/COLINUSB/Scripts/corrIdealMeasRadials.m



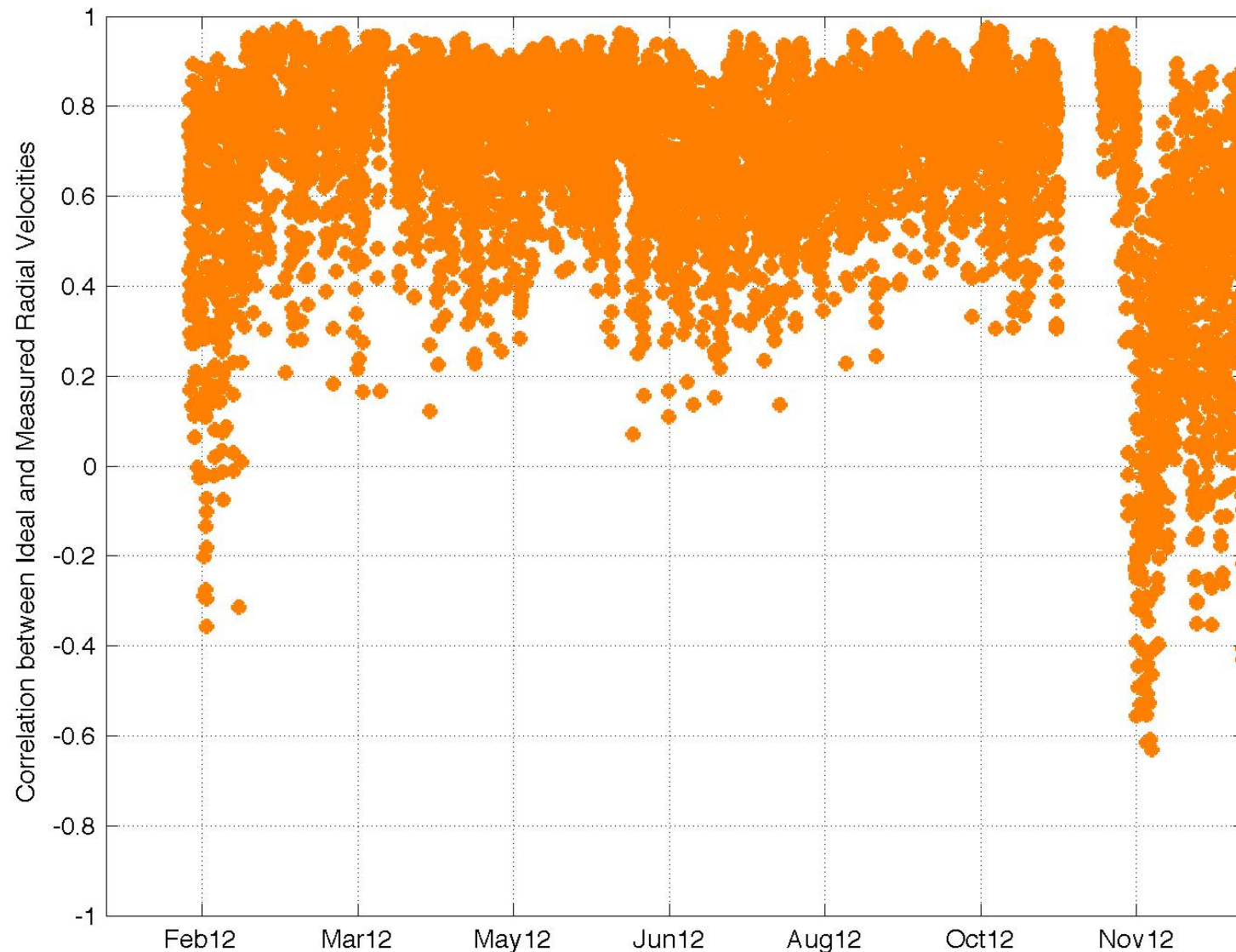
# RATH Ideal/Measured Radial Correlation 2012



01/28/13

Volumes/COLINUSB/Scripts/corrIdealMeasRadials.m

# WOOD Ideal/Measured Radial Correlation 2012



01/28/13

Volumes/COLINUSB/Scripts/corrIdealMeasRadials.m

Section 09:

**BPU**

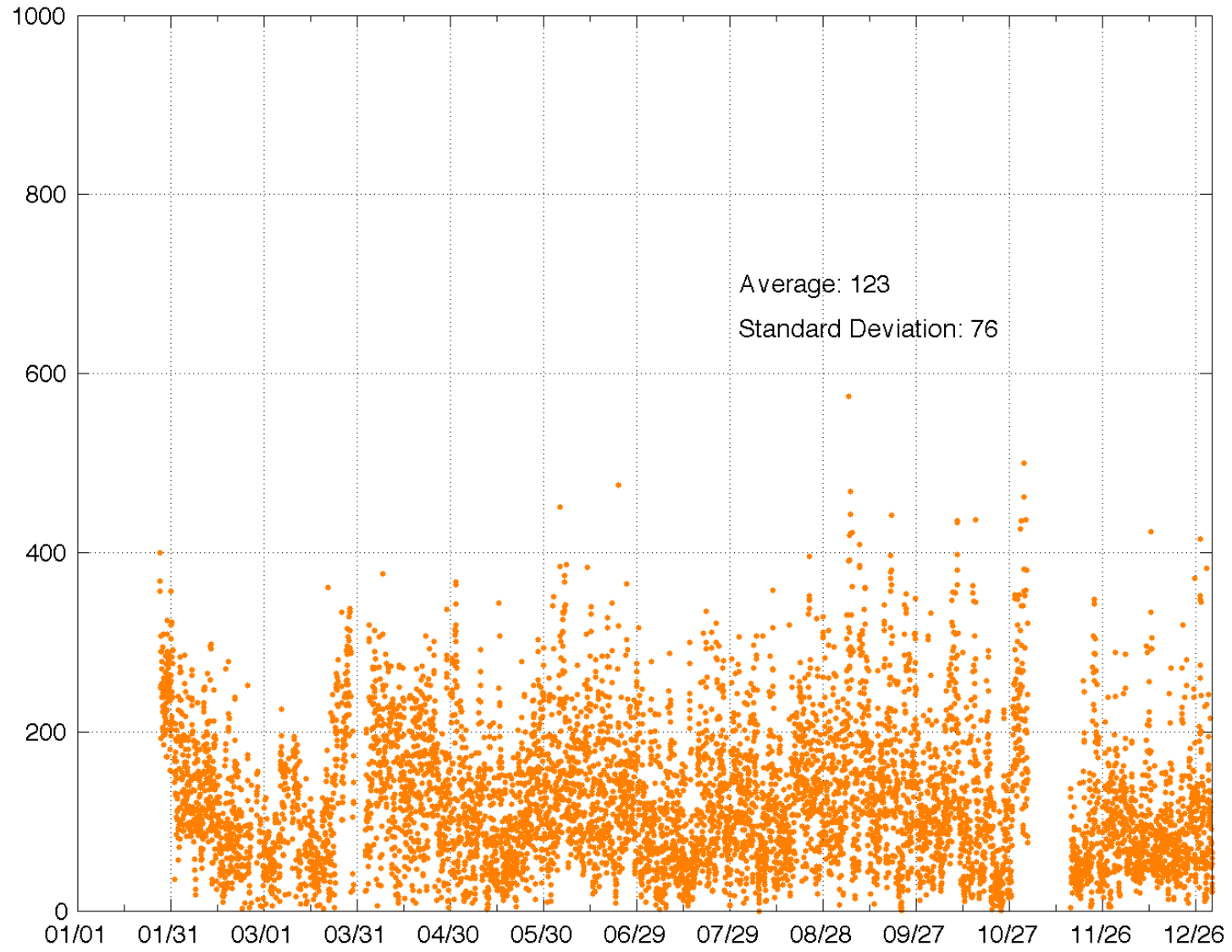
**Ideal Radials Filtered by Land Mask**

January 1, 2012 to December 31, 2012

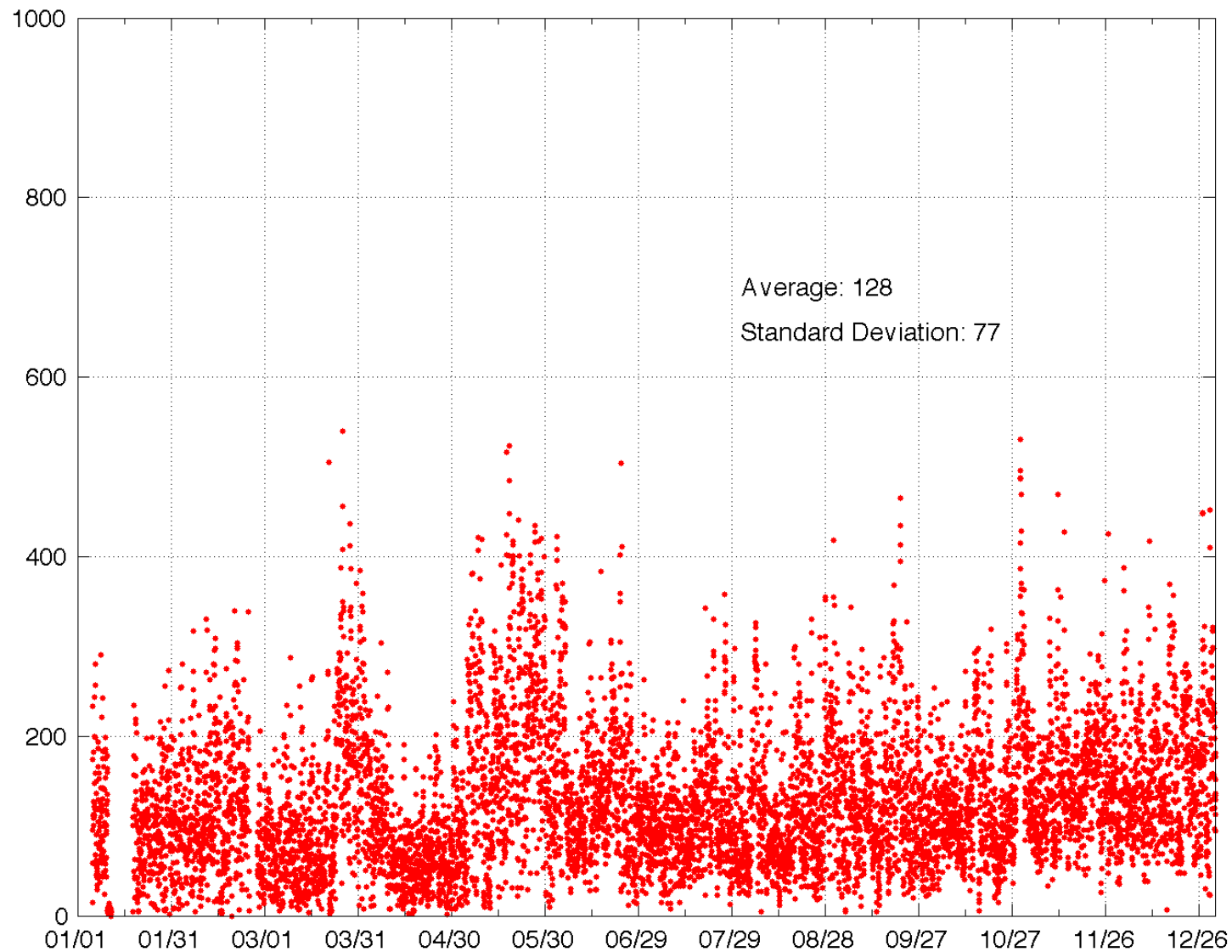
**NUMBER**

**IDEAL RADIALS FILTERED BY LAND  
MASK**

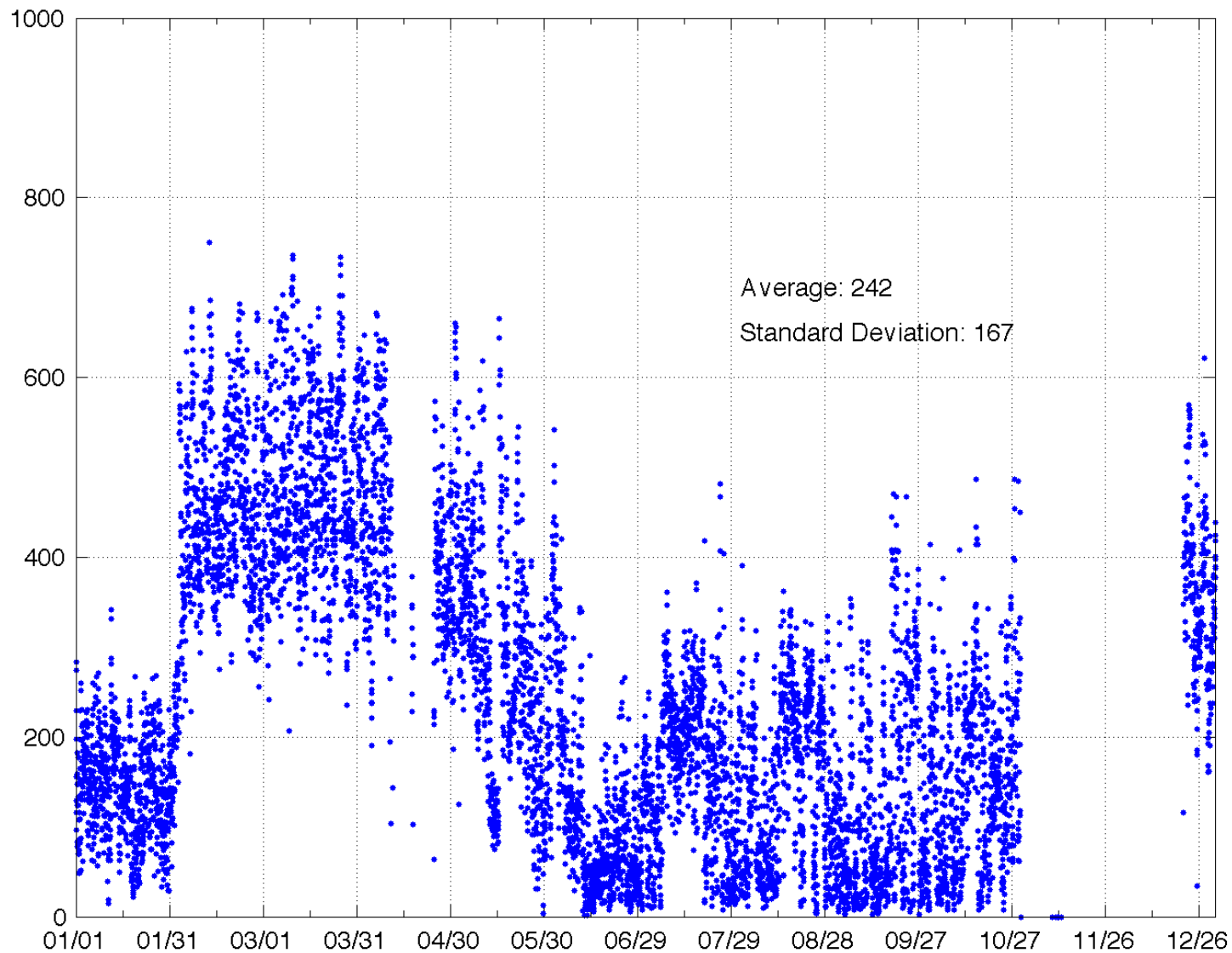
2012 Number of Radials on Land for Site WOOD



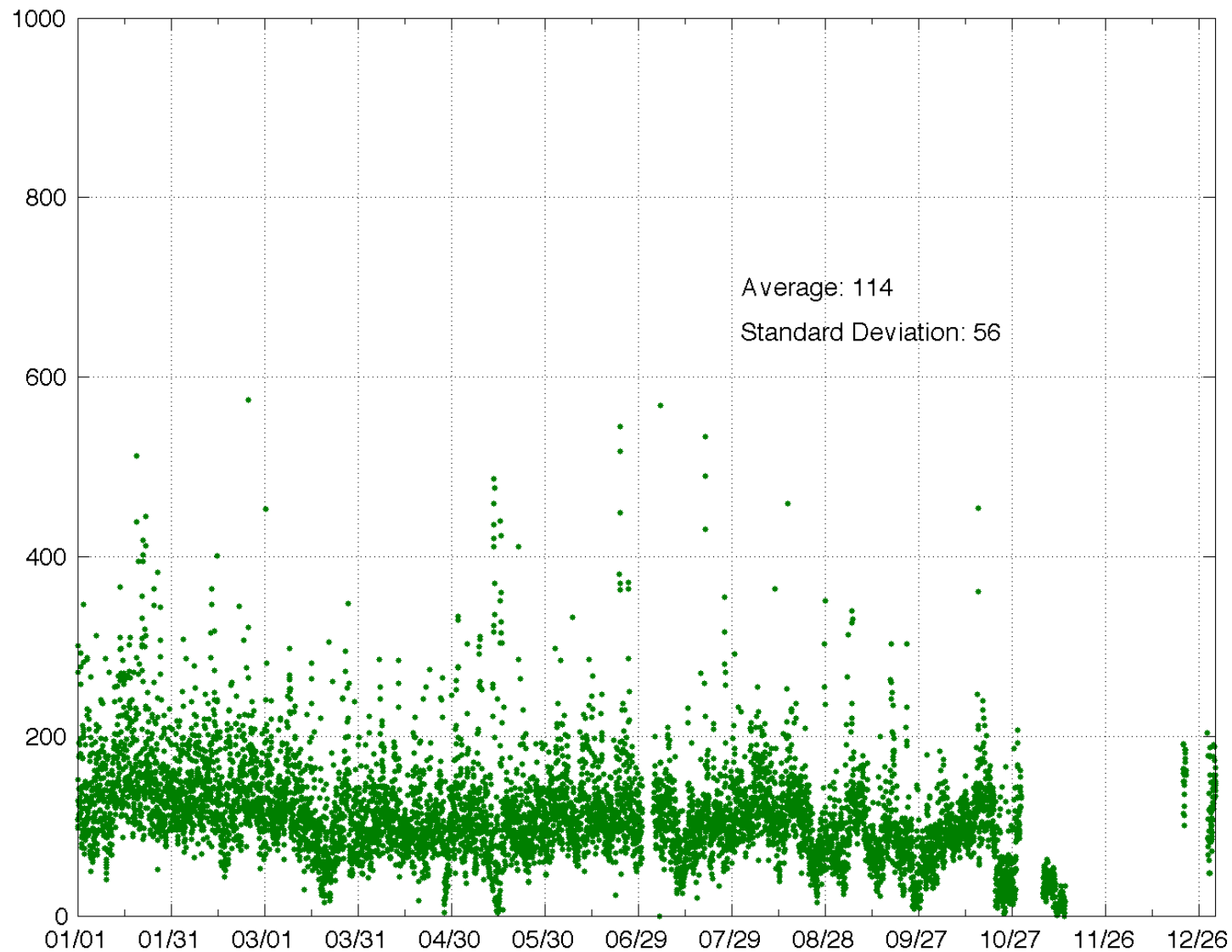
2012 Number of Radials on Land for Site RATH



2012 Number of Radials on Land for Site BRNT



2012 Number of Radials on Land for Site BRMR

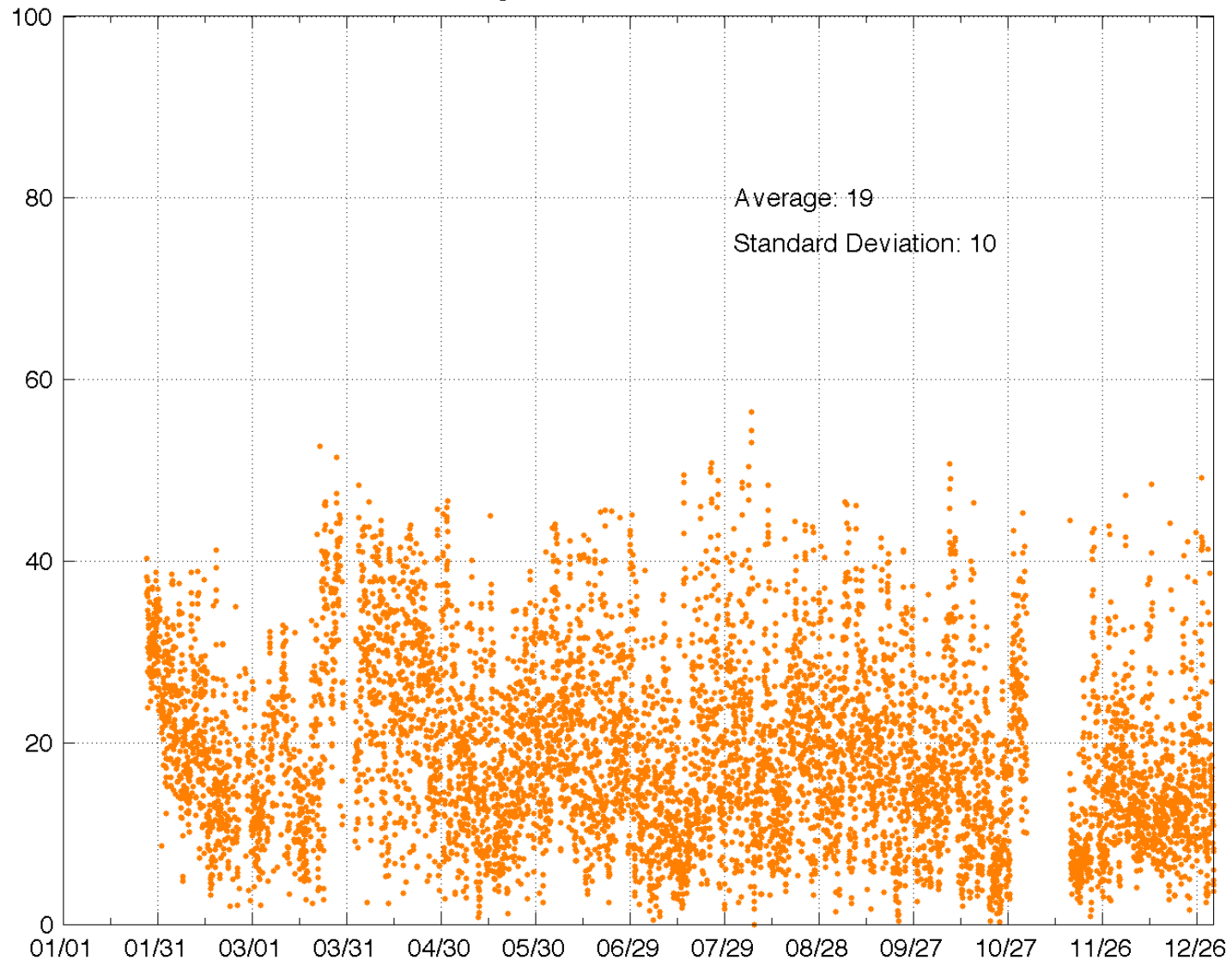




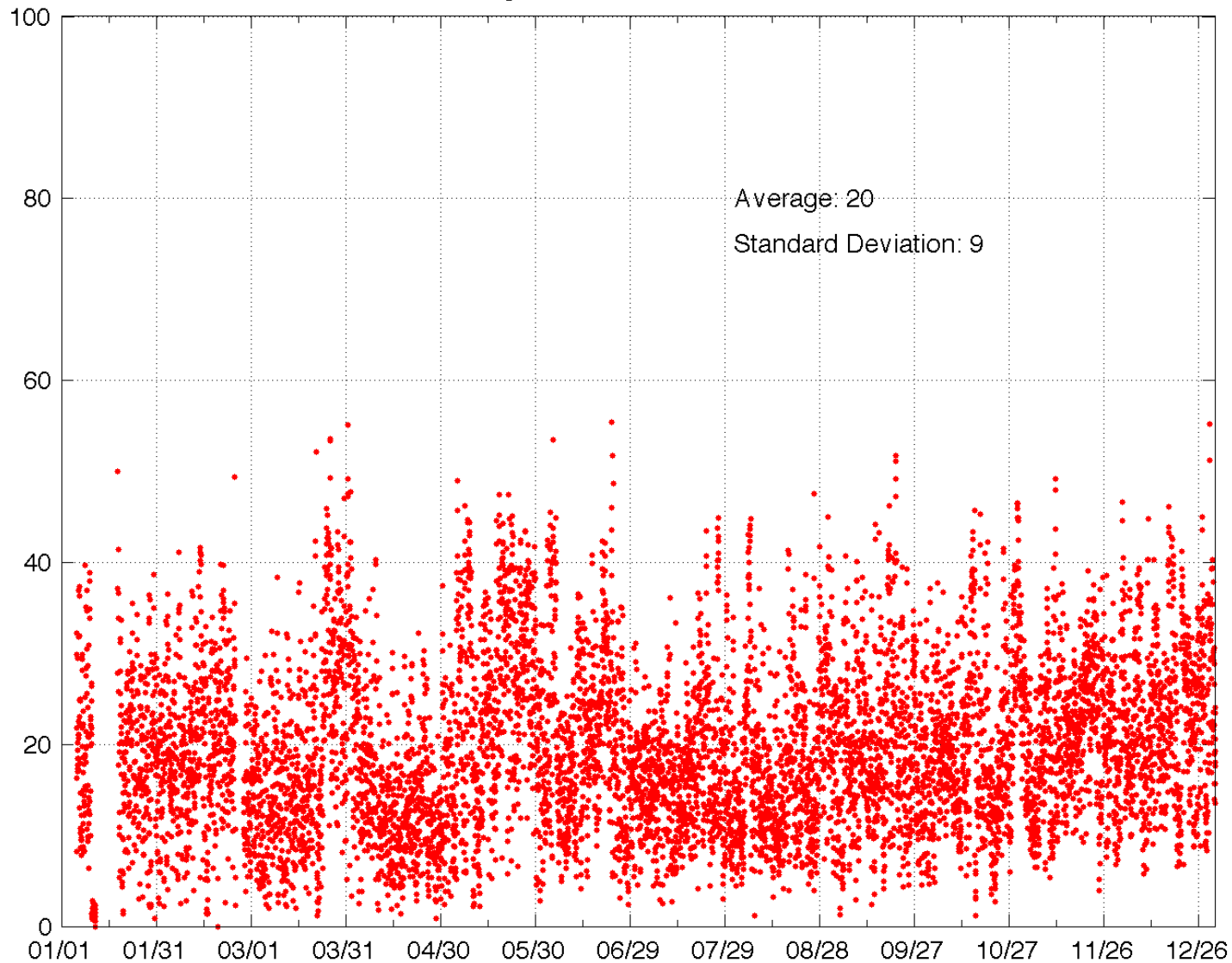
**PERCENTAGE**

**IDEAL RADIALS FILTERED BY LAND  
MASK**

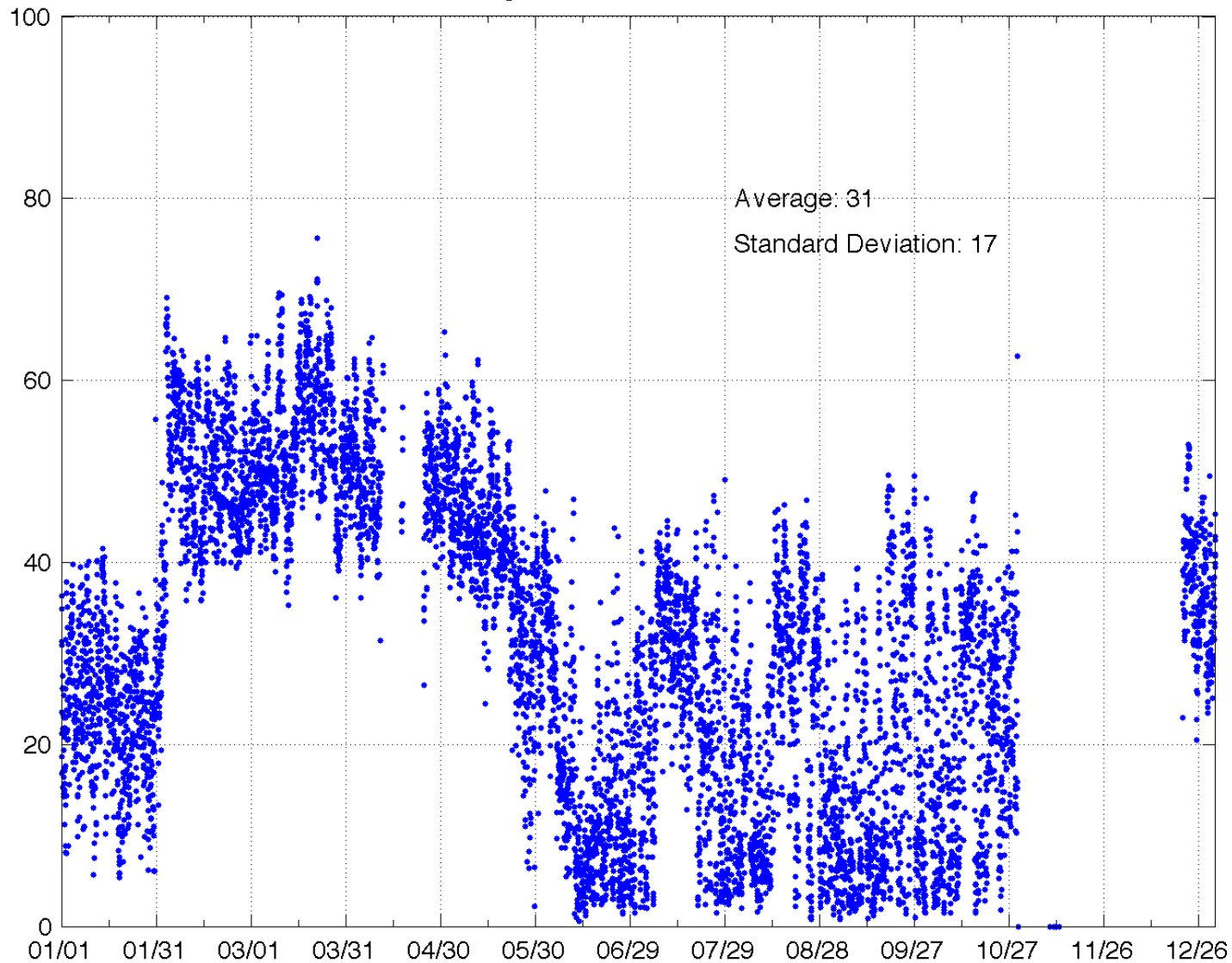
2012 Percentage of Radials on Land for Site WOOD



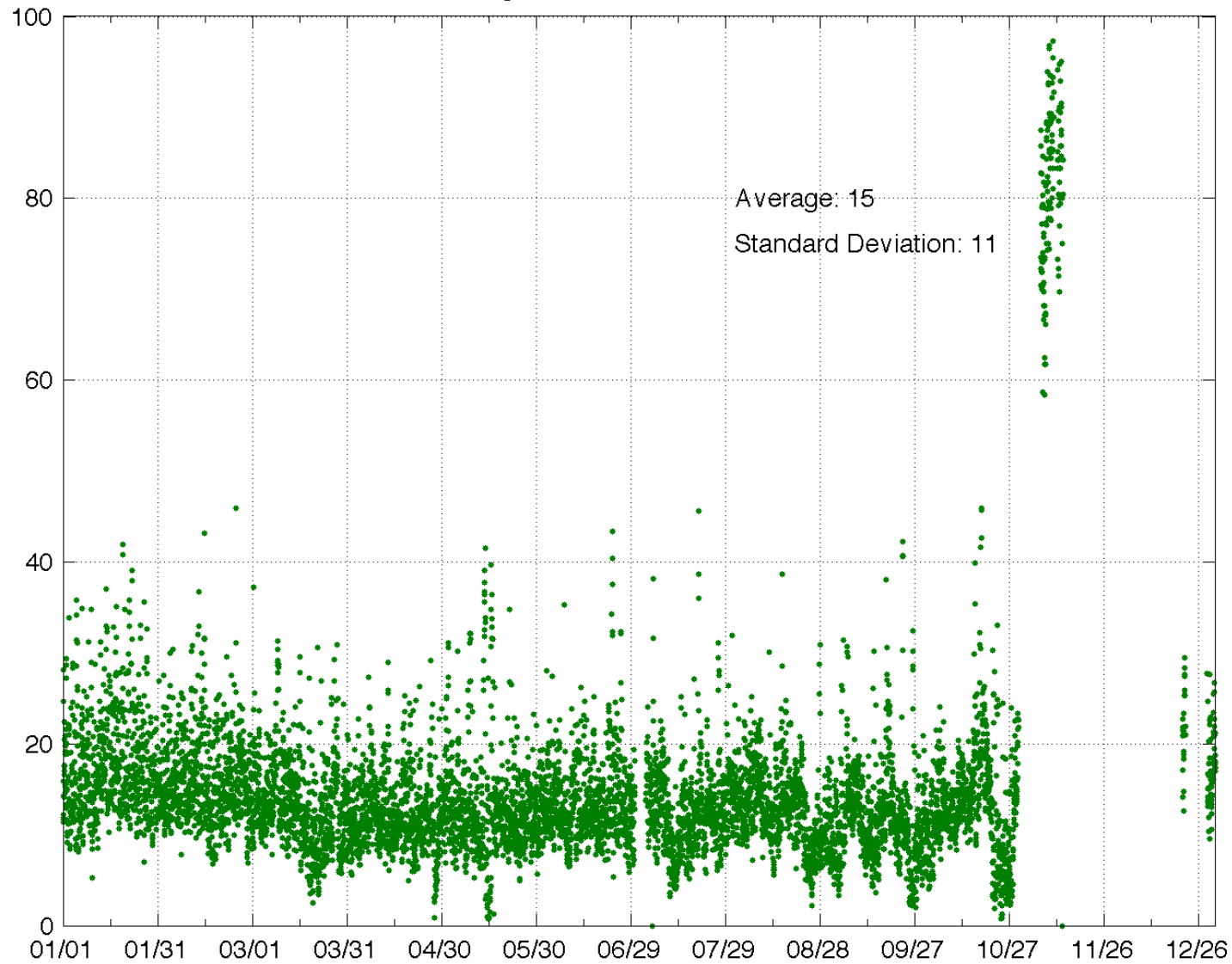
2012 Percentage of Radials on Land for Site RATH



2012 Percentage of Radials on Land for Site BRNT



2012 Percentage of Radials on Land for Site BRMR

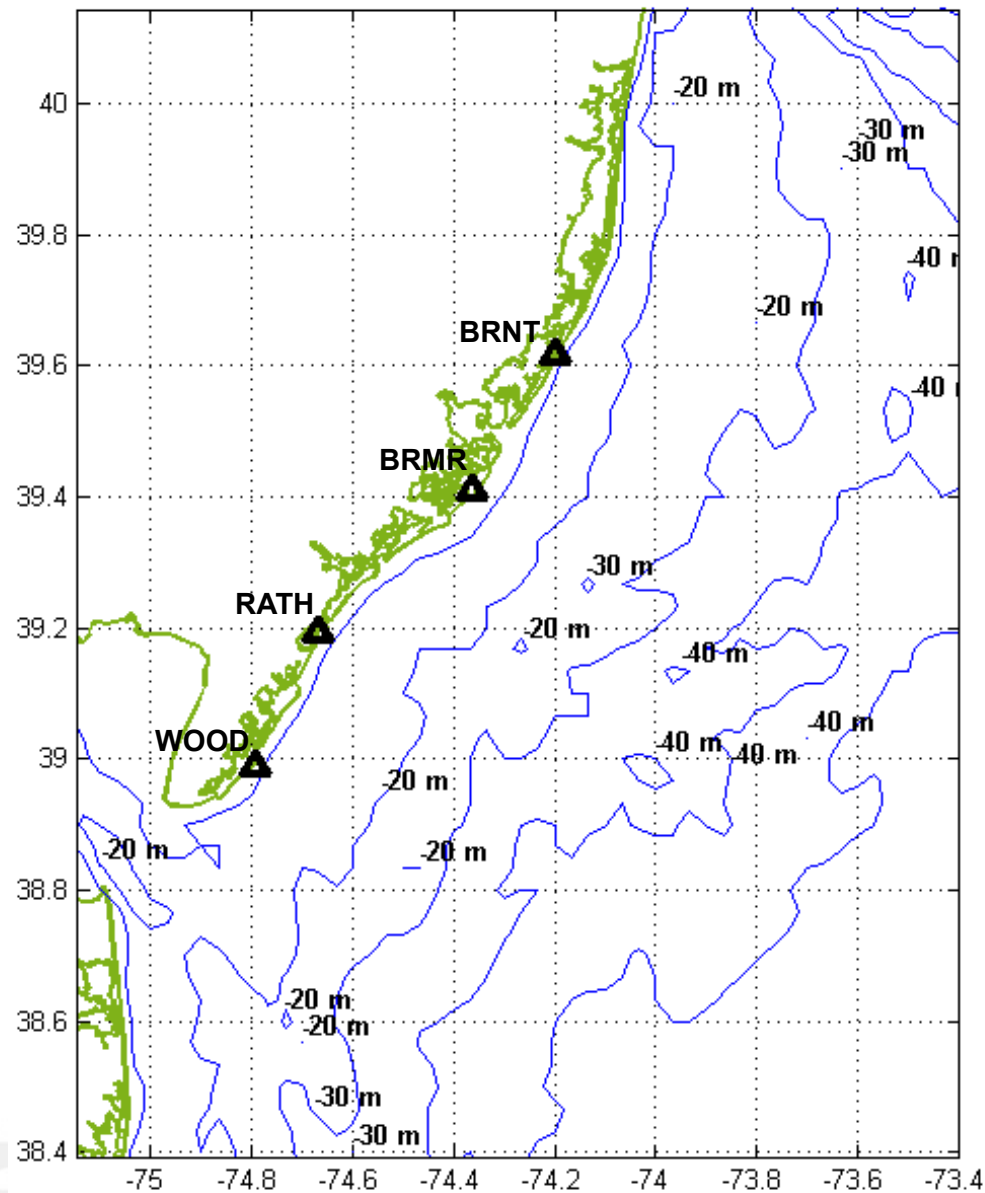


Section 10:

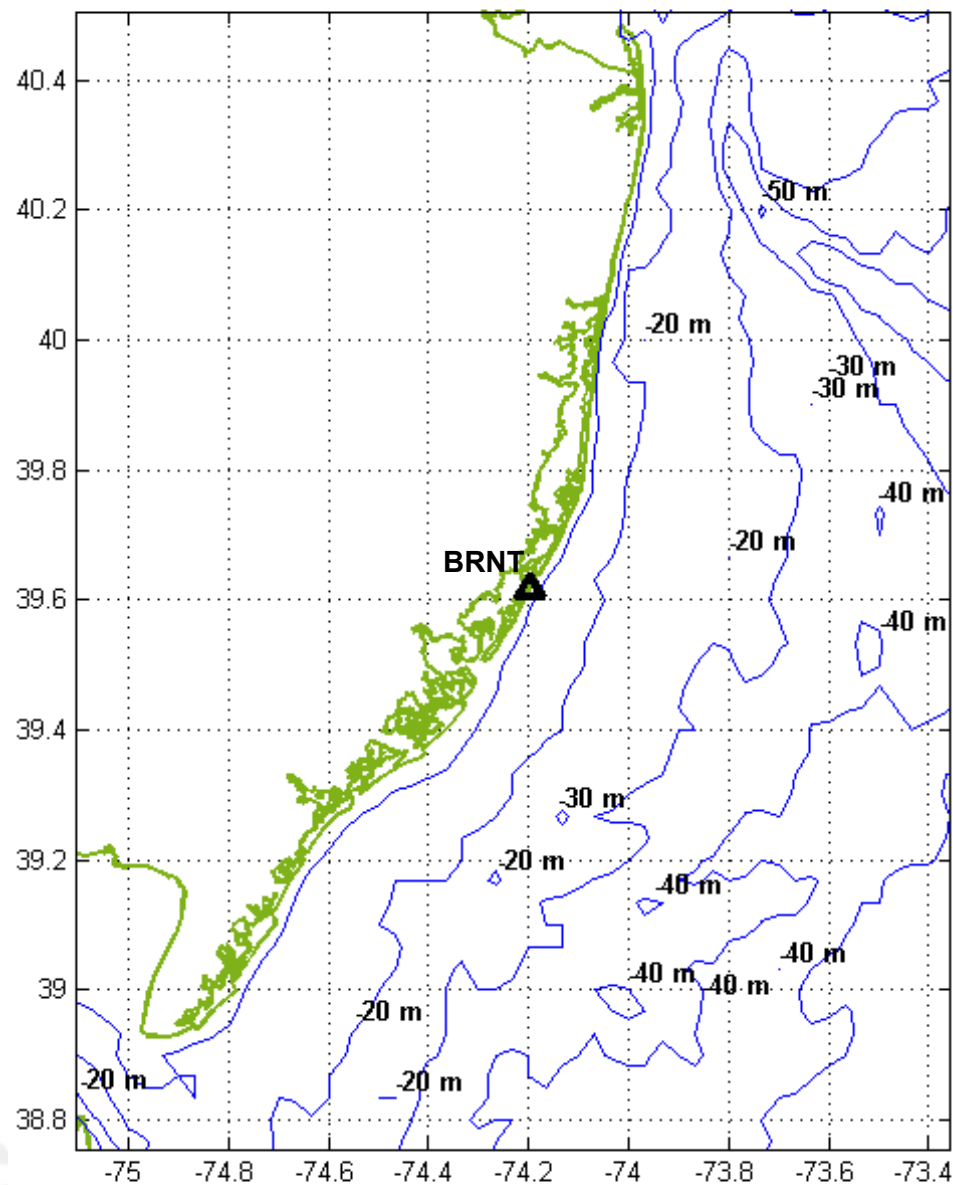
# BPU Site Locations with Bathymetry Maps



4 BPU Site Locations with Bathymetry

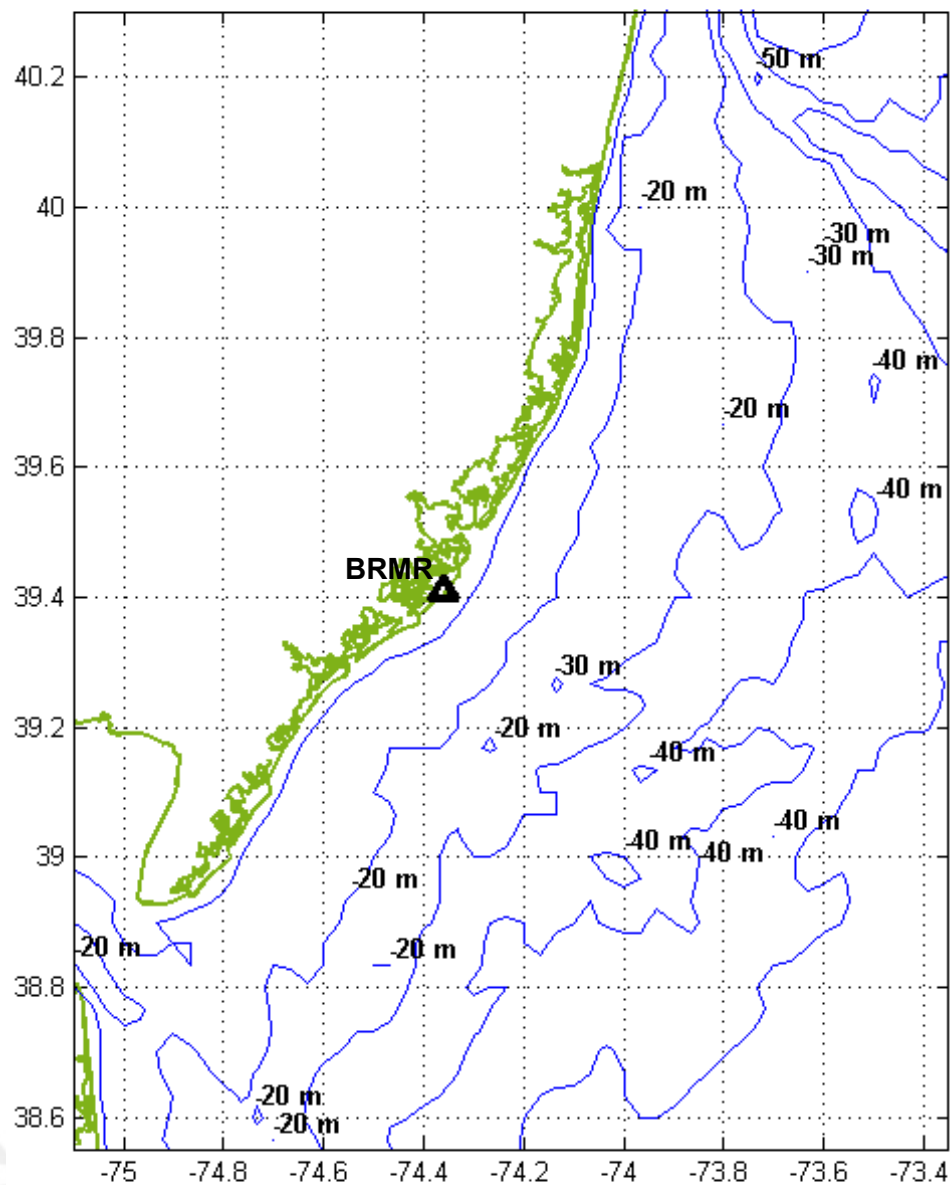


BPU BRNT Location with Bathymetry

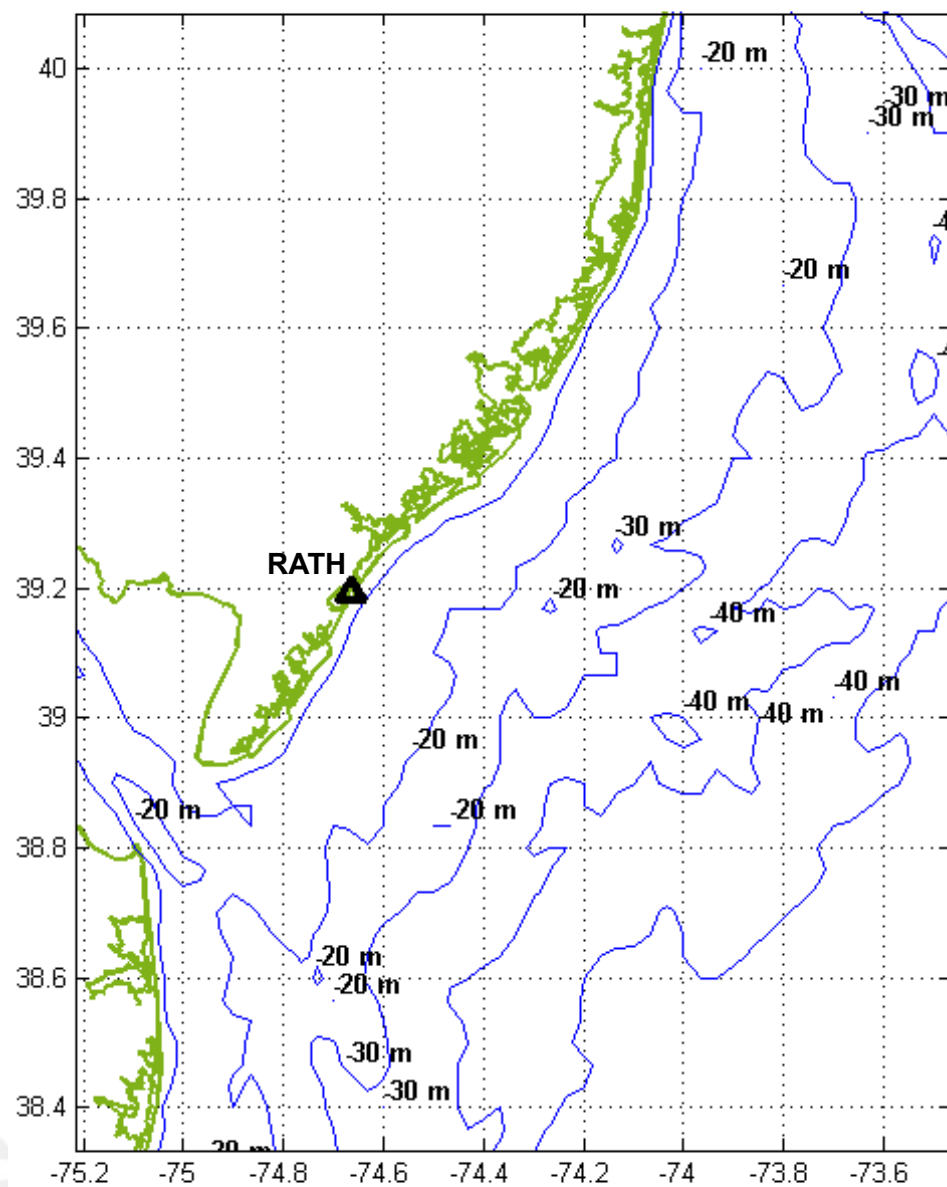




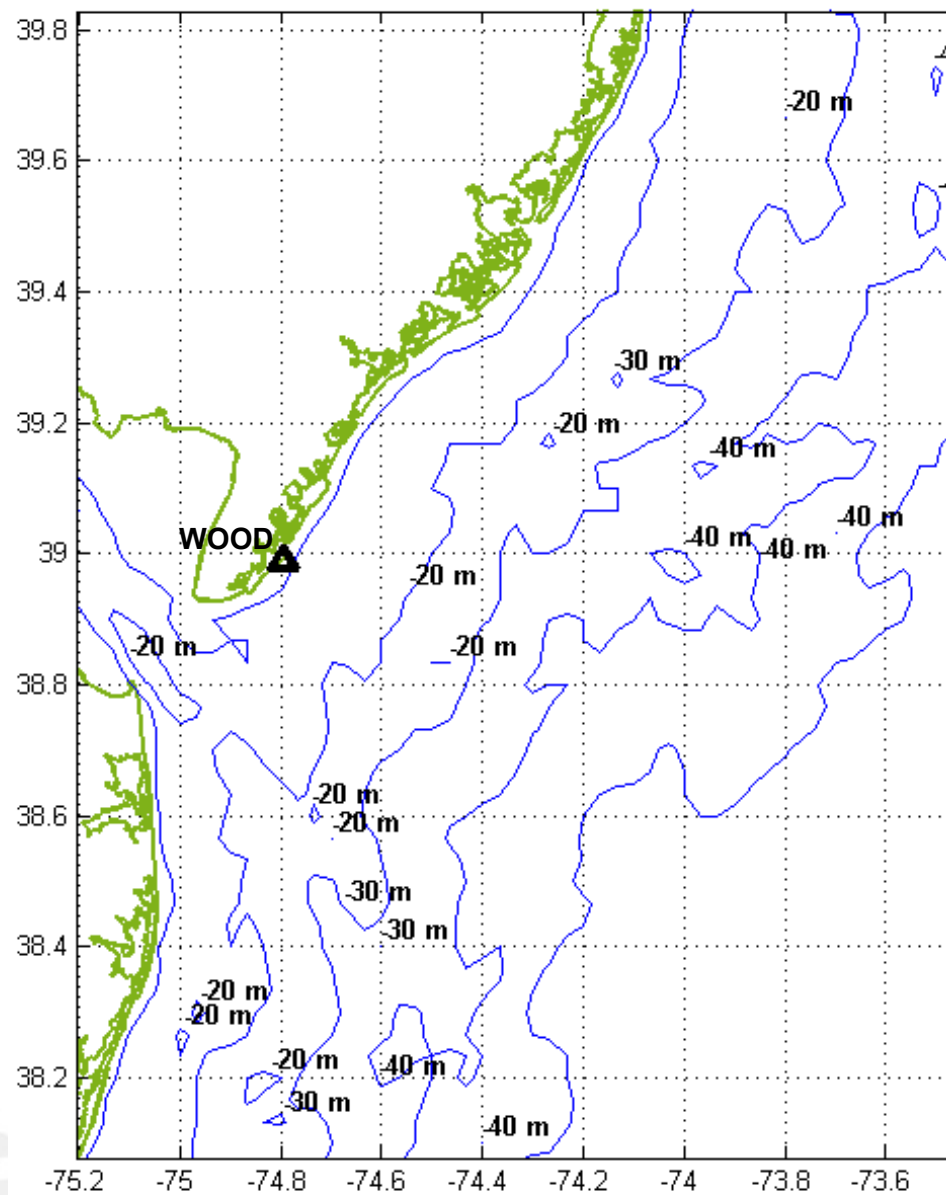
BPU BRMR Location with Bathymetry



BPU RATH Location with Bathymetry



BPU WOOD Location with Bathymetry



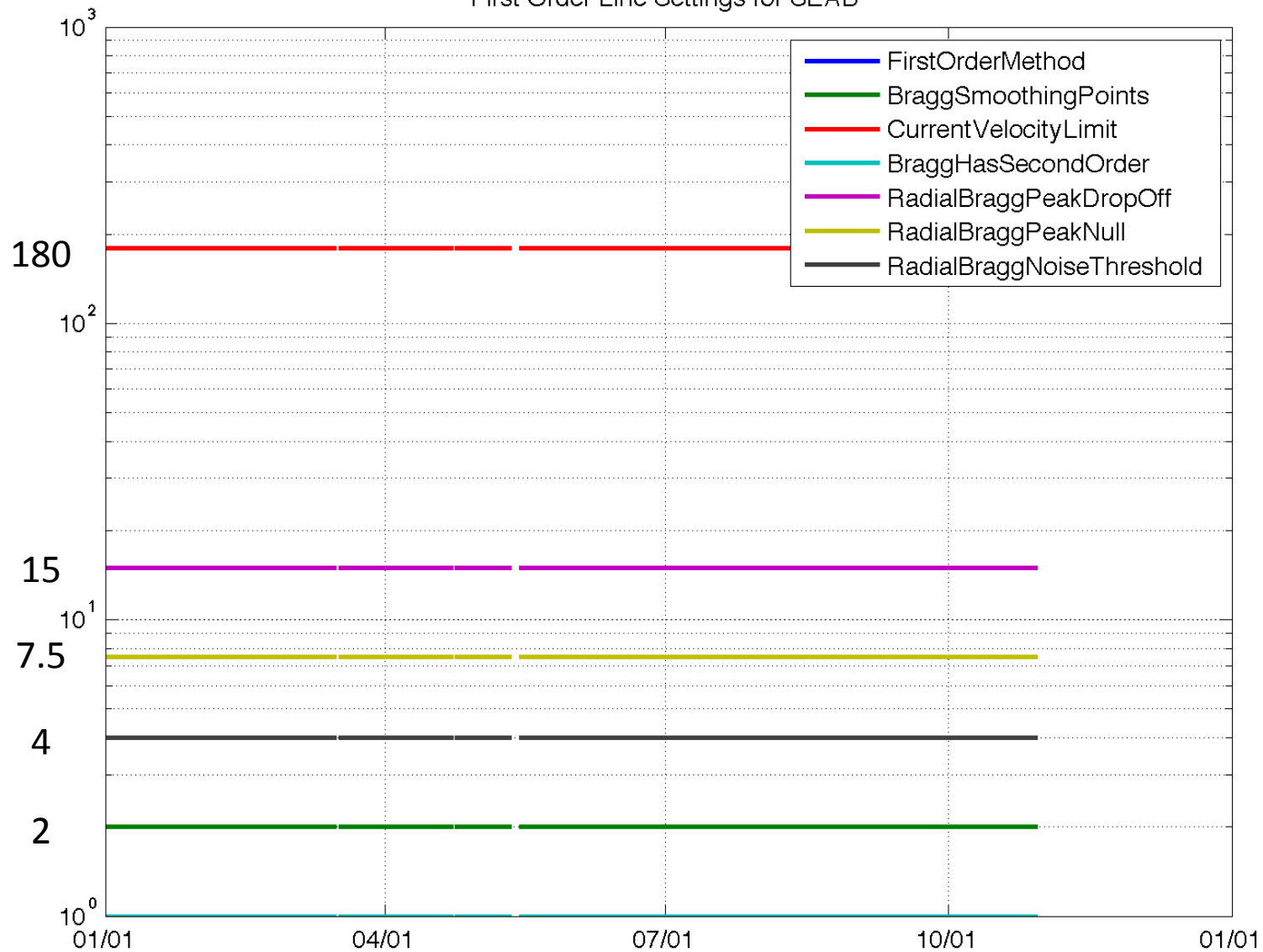
Section 11:

# 13 MHz First Order Line Setting Inspection

January 1, 2012 to December 31, 2012

# SEAB

First Order Line Settings for SEAB

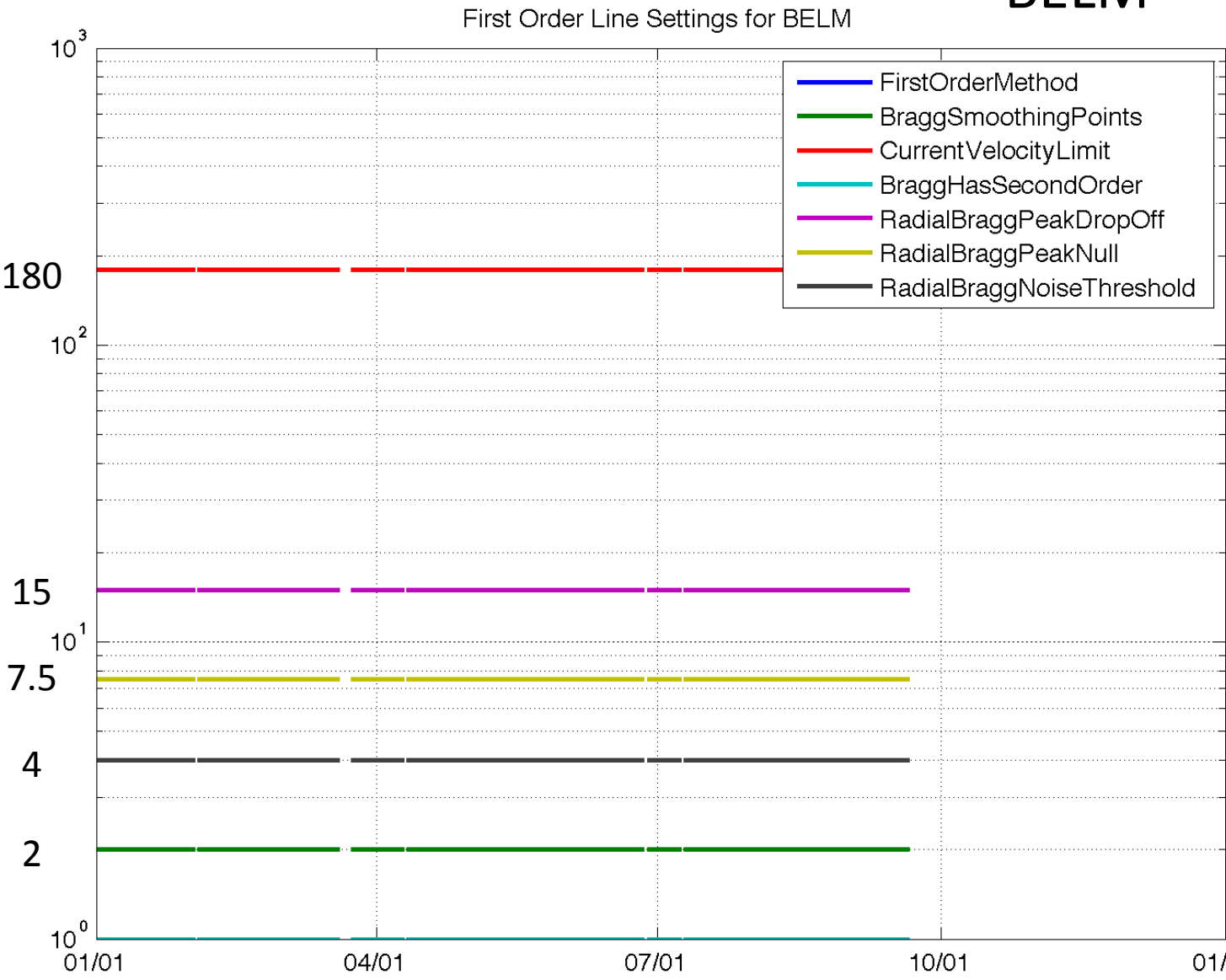


02/26/13

/Users/hroarty/Documents/MATLAB/HJR\_Scripts/radial\_plots/inspect\_radial\_header.m

BPU/20130226\_FOL\_Inspection

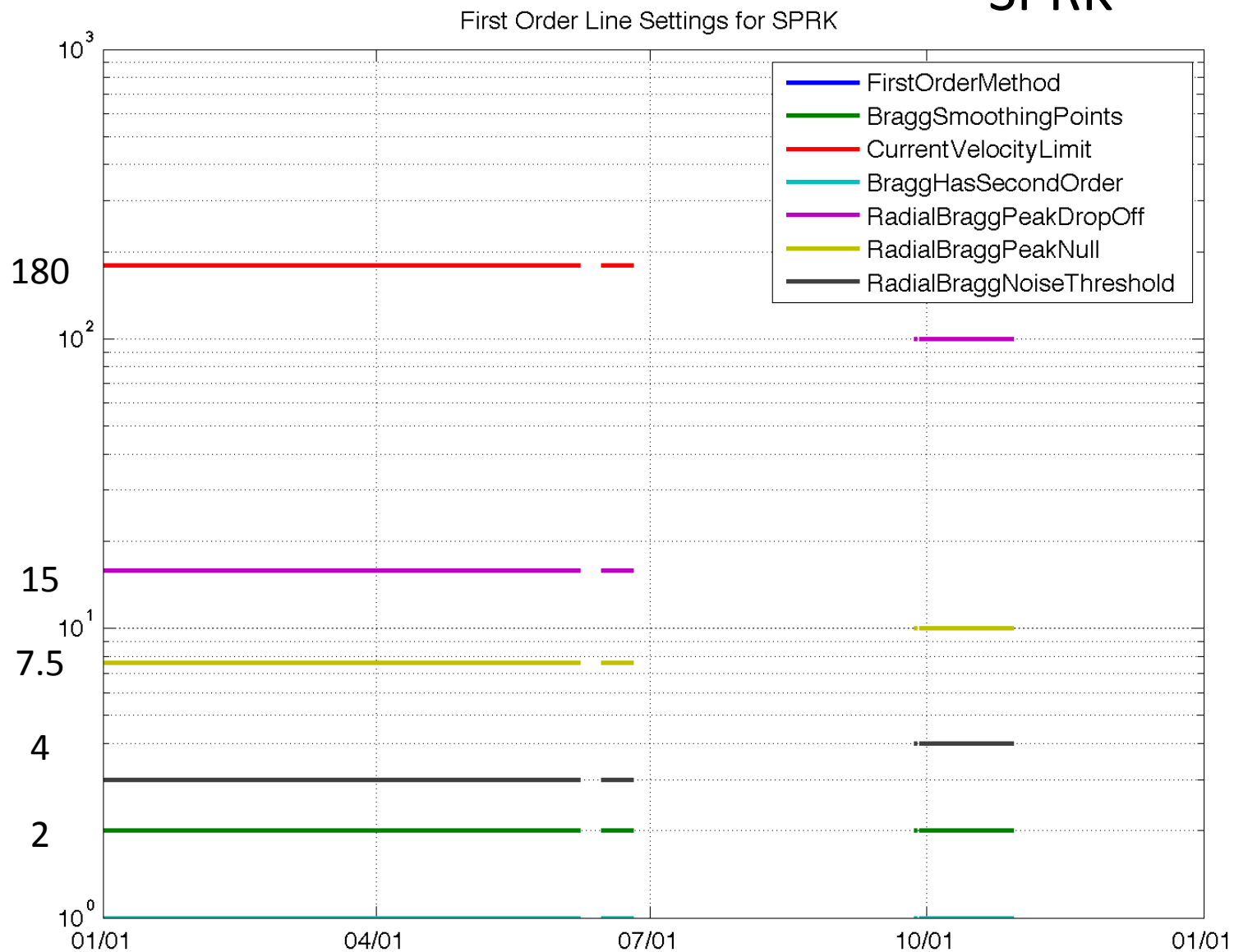
# BELM



02/26/13

/Users/hroarty/Documents/MATLAB/HJR\_Scripts/radial\_plots/inspect\_radial\_header.m

# SPRK

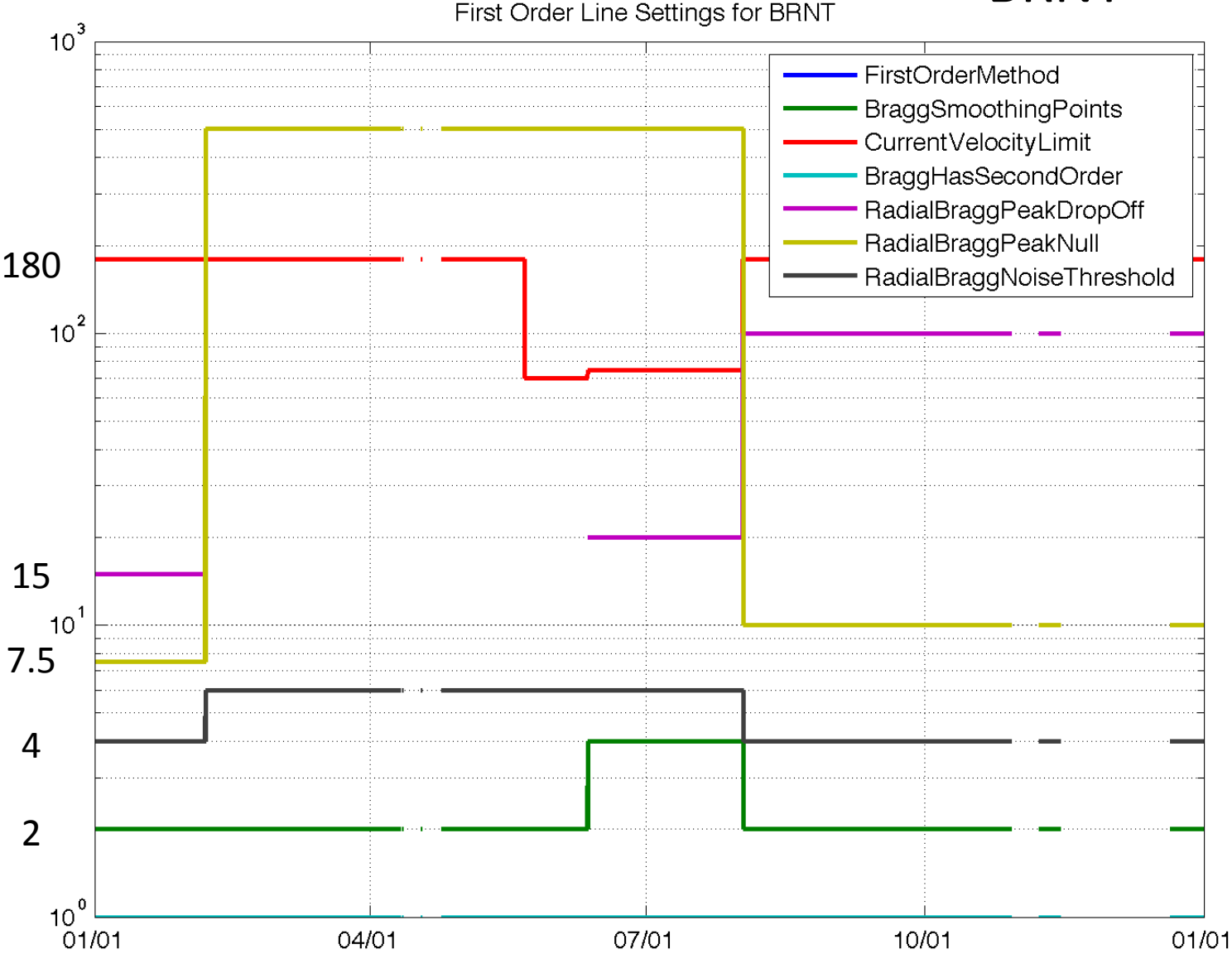


02/26/13

/Users/hroarty/Documents/MATLAB/HJR\_Scripts/radial\_plots/inspect\_radial\_header.m

BPU/20130226\_FOL\_Inspection

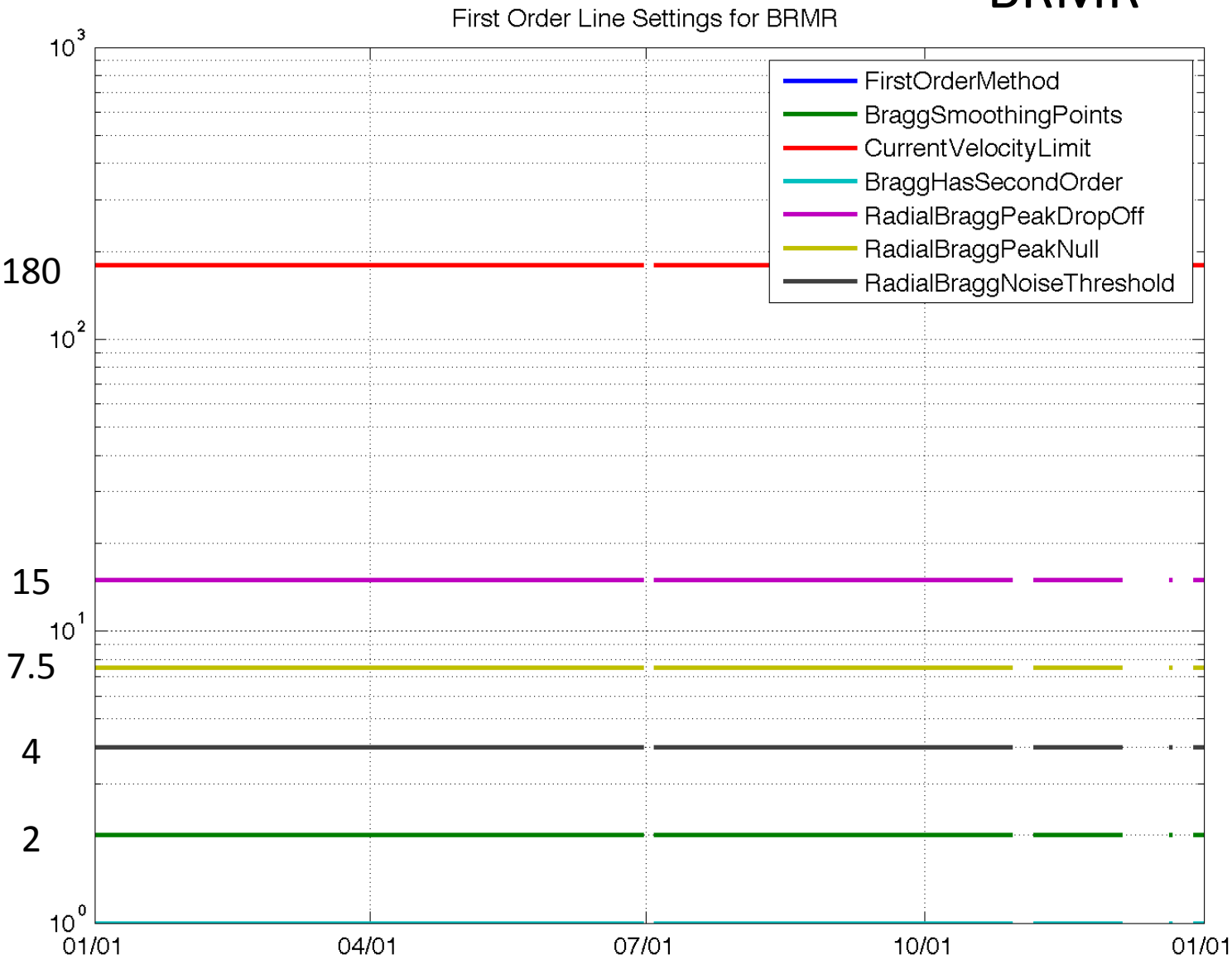
# BRNT



02/26/13  
/Users/hroarty/Documents/MATLAB/HJR\_Scripts/radial\_plots/inspect\_radial\_header.m



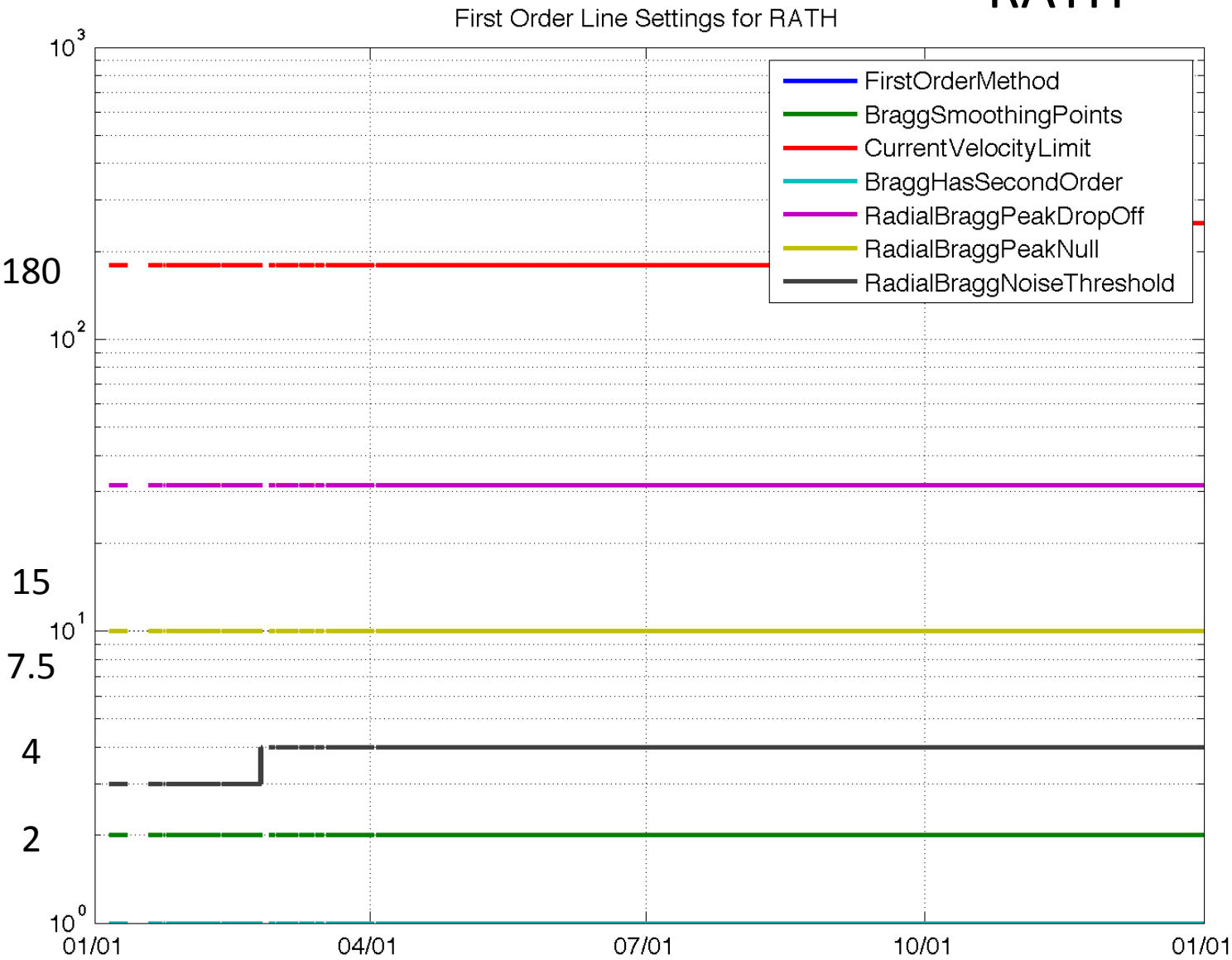
# BRMR



02/26/13

/Users/hroarty/Documents/MATLAB/HJR\_Scripts/radial\_plots/inspect\_radial\_header.m

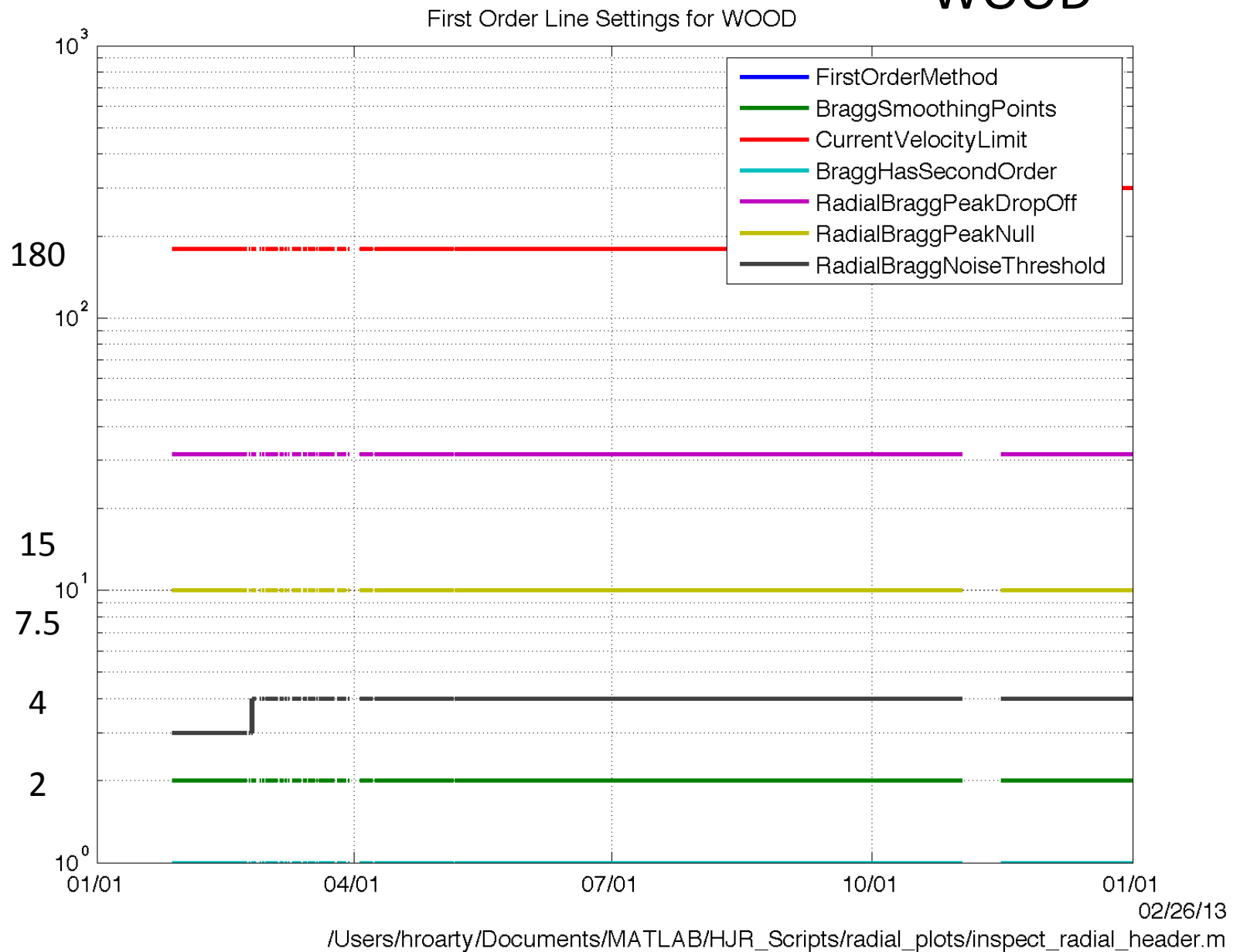
# RATH



02/26/13

/Users/hroarty/Documents/MATLAB/HJR\_Scripts/radial\_plots/inspect\_radial\_header.m

# WOOD

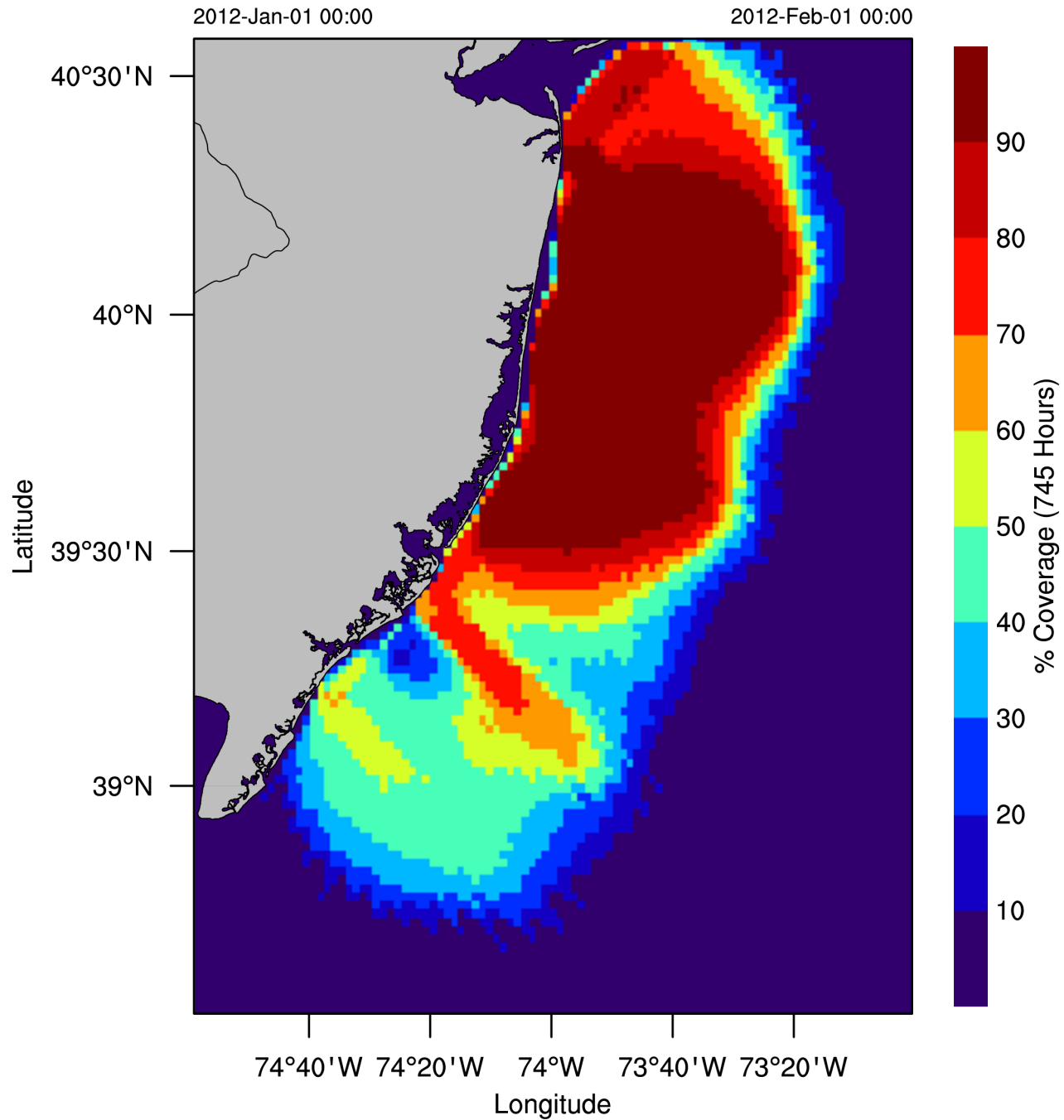


Section 12:

# HF Radar Vector Coverage

January 1, 2012 to December 31, 2012

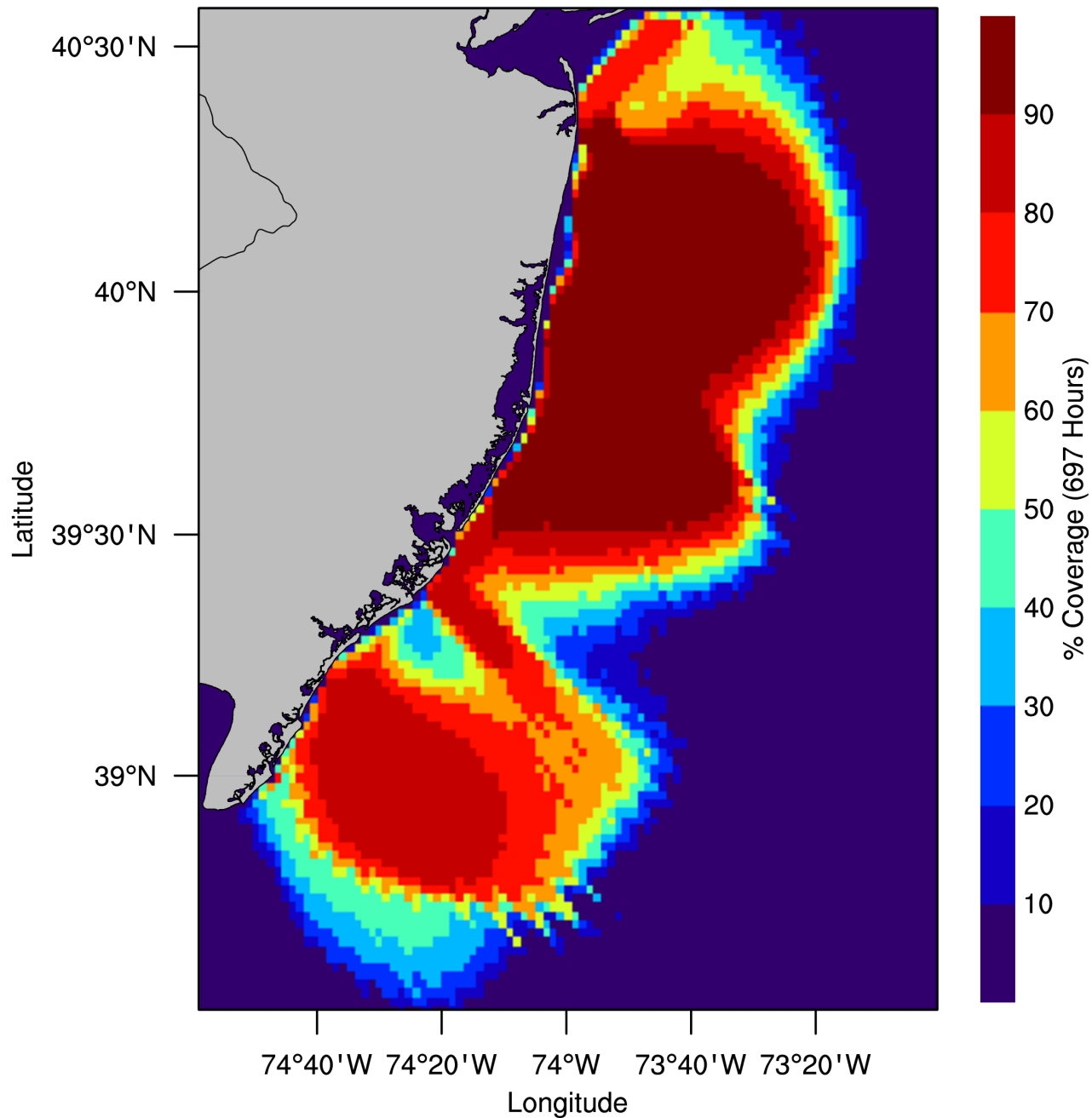
# HF Radar Vector Coverage



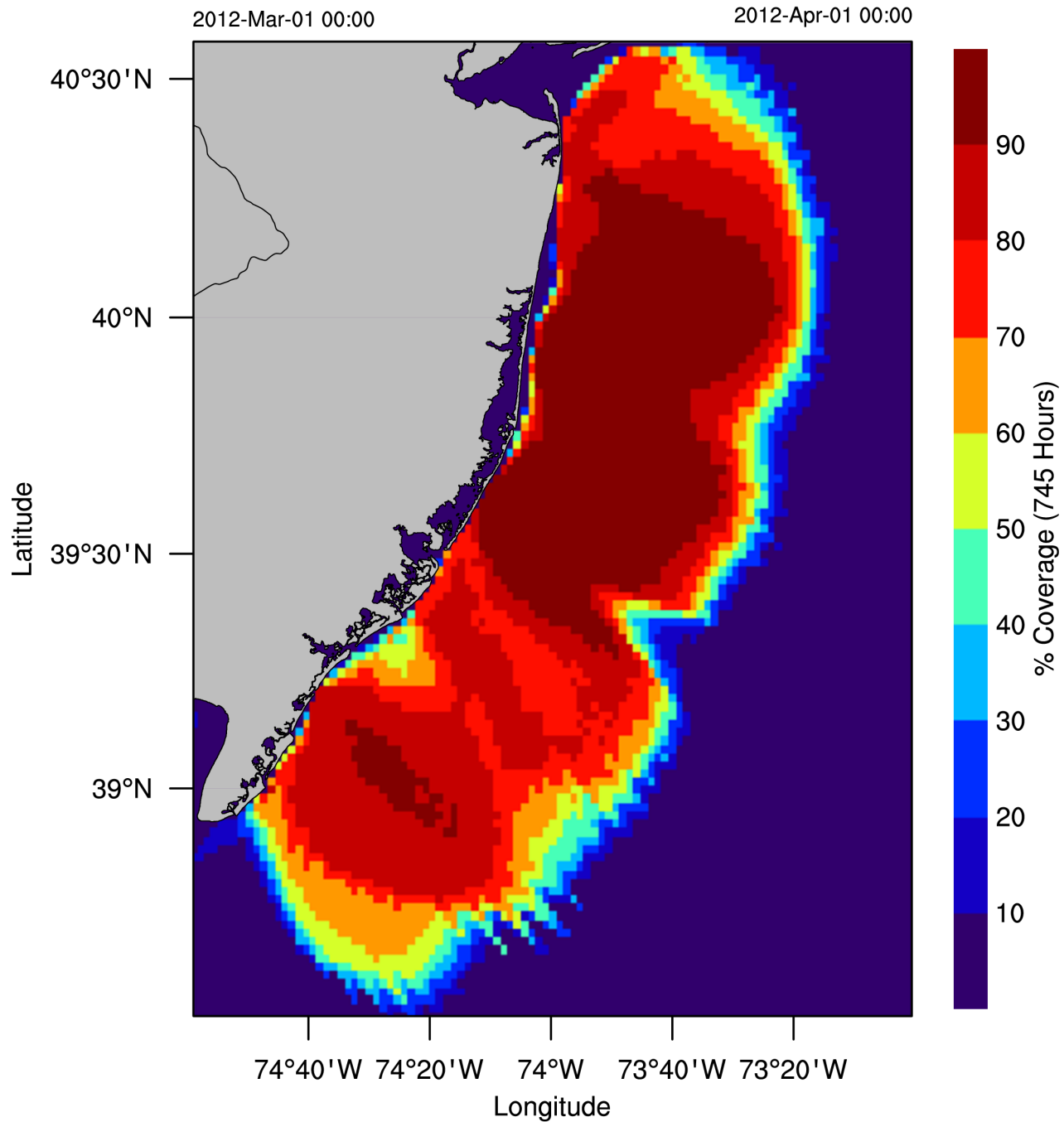
# HF Radar Vector Coverage

2012-Feb-01 00:00

2012-Mar-01 00:00



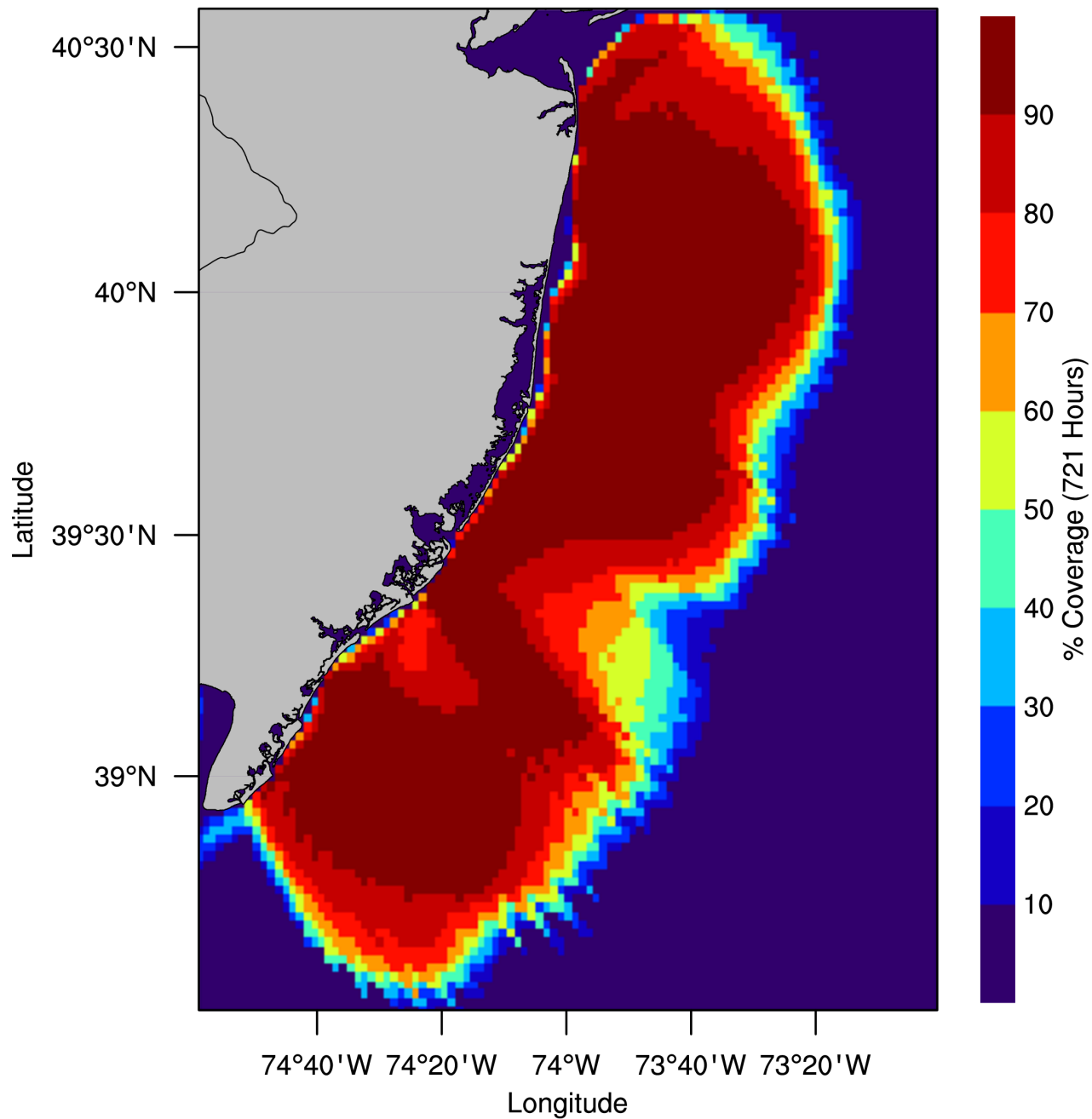
# HF Radar Vector Coverage



# HF Radar Vector Coverage

2012-Apr-01 00:00

2012-May-01 00:00

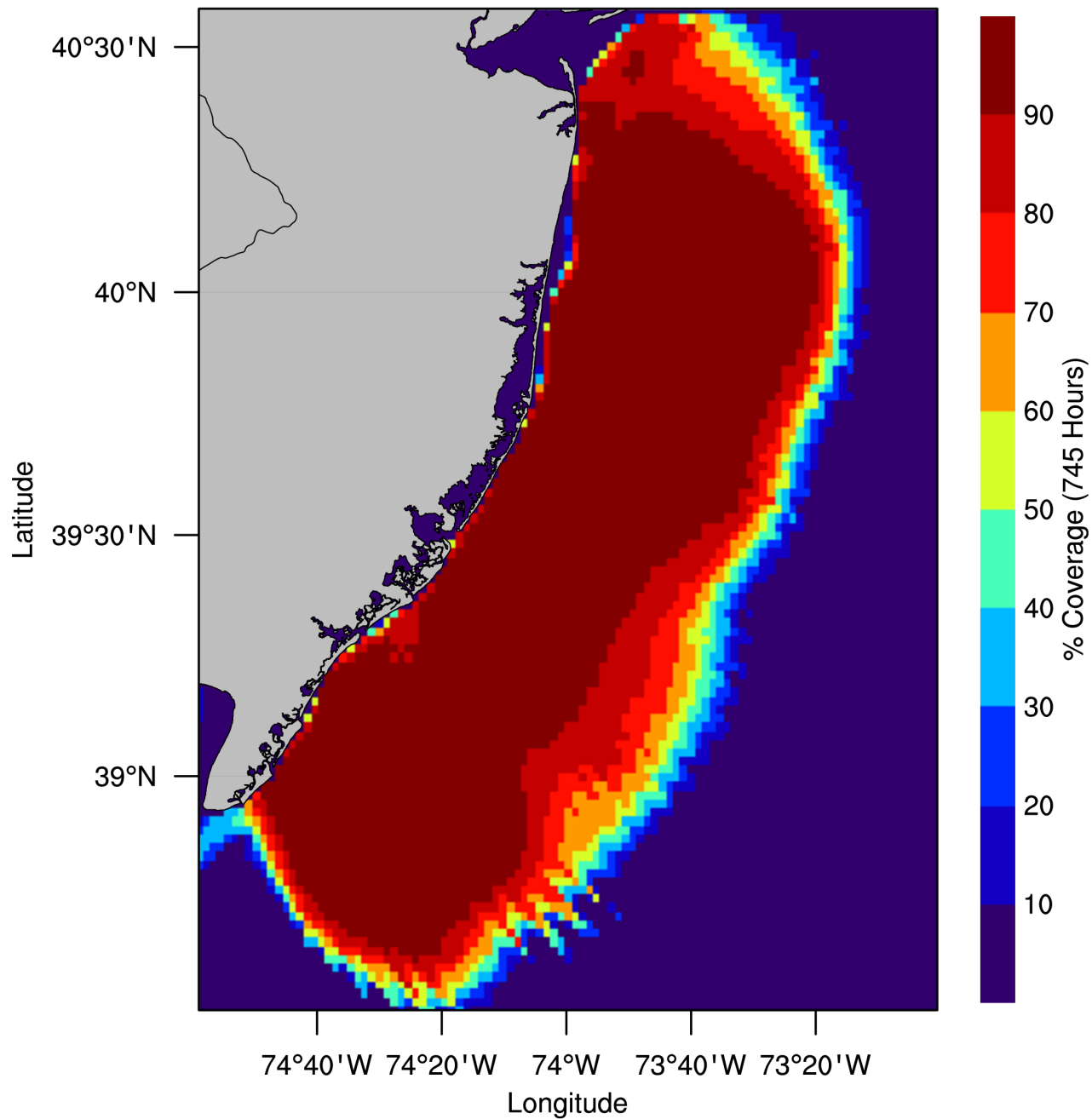




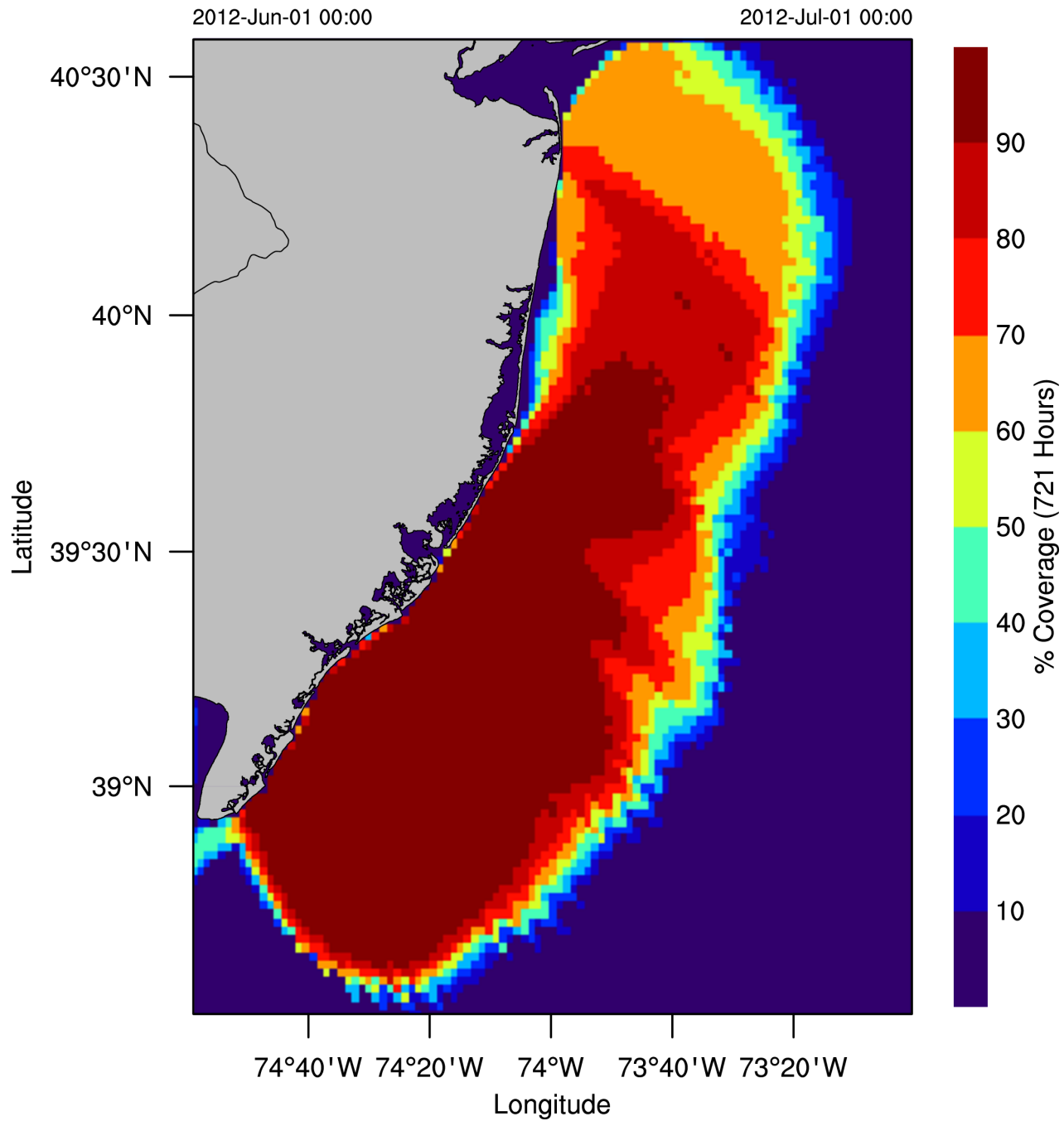
# HF Radar Vector Coverage

2012-May-01 00:00

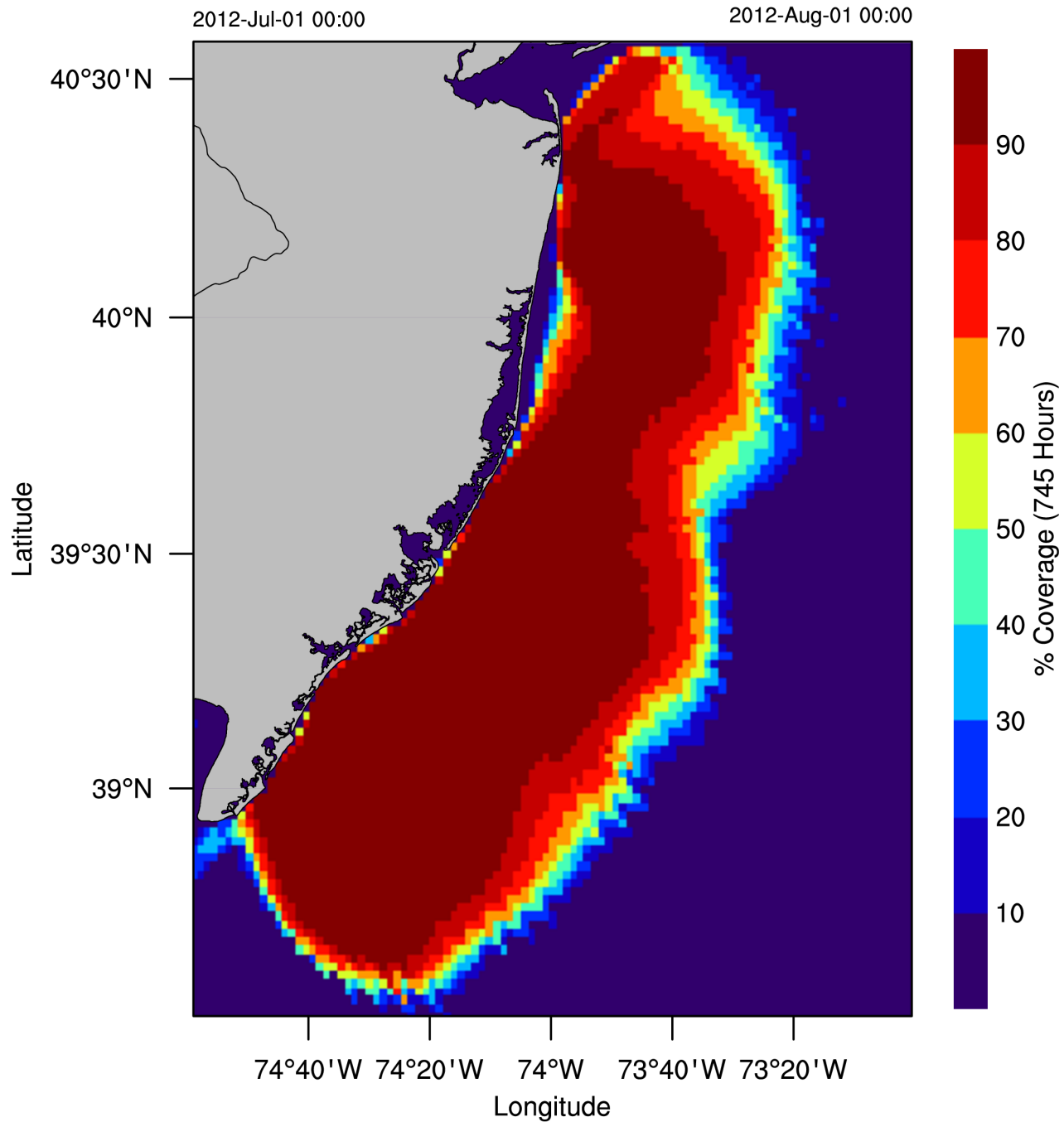
2012-Jun-01 00:00



# HF Radar Vector Coverage



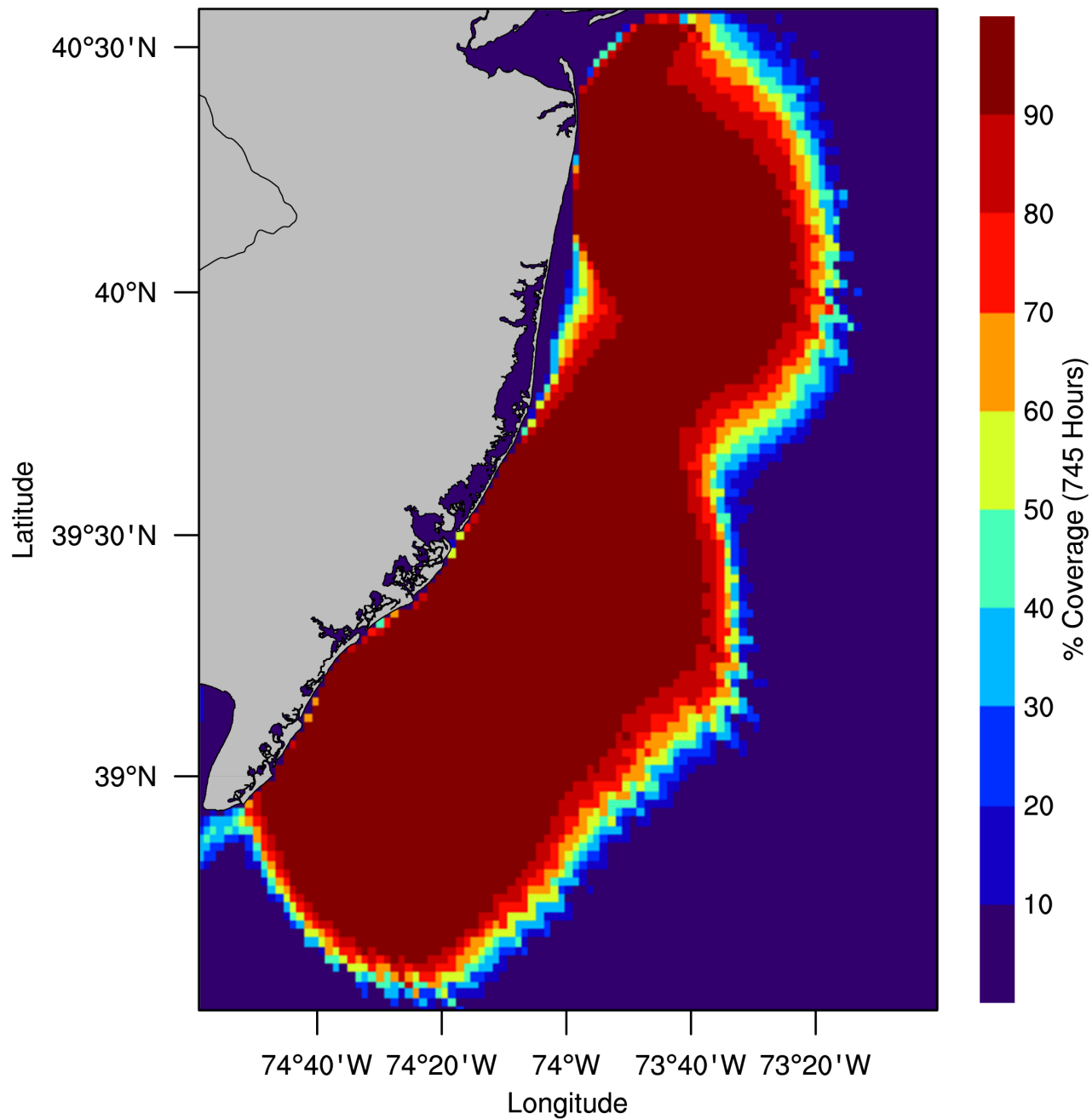
# HF Radar Vector Coverage



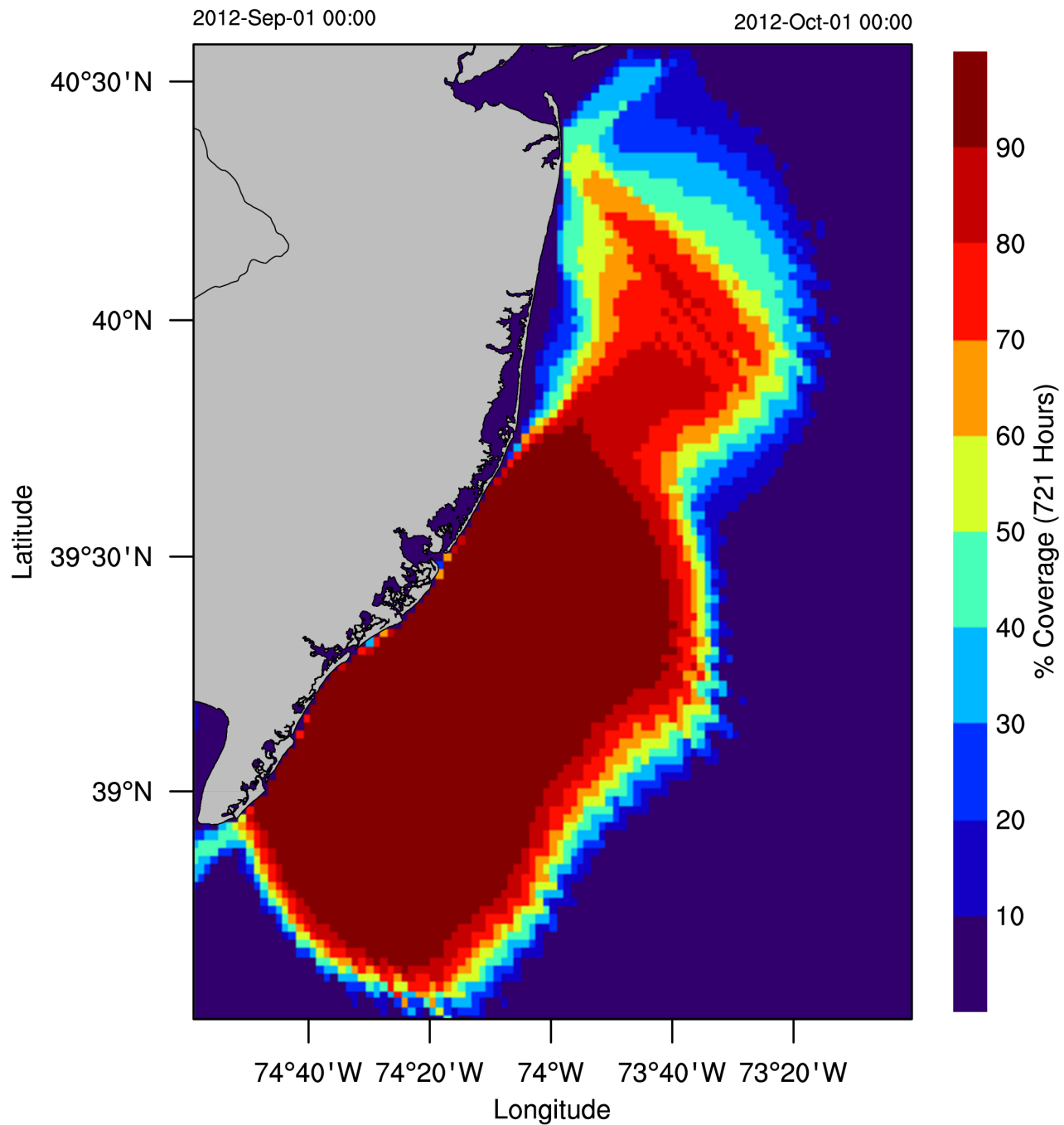
# HF Radar Vector Coverage

2012-Aug-01 00:00

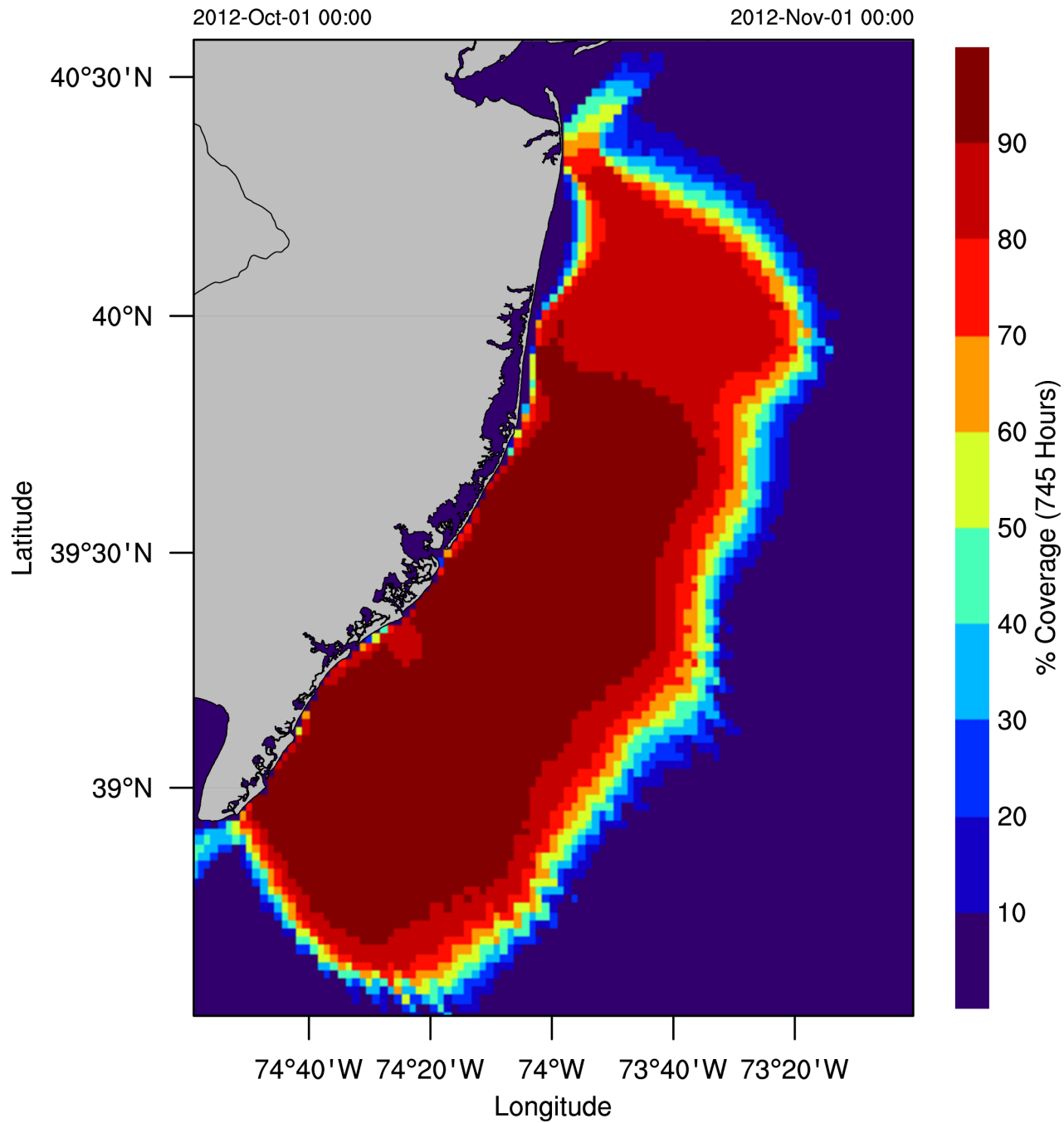
2012-Sep-01 00:00



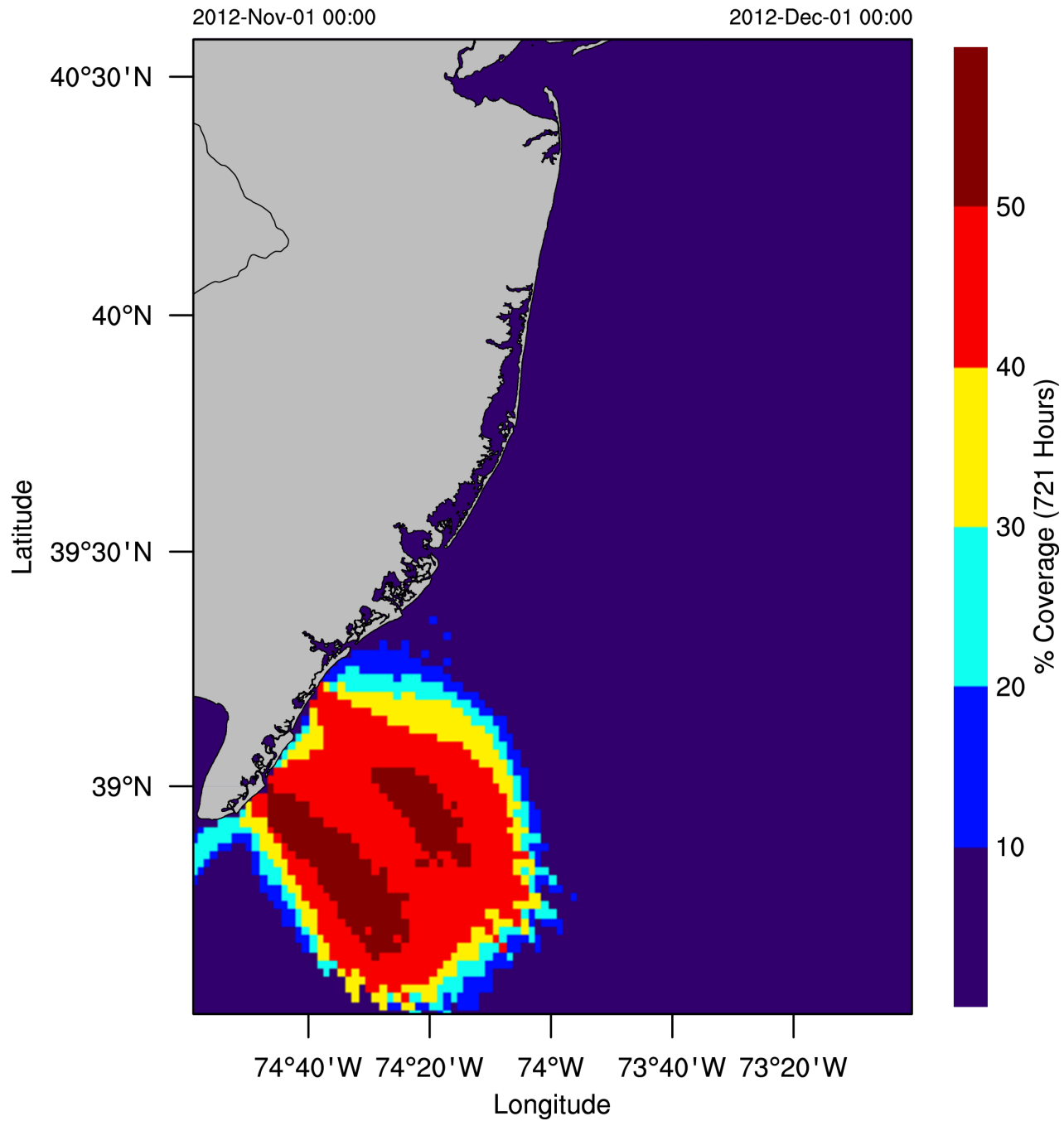
# HF Radar Vector Coverage



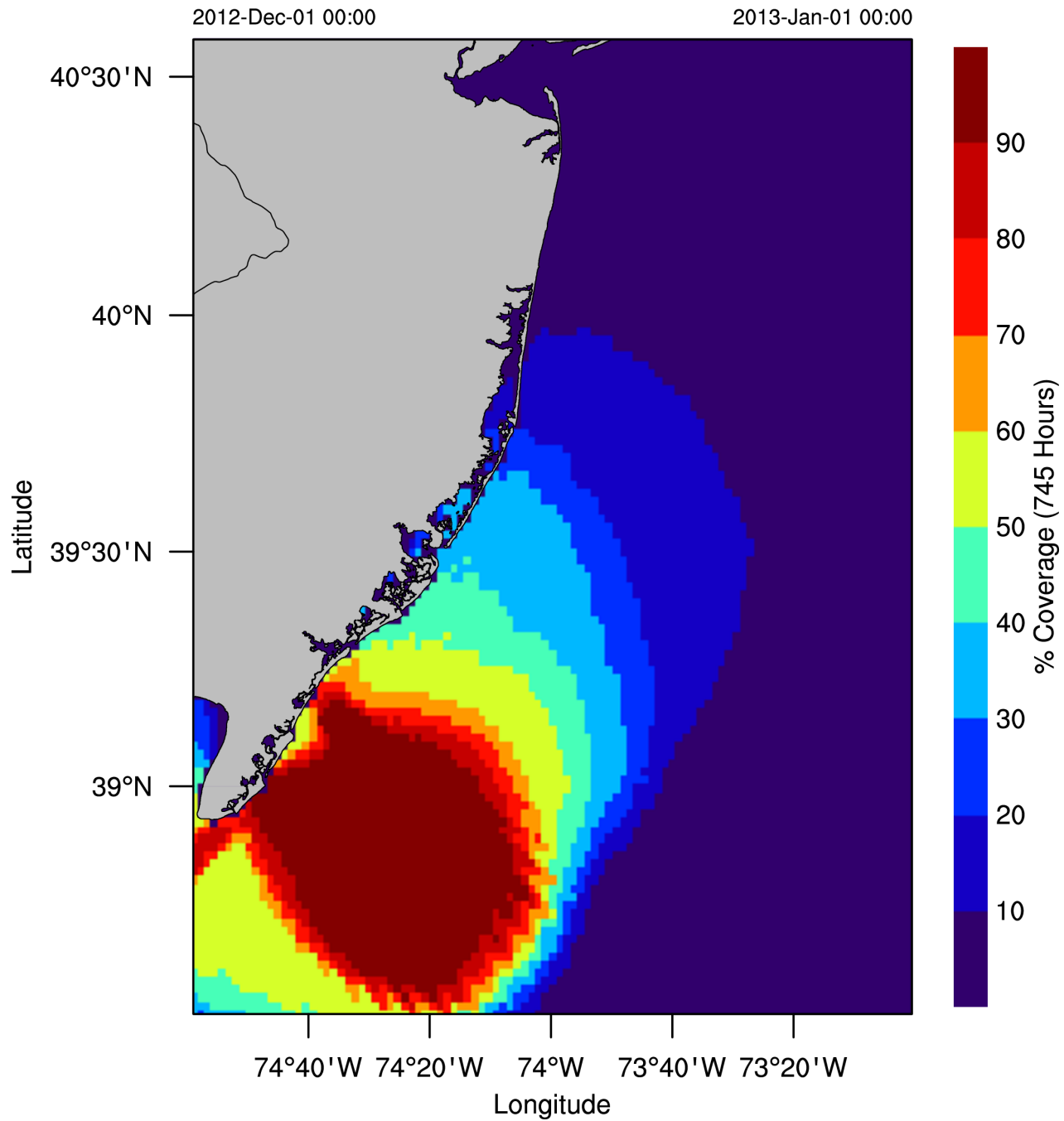
# HF Radar Vector Coverage



# HF Radar Vector Coverage



# HF Radar Vector Coverage





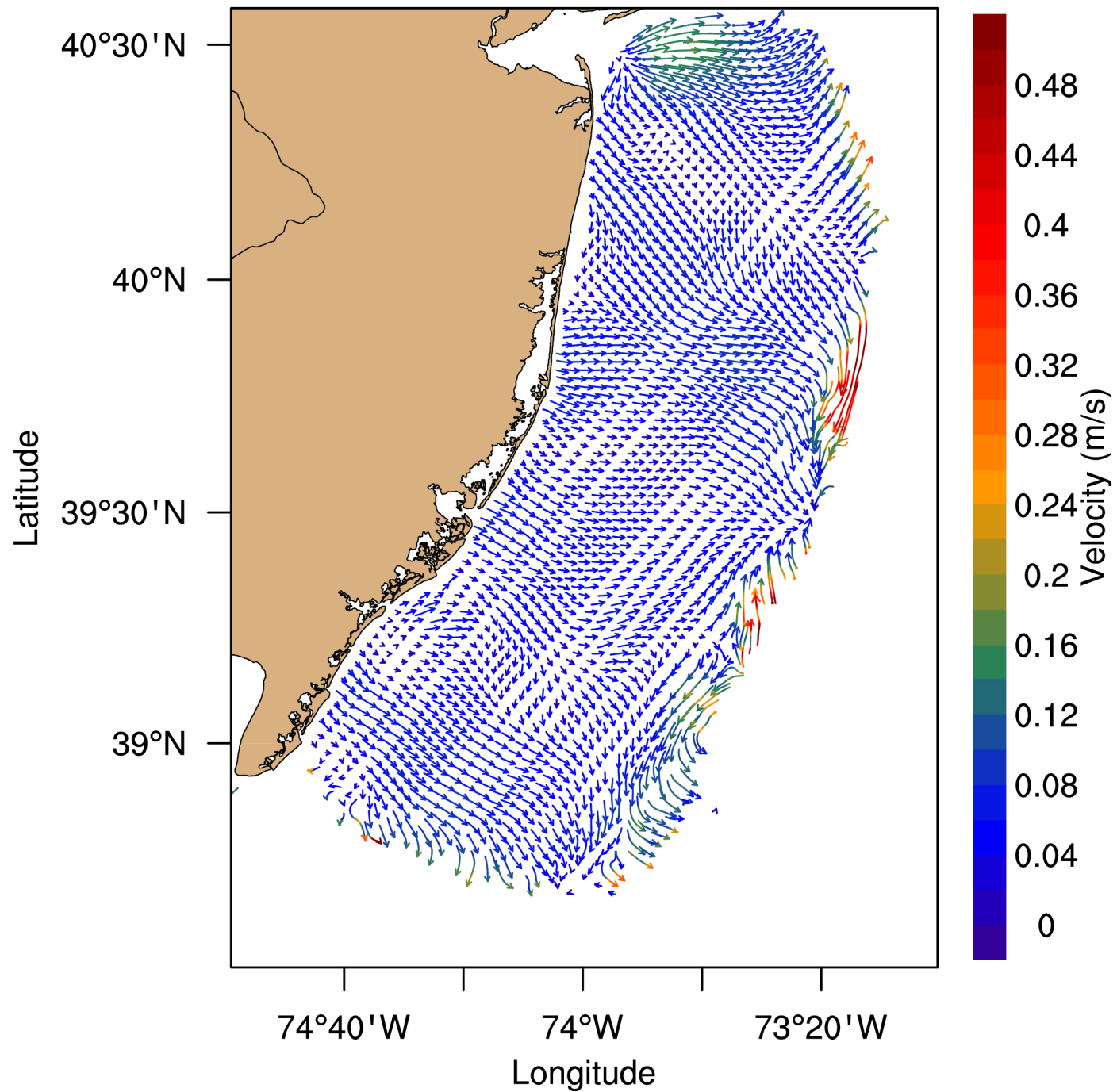
Section 13:

**BPU 13 MHz**

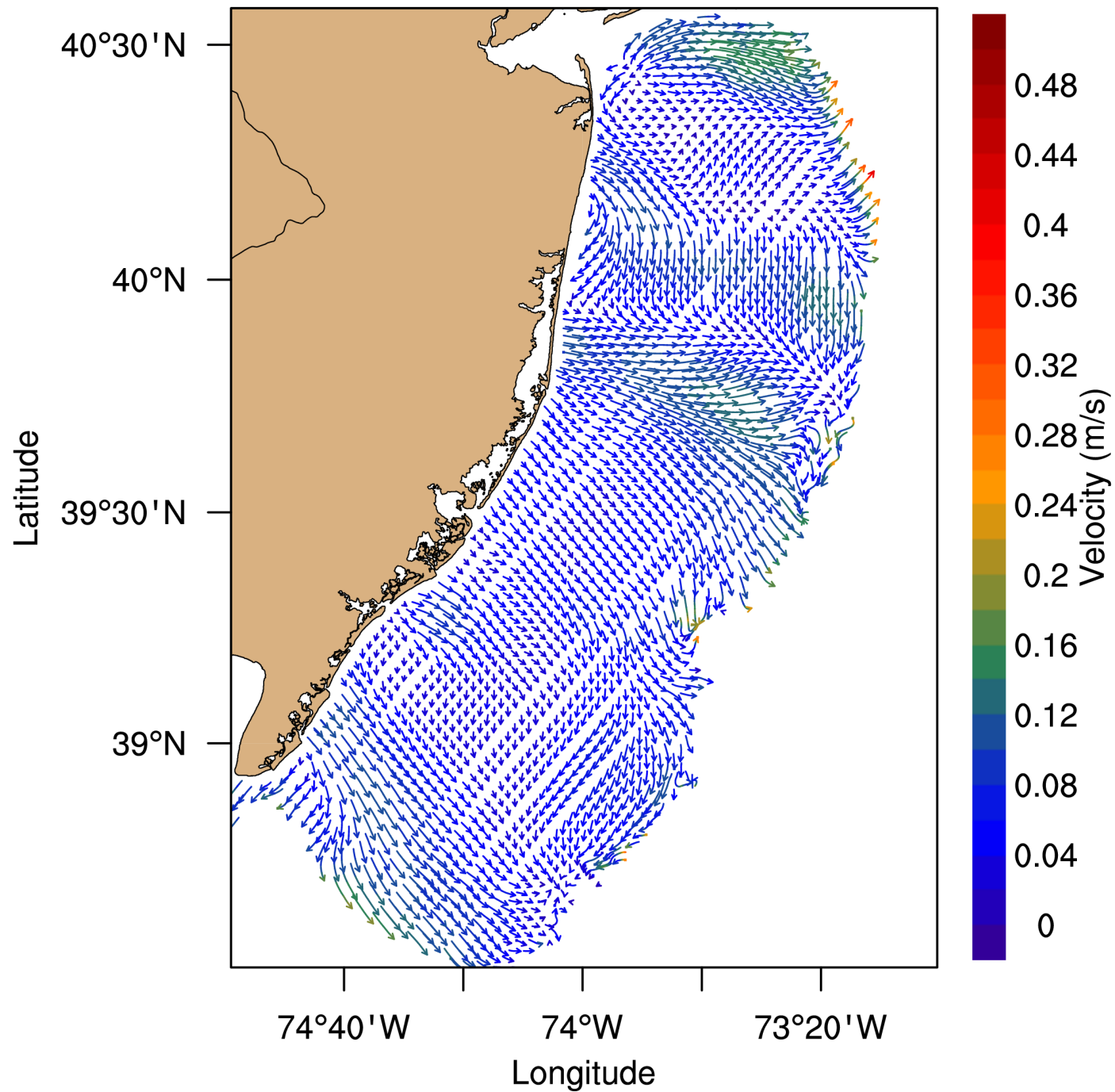
# **Monthly Average Surface Current Maps**

January 1, 2012 to December 31, 2012

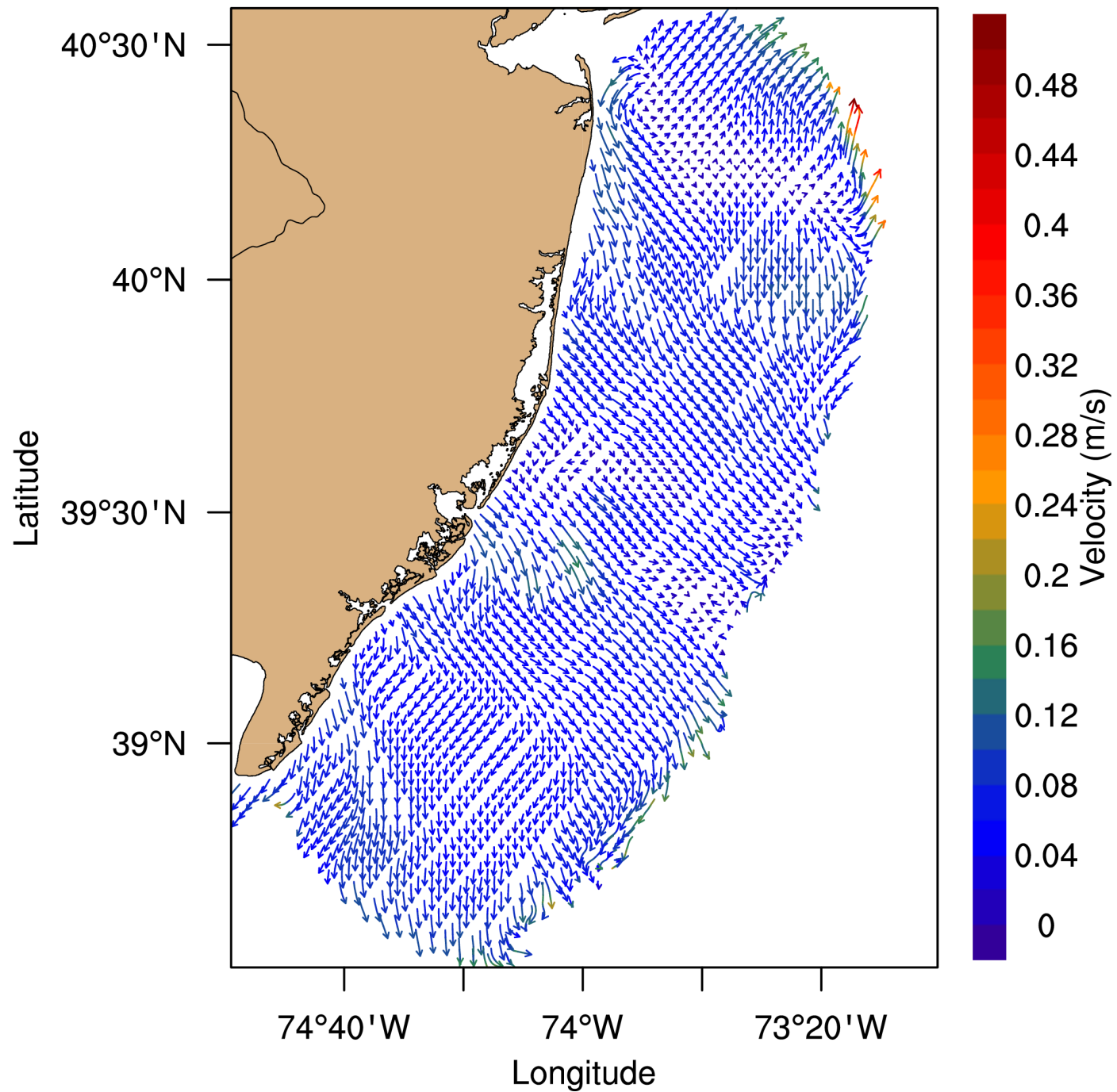
Surface Current Field: 2012-Jan-16 11:38 GMT (+/-372 hrs)



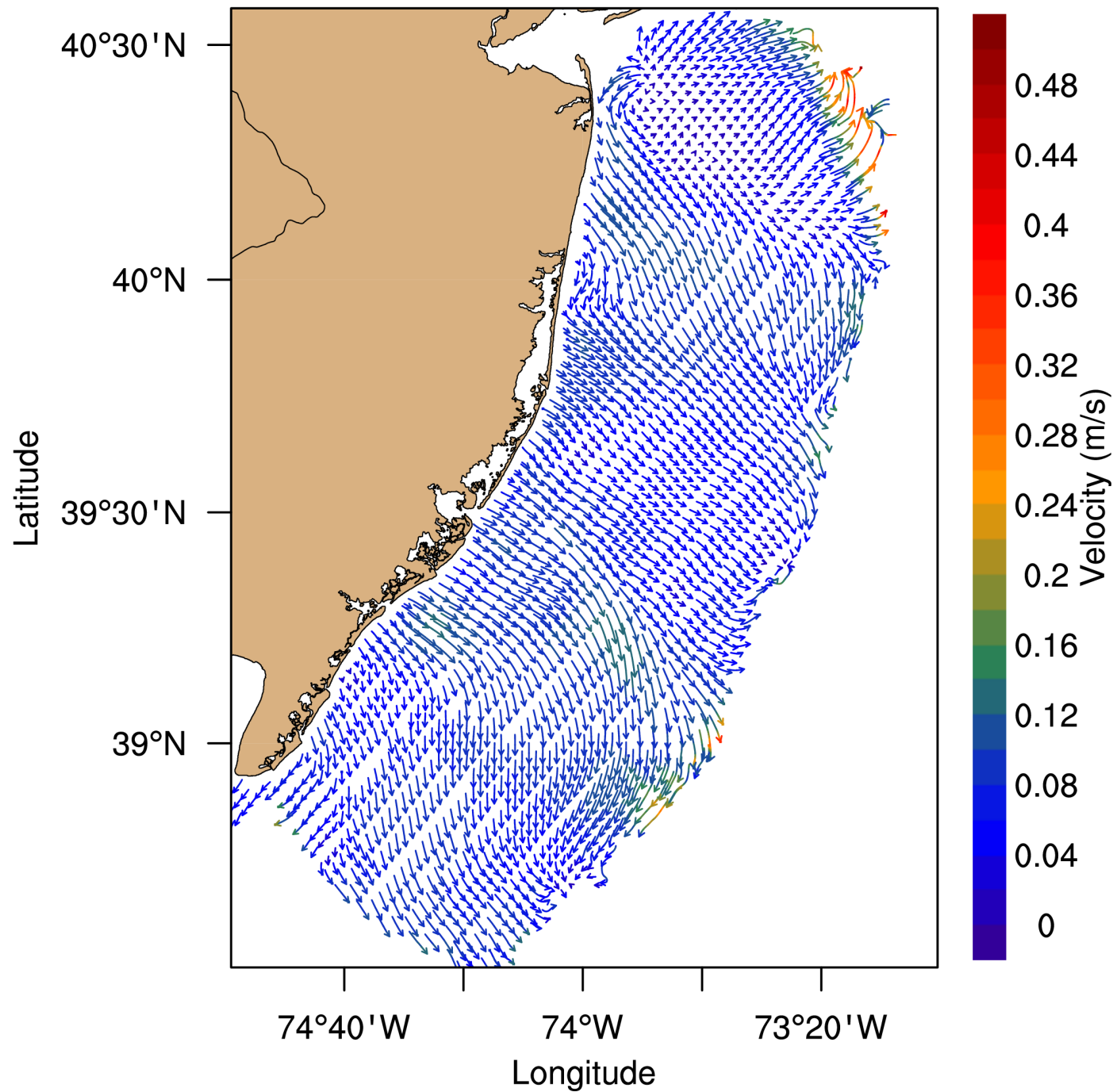
Surface Current Field: 2012-Feb-15 12:00 GMT ( $\pm 348$  hrs)



Surface Current Field: 2012-Mar-16 12:00 GMT (+/-372 hrs)

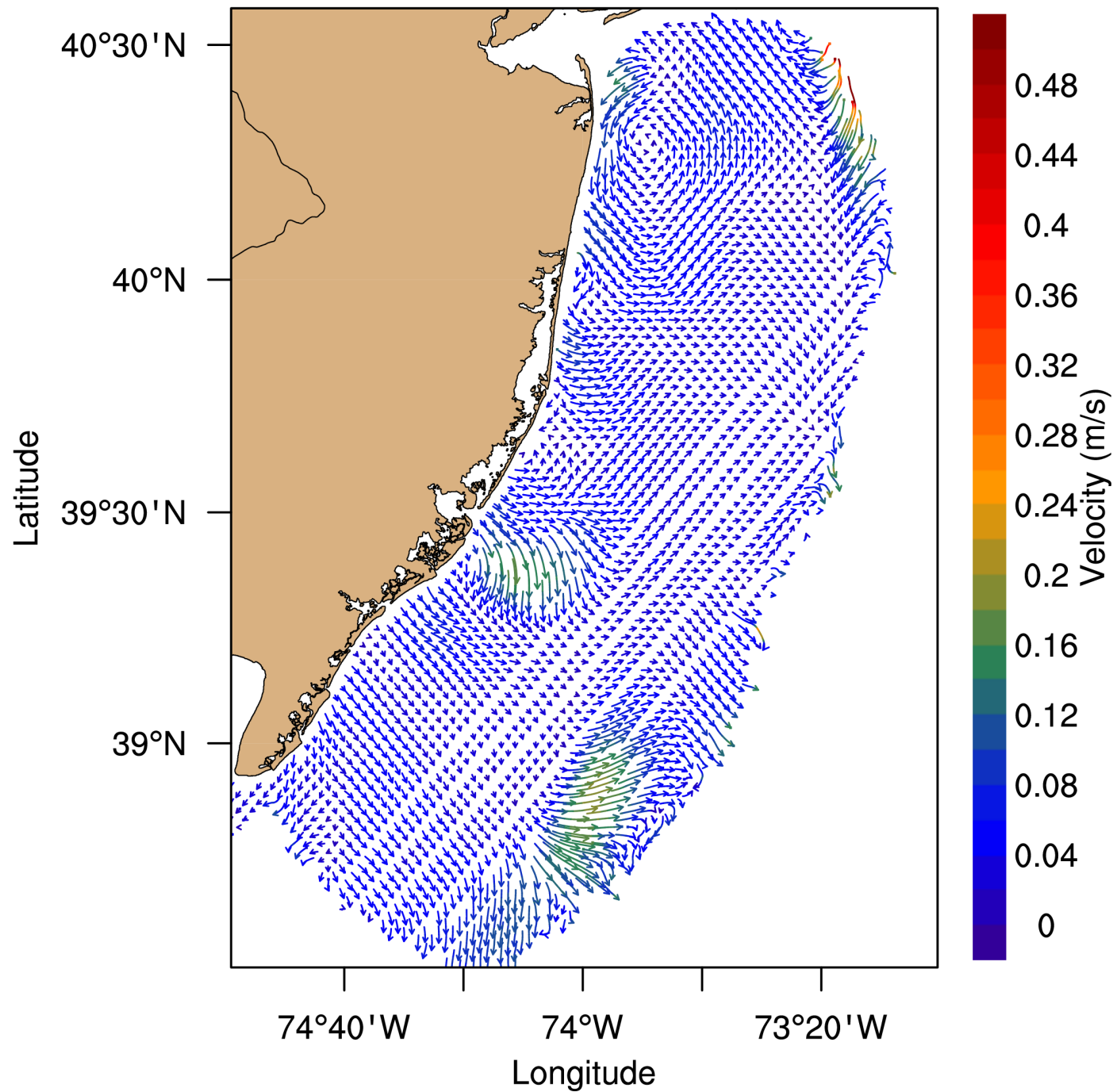


Surface Current Field: 2012-Apr-16 08:13 GMT (+/-351 hrs)

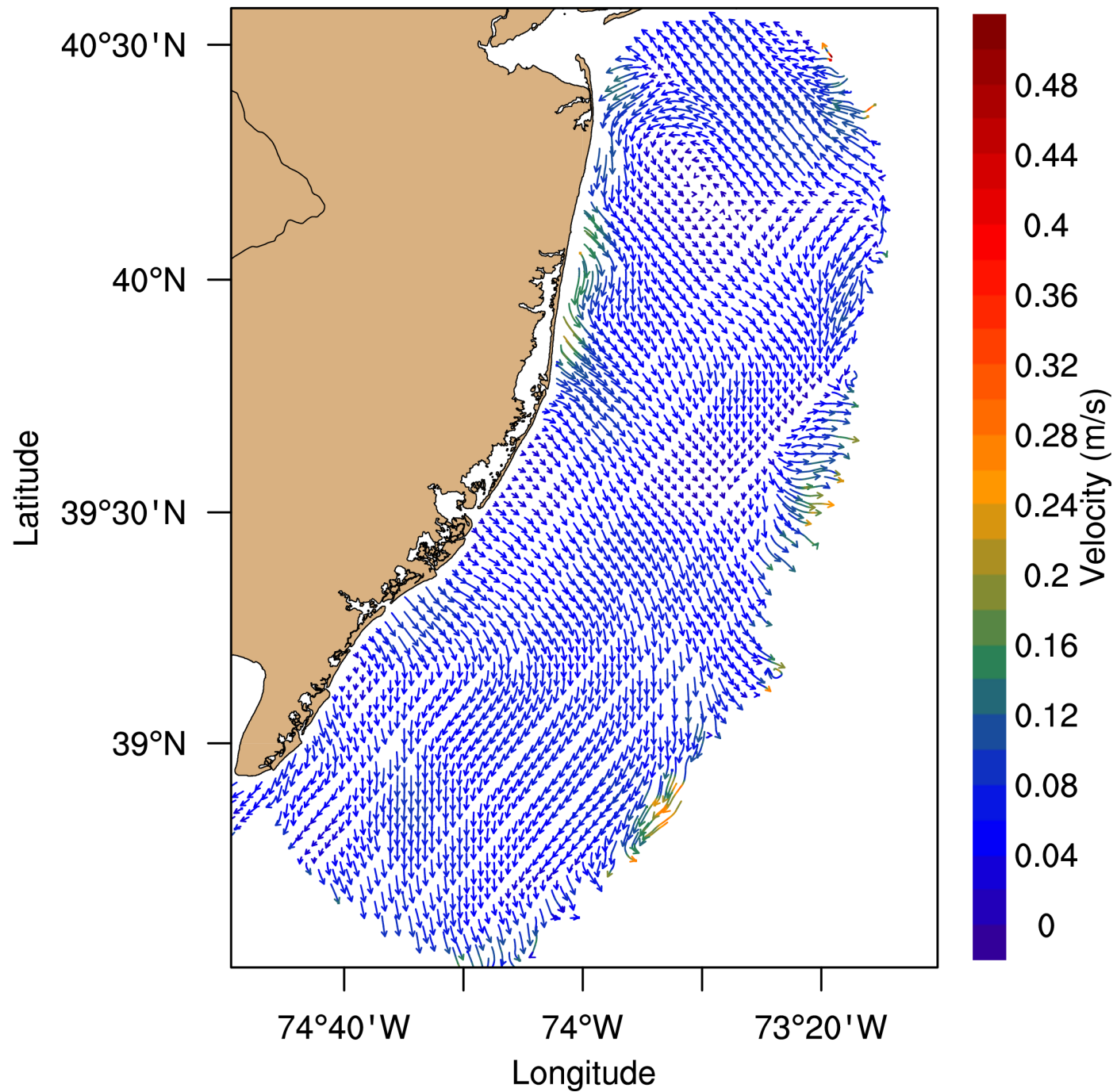




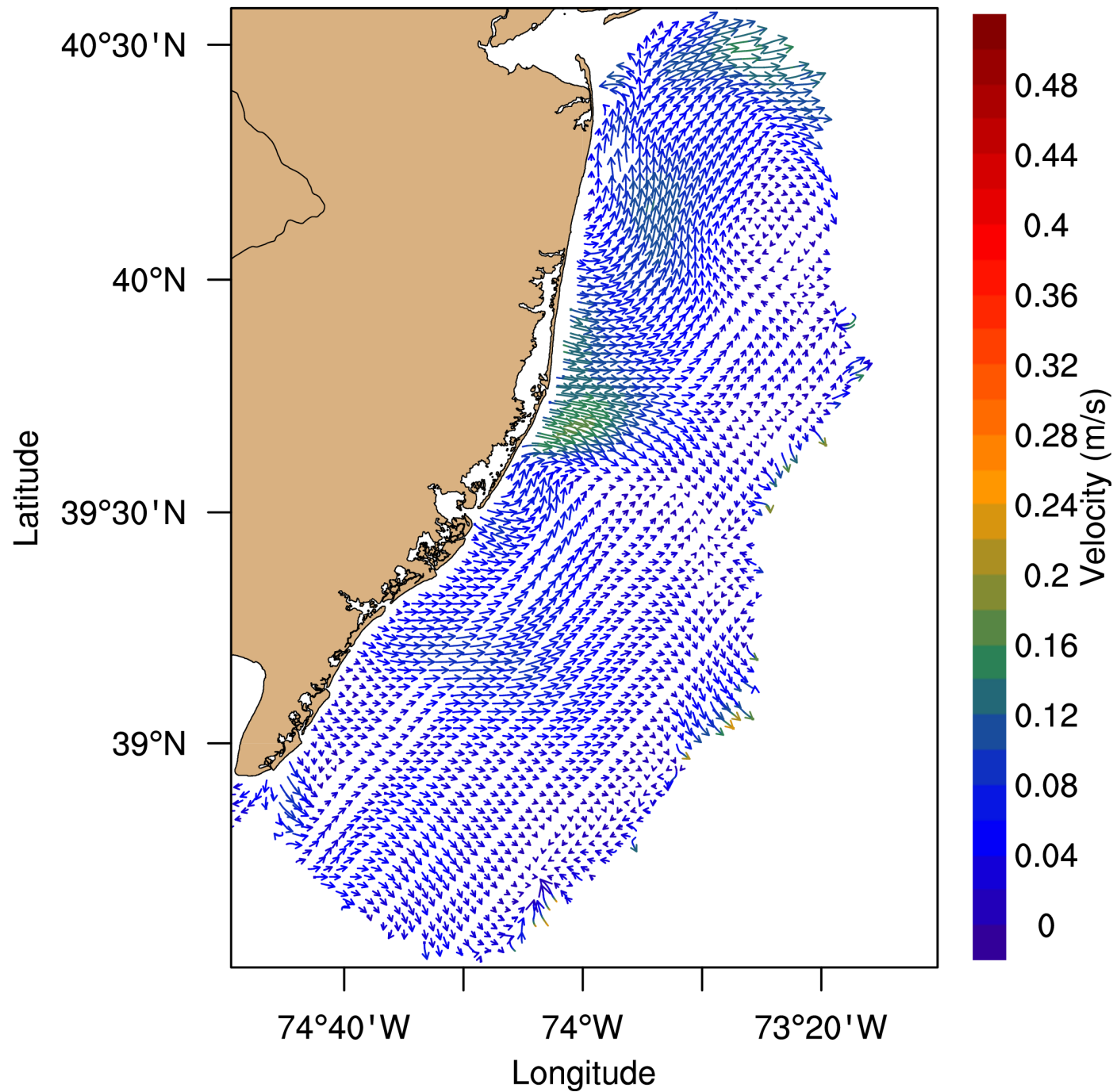
Surface Current Field: 2012-May-16 12:00 GMT (+/-372 hrs)



Surface Current Field: 2012-Jun-16 00:00 GMT (+/-360 hrs)

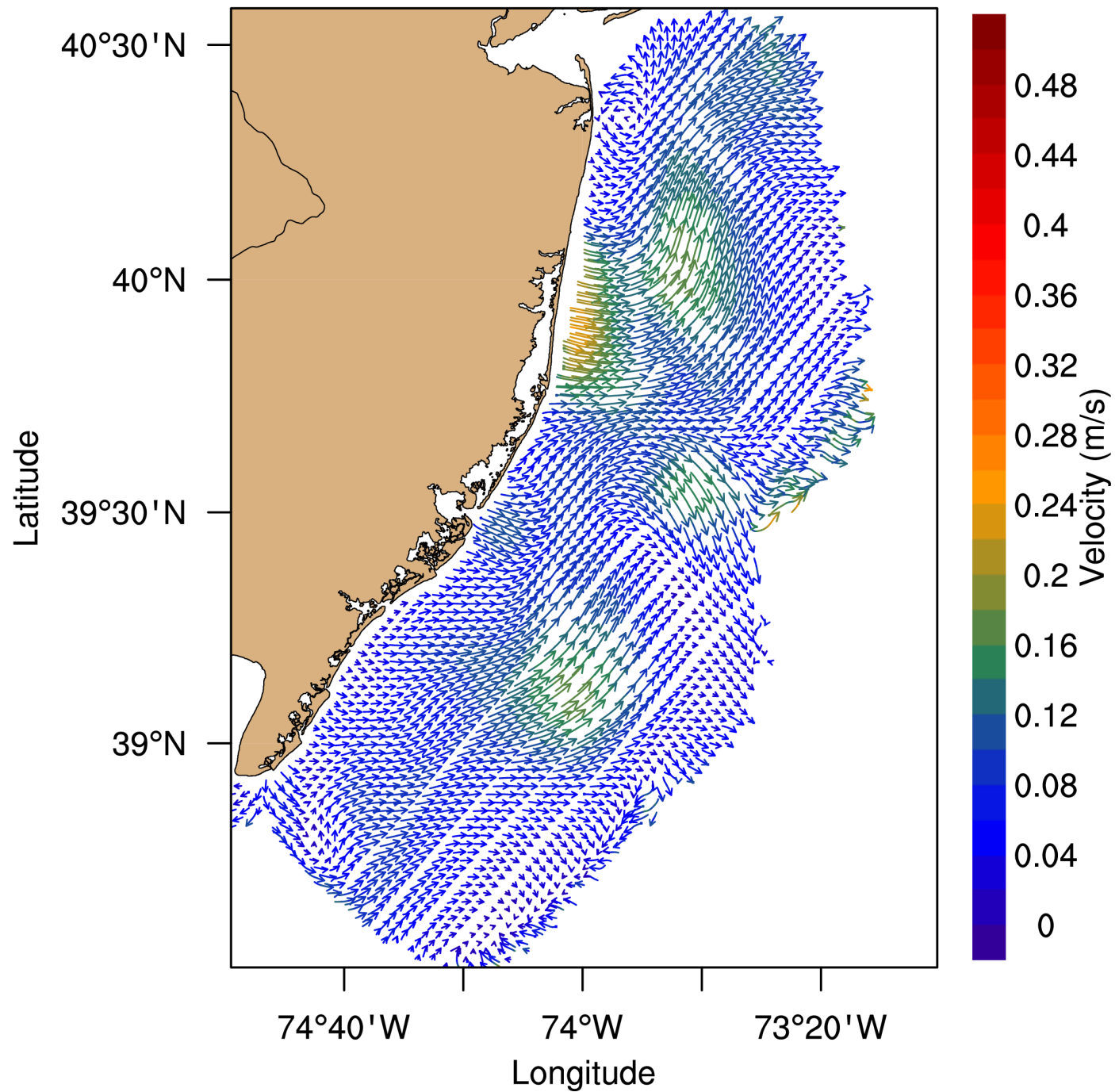


Surface Current Field: 2012-Jul-16 12:00 GMT (+/-372 hrs)

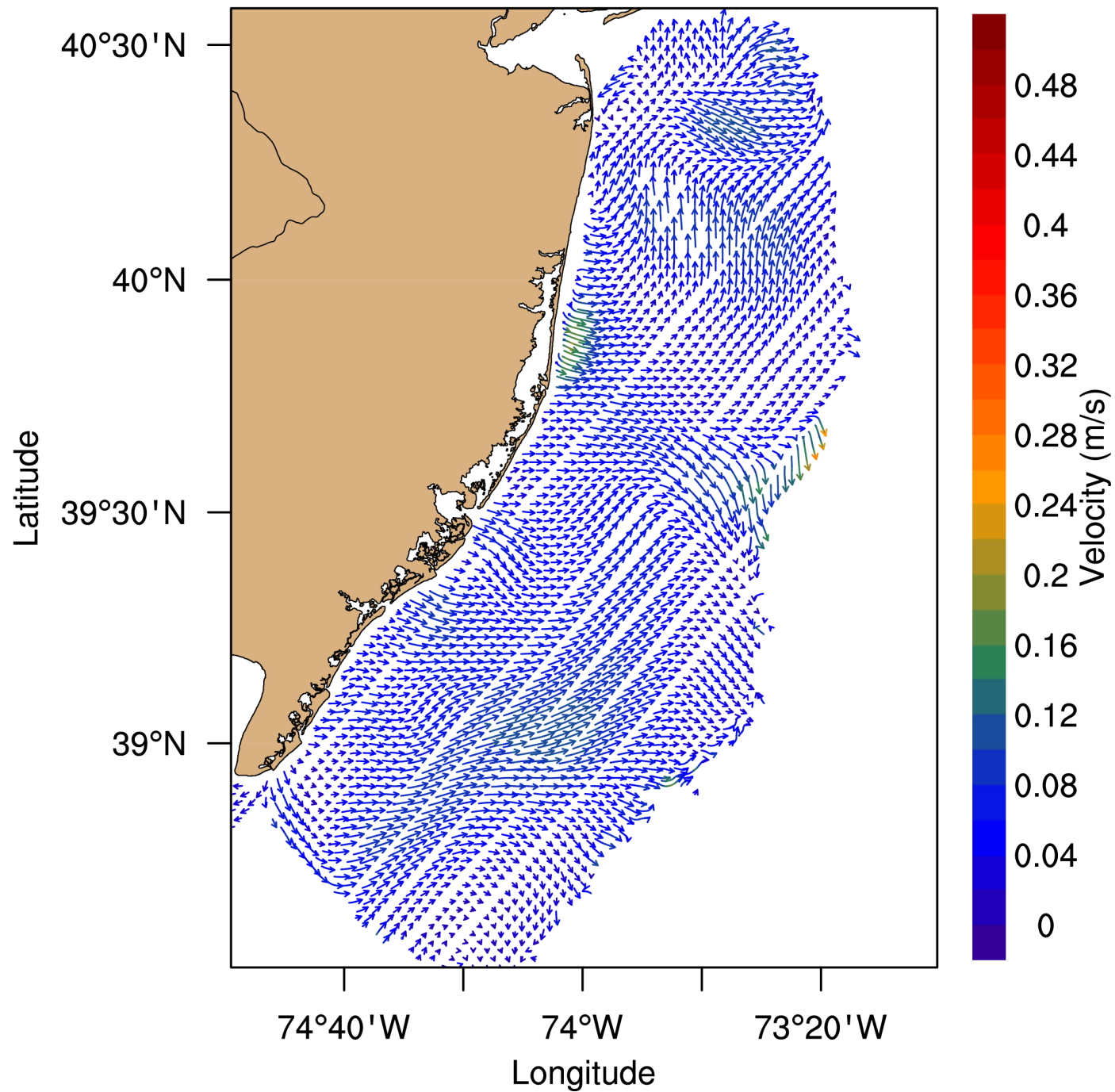




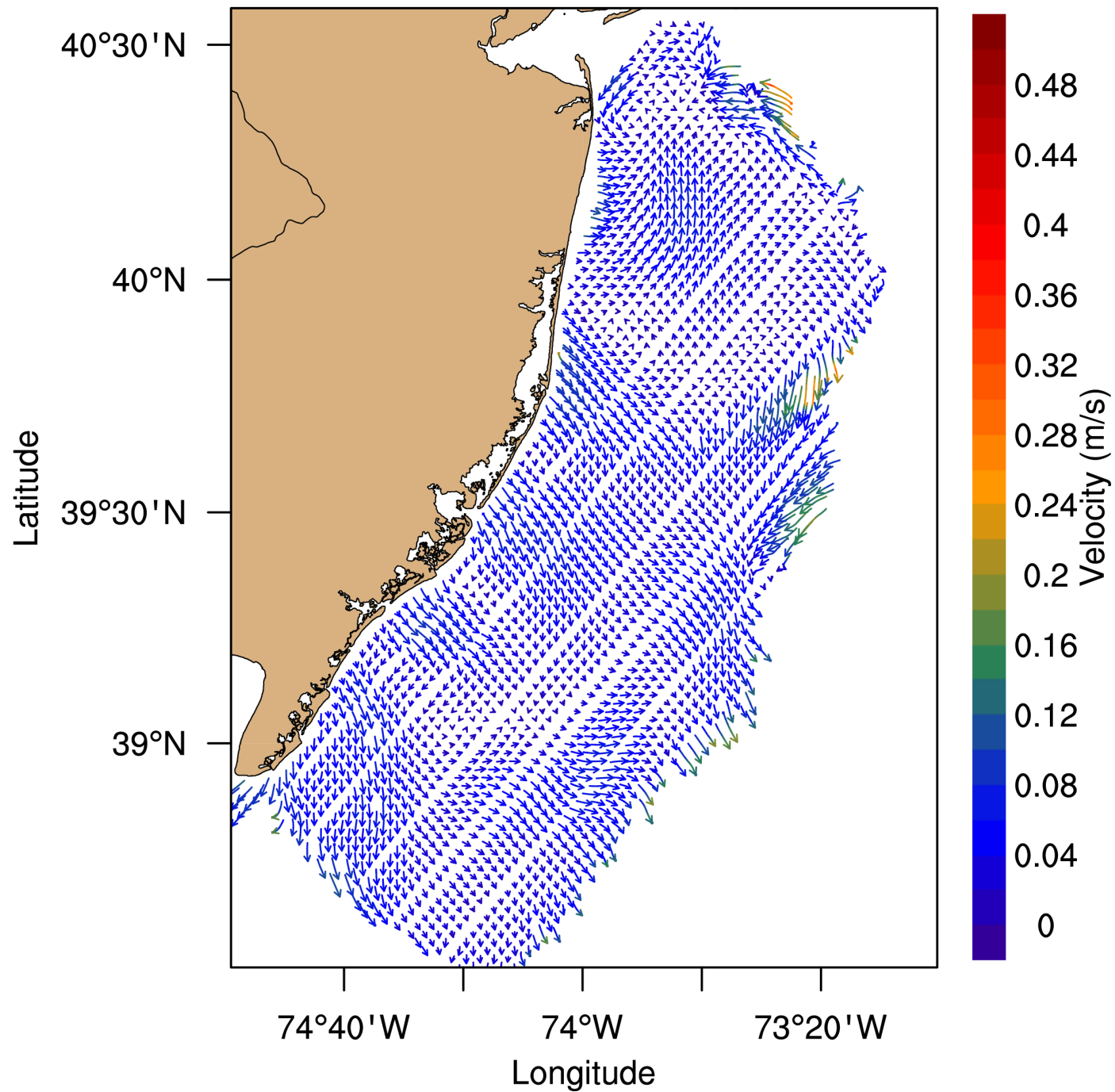
Surface Current Field: 2012-Aug-16 13:55 GMT (+/-370 hrs)



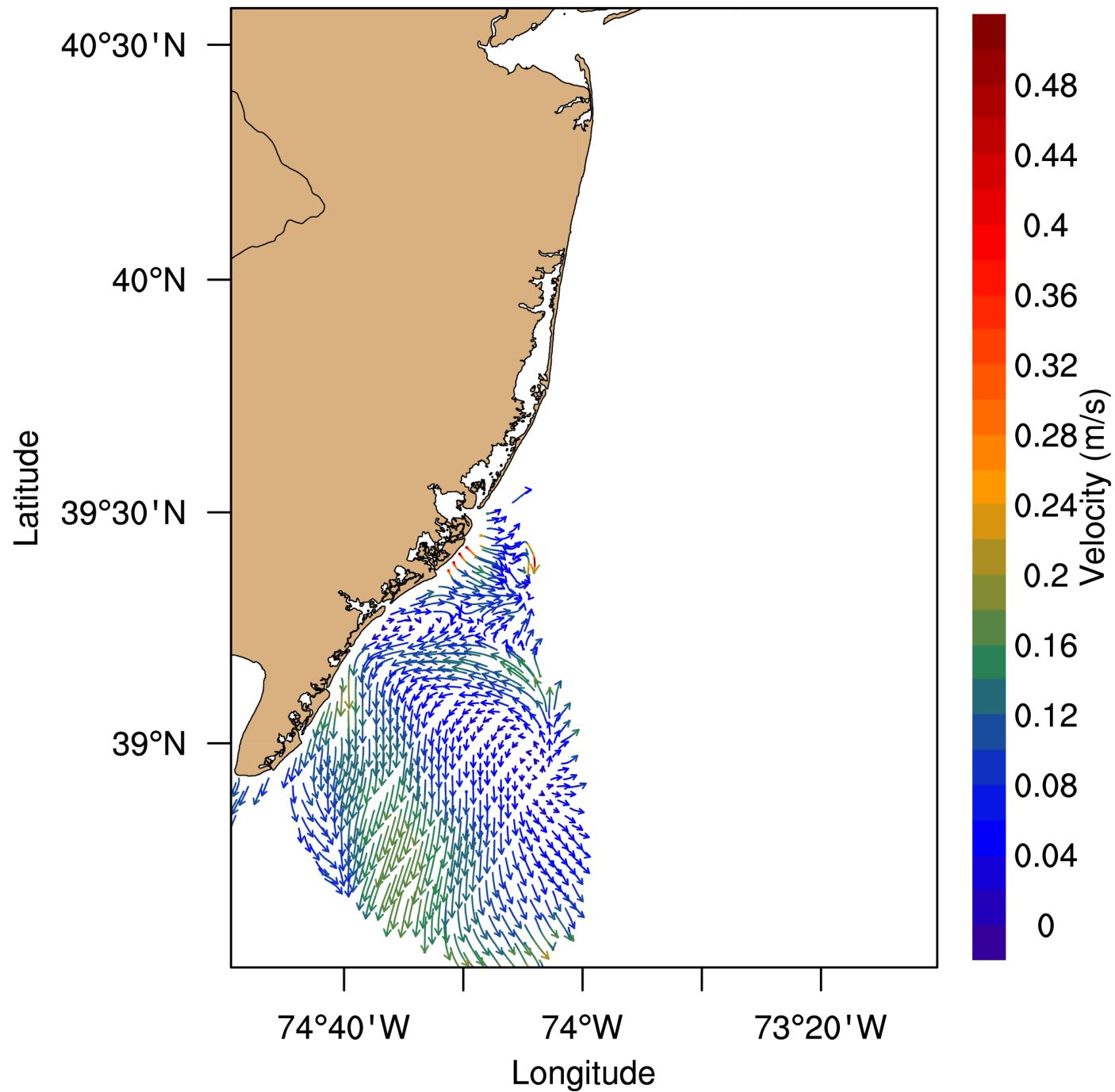
Surface Current Field: 2012-Sep-16 00:00 GMT (+/-360 hrs)



Surface Current Field: 2012-Oct-16 12:00 GMT (+/-372 hrs)

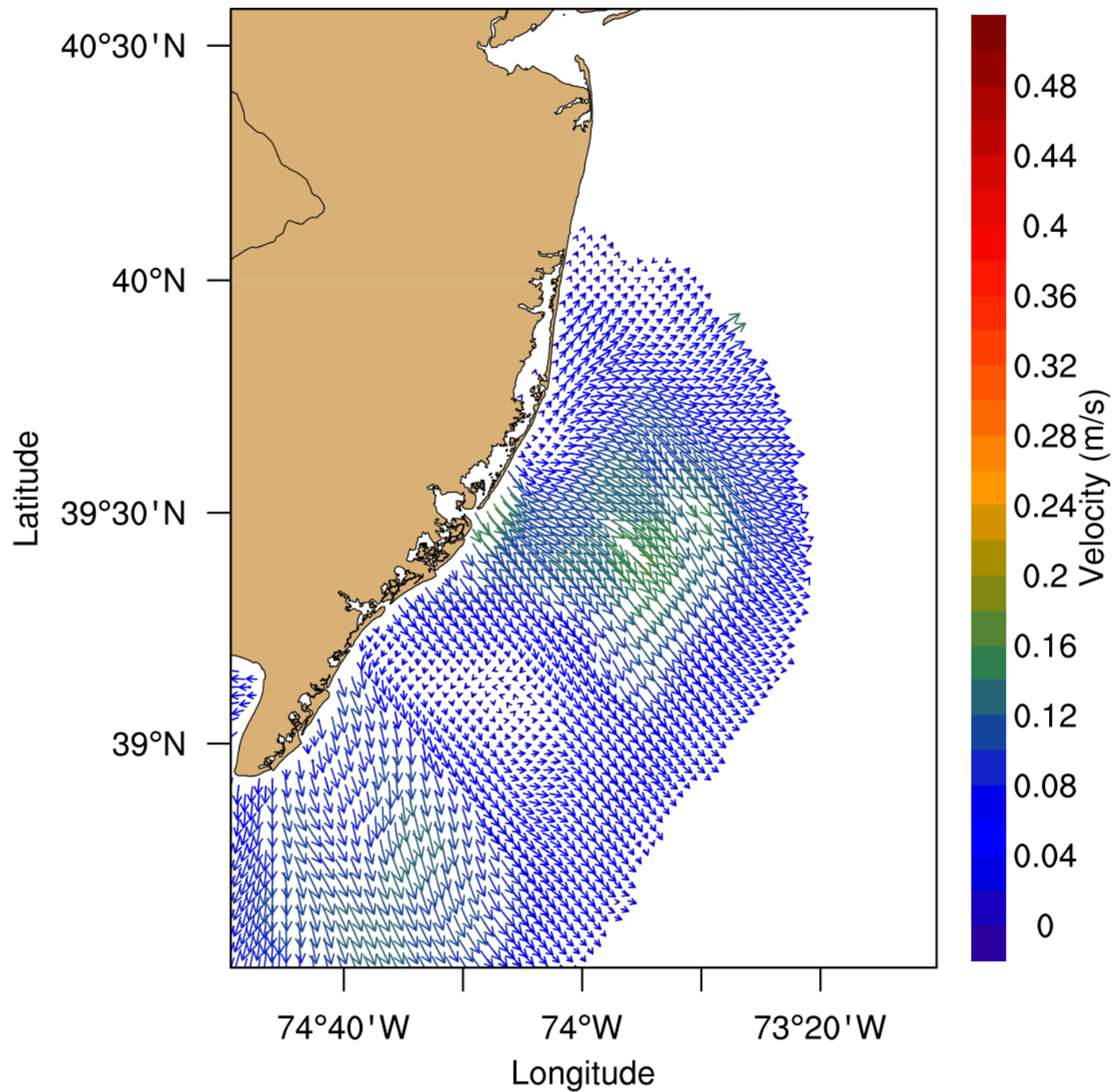


Surface Current Field: 2012-Nov-16 00:00 GMT (+/-360 hrs)





Surface Current Field: 2012-Dec-16 11:30 GMT (+/-372 hrs)



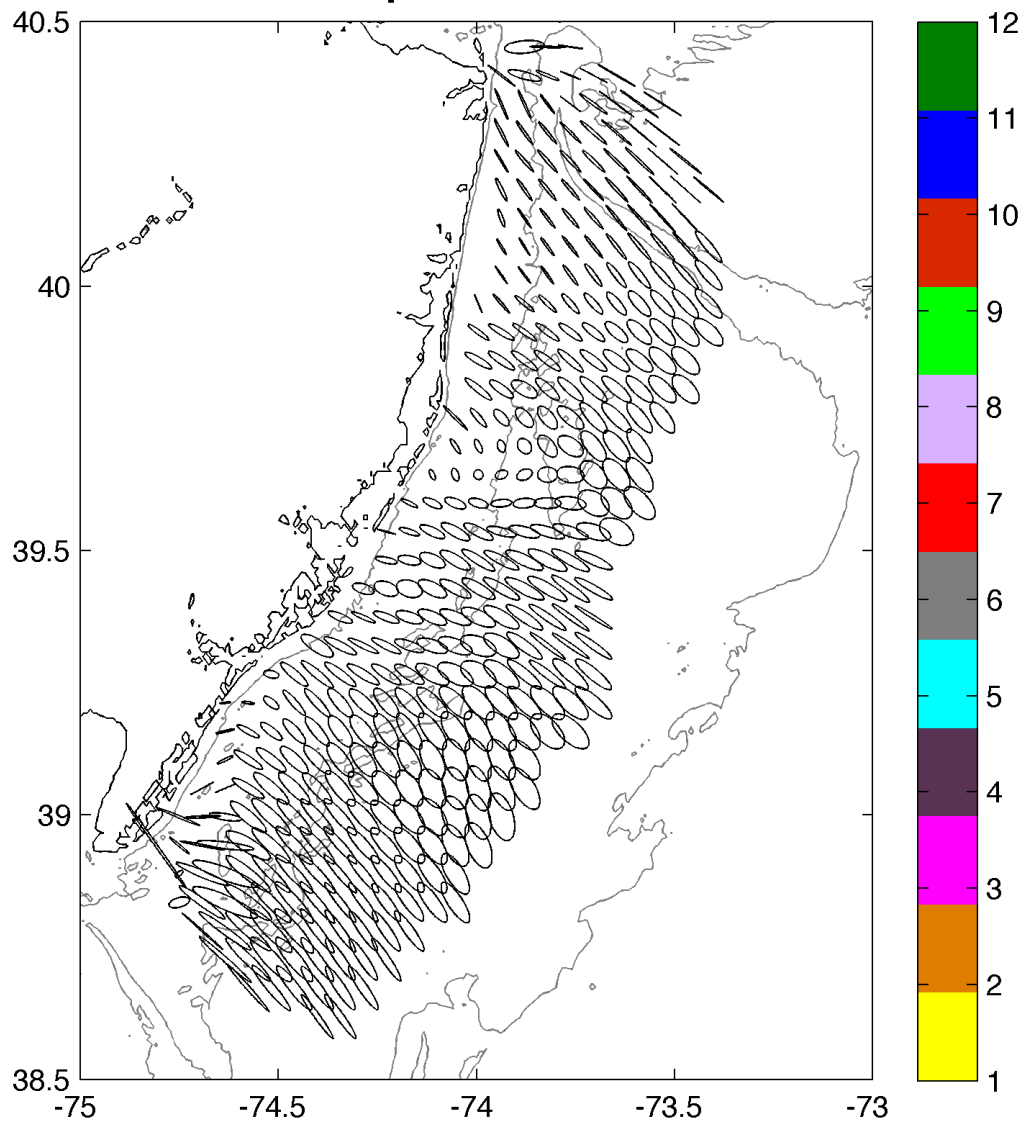
Section 14:

**BPU**

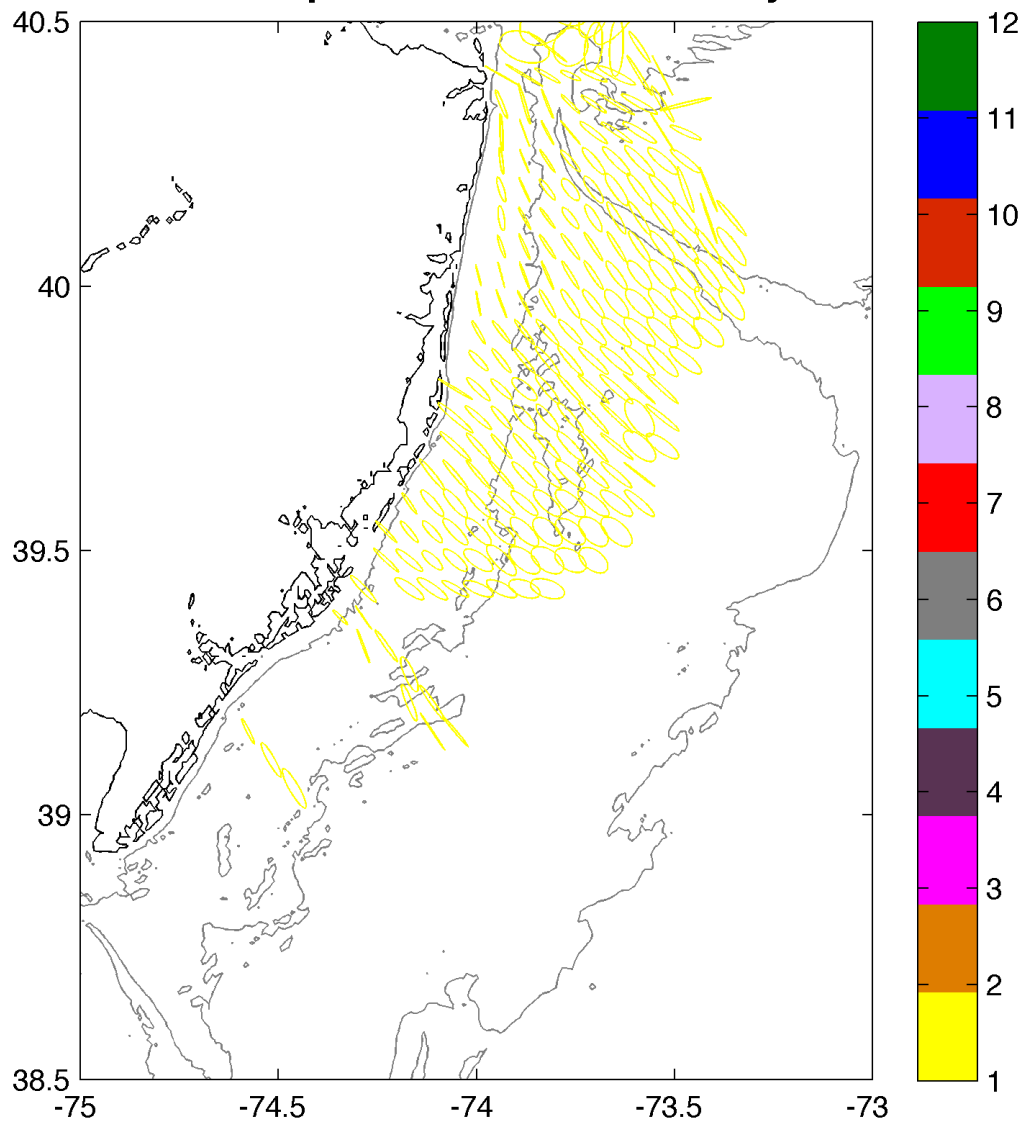
**M2 Tidal Ellipses**

January 1, 2012 to December 31, 2012

# M2 Tidal Ellipses > 50% data 2012

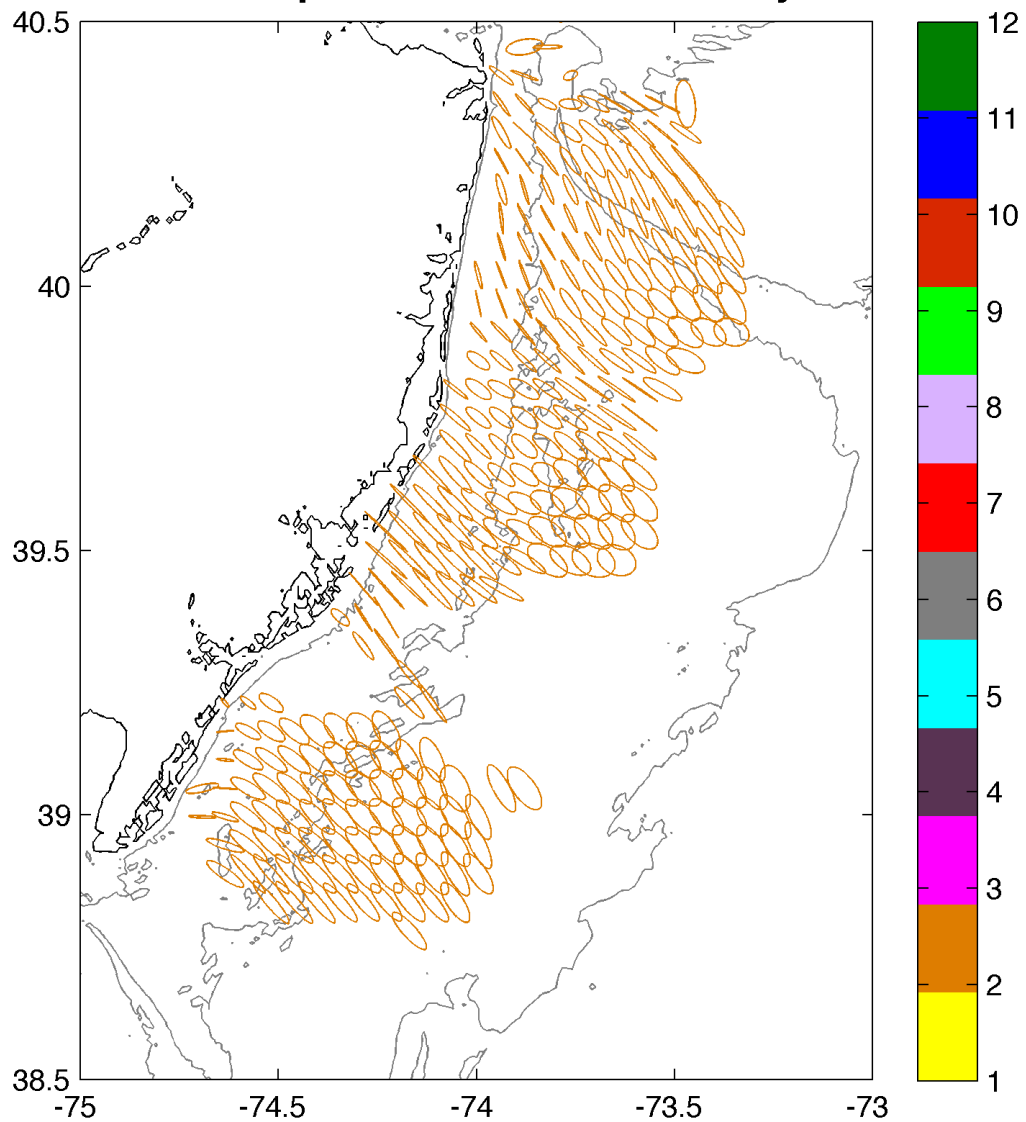


# M2 Tidal Ellipses > 50% dataJanuary 2012

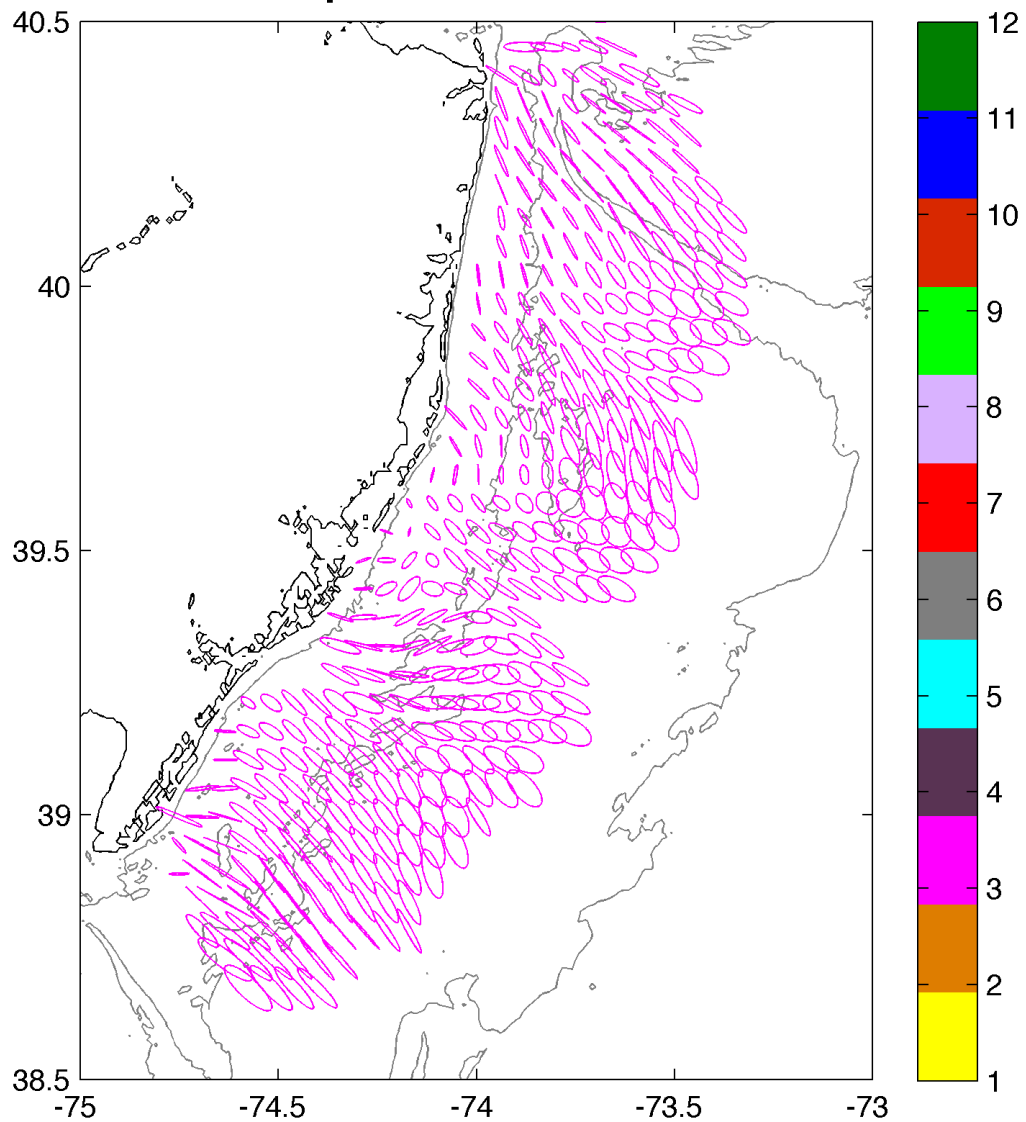




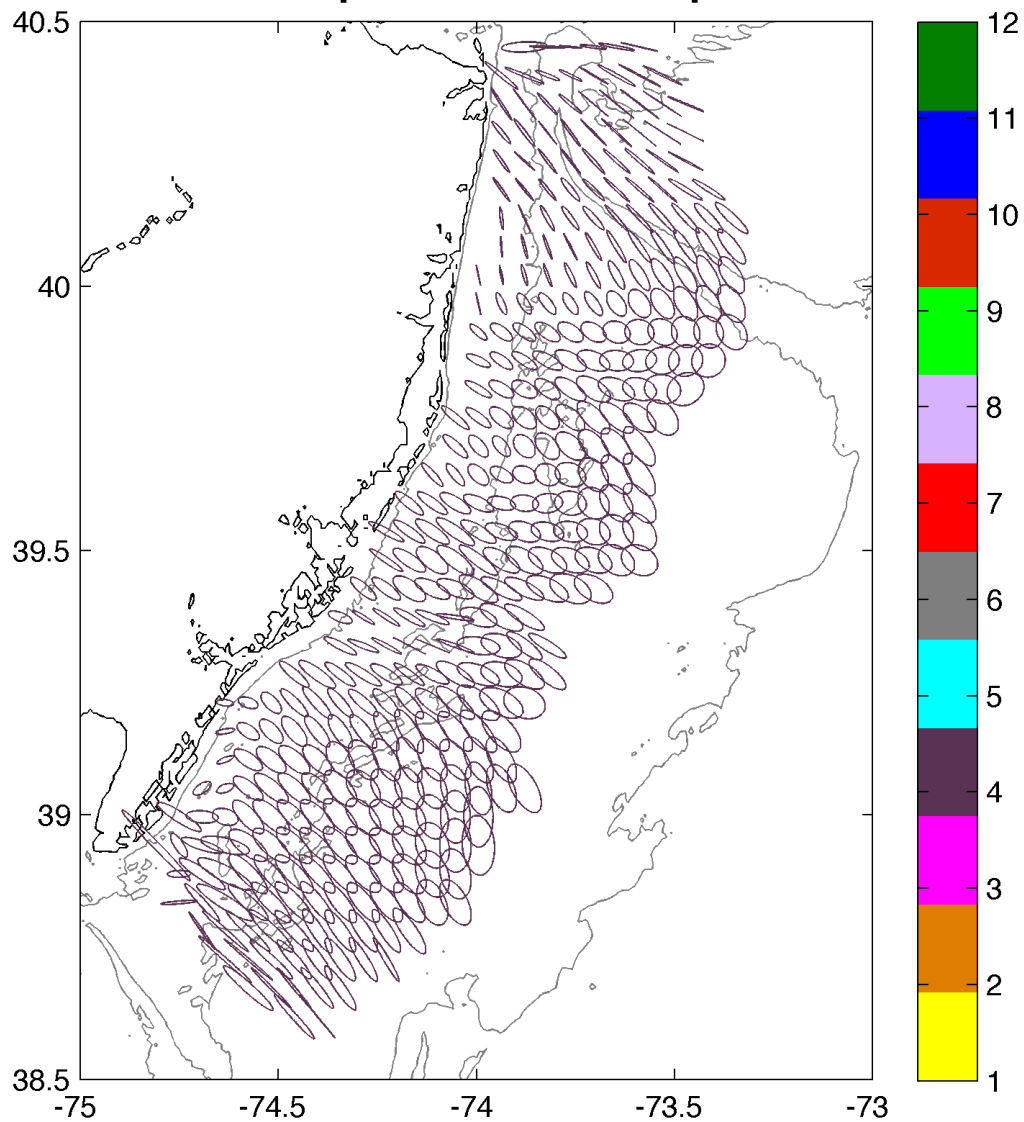
# M2 Tidal Ellipses > 50% dataFebruary 2012



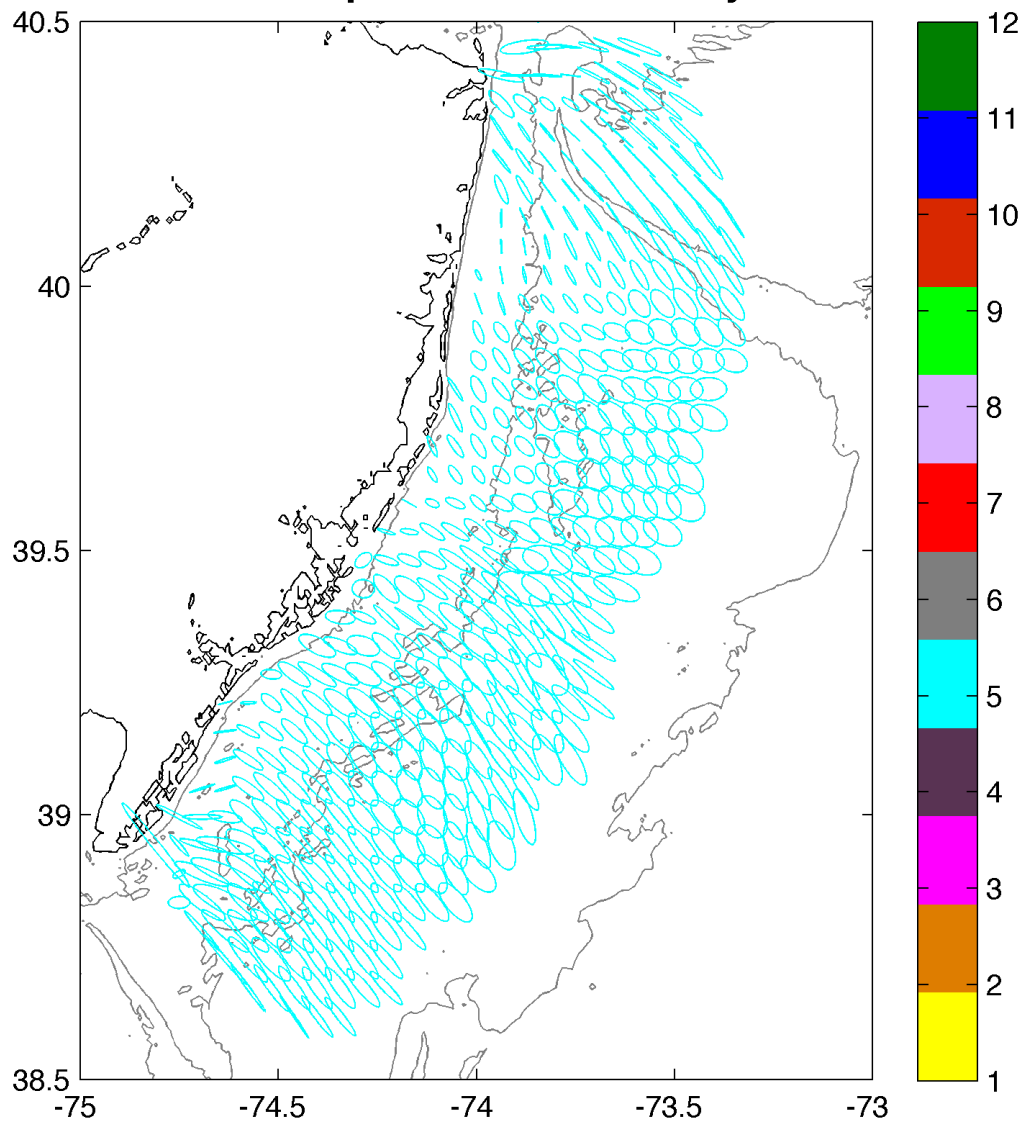
# M2 Tidal Ellipses > 50% dataMarch 2012



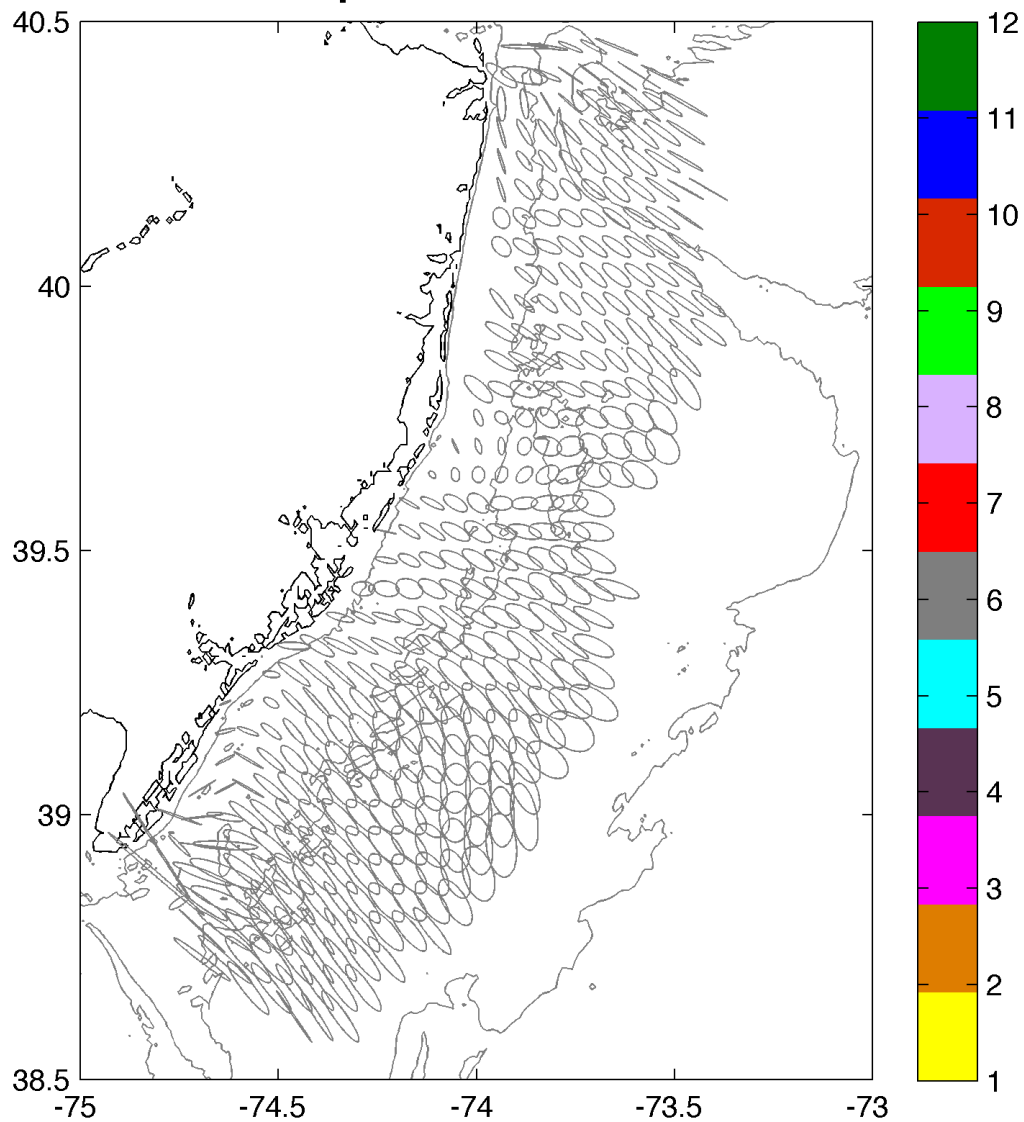
# M2 Tidal Ellipses > 50% dataApril 2012



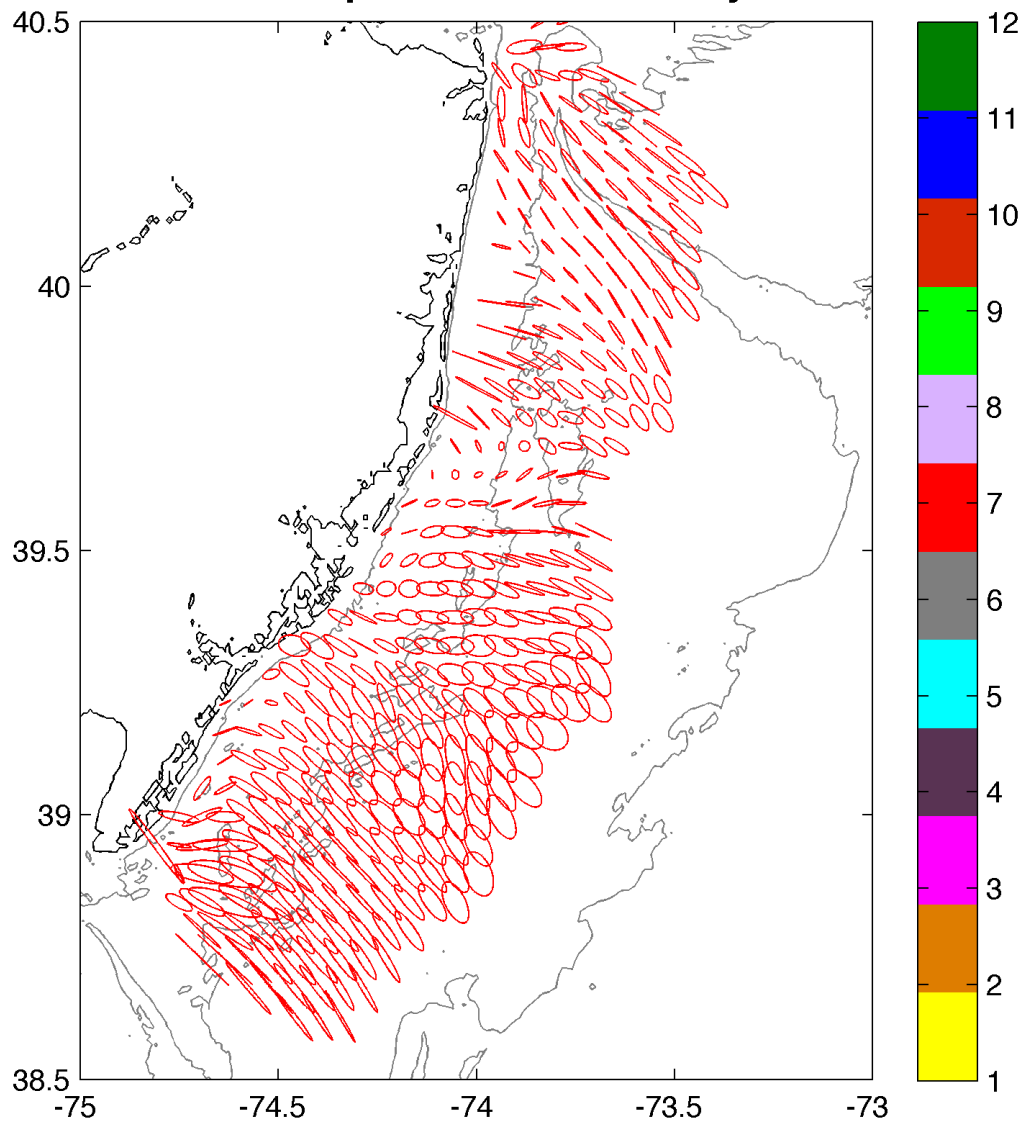
# M2 Tidal Ellipses > 50% dataMay 2012



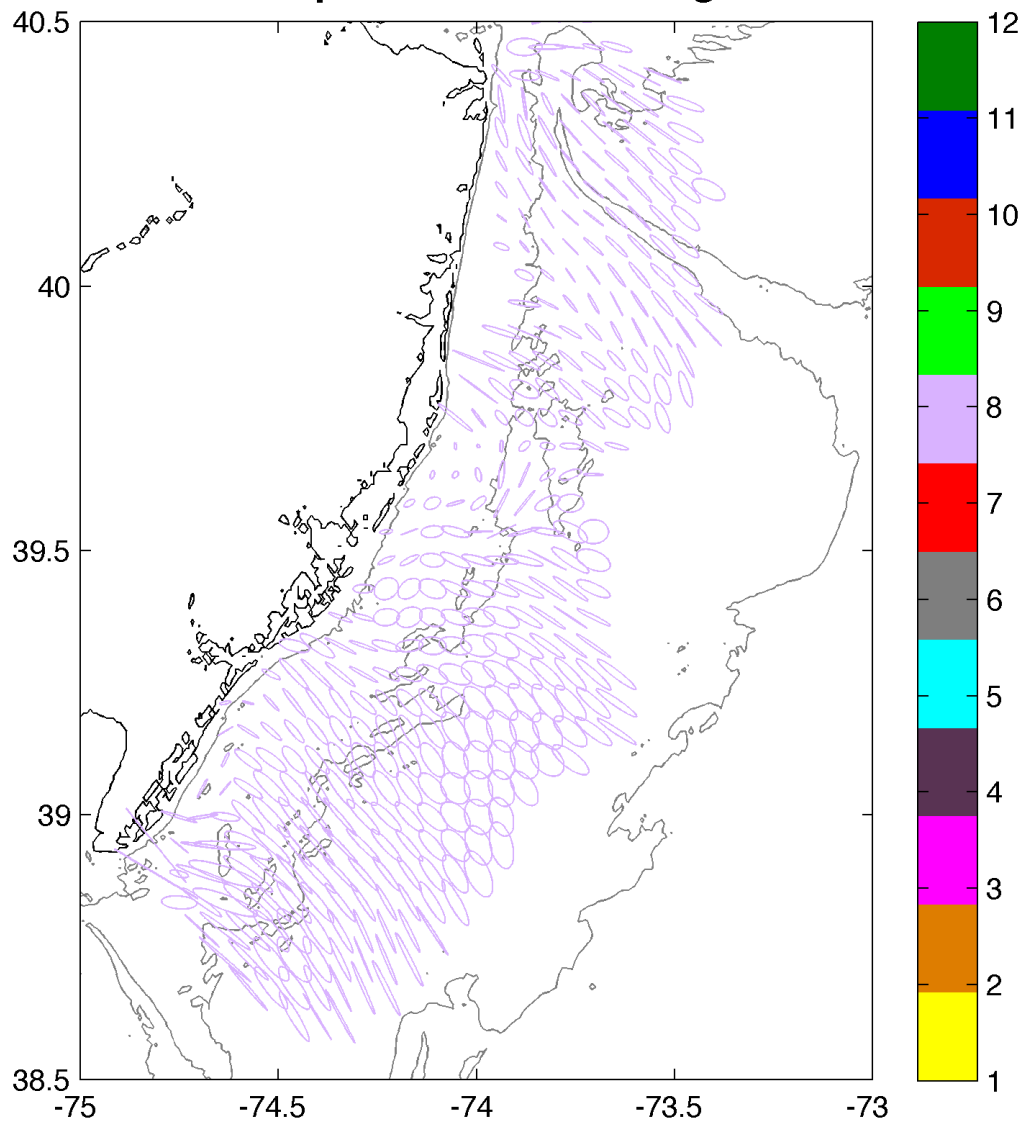
# M2 Tidal Ellipses > 50% data June 2012



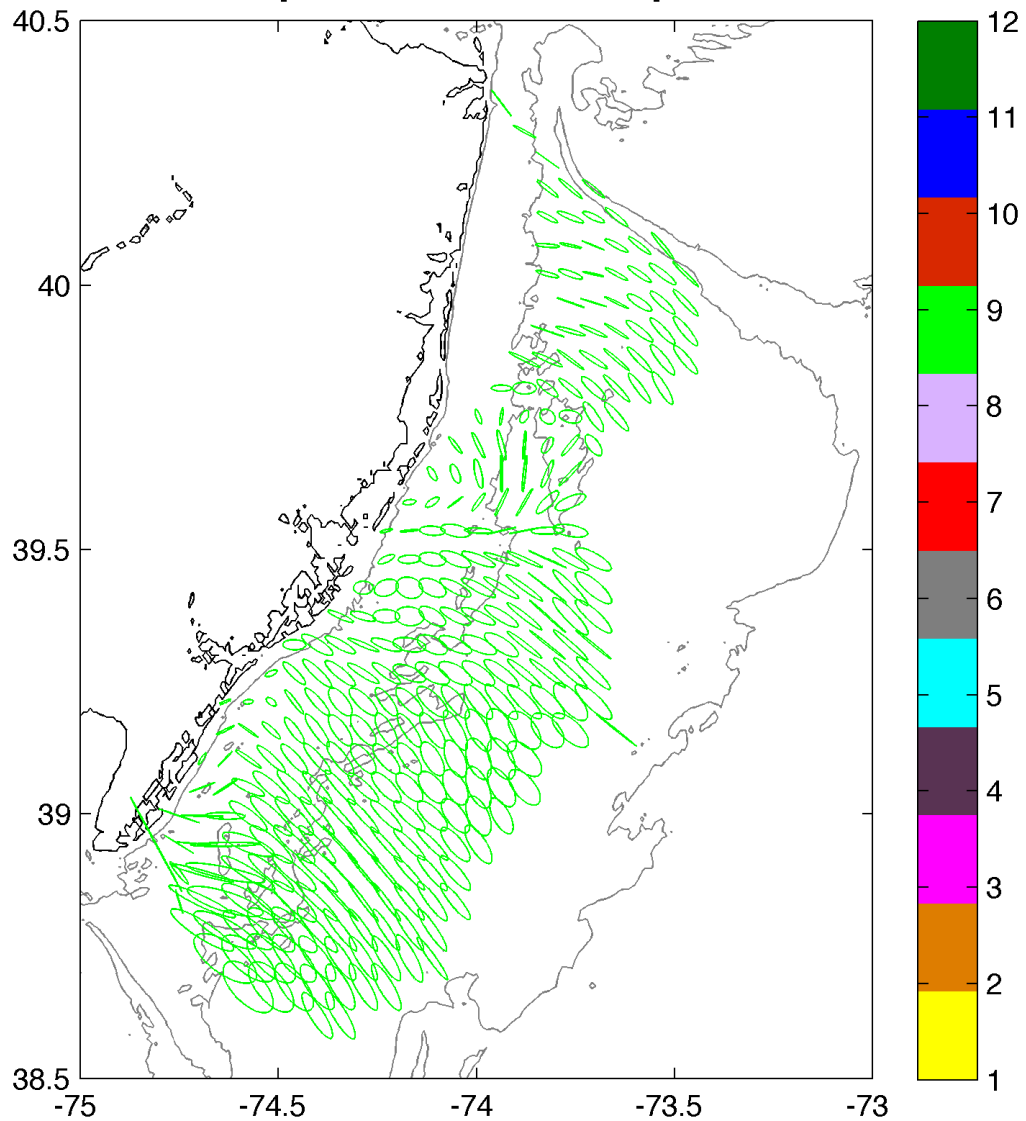
# M2 Tidal Ellipses > 50% data July 2012



# M2 Tidal Ellipses > 50% dataAugust 2012

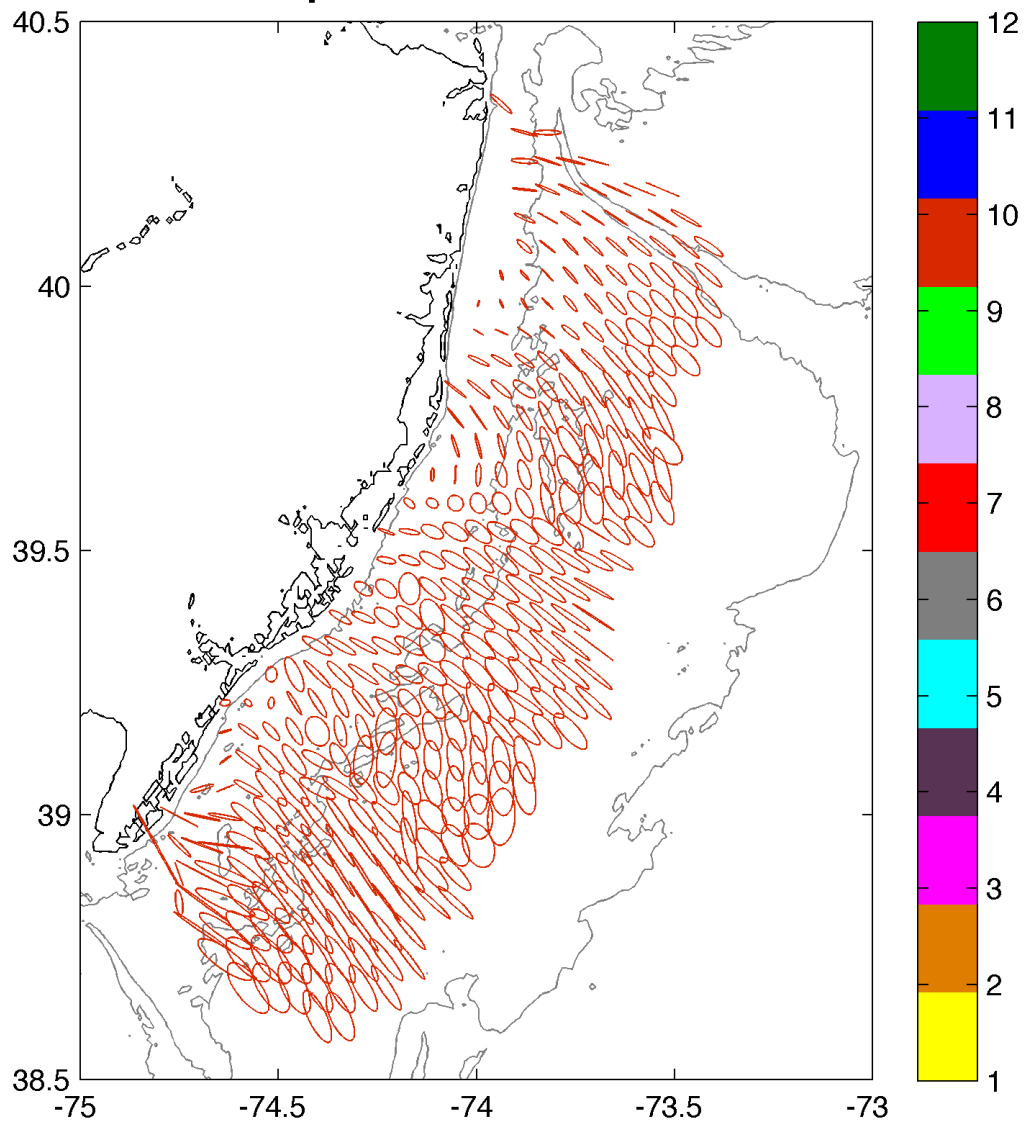


# M2 Tidal Ellipses > 50% dataSeptember 2012

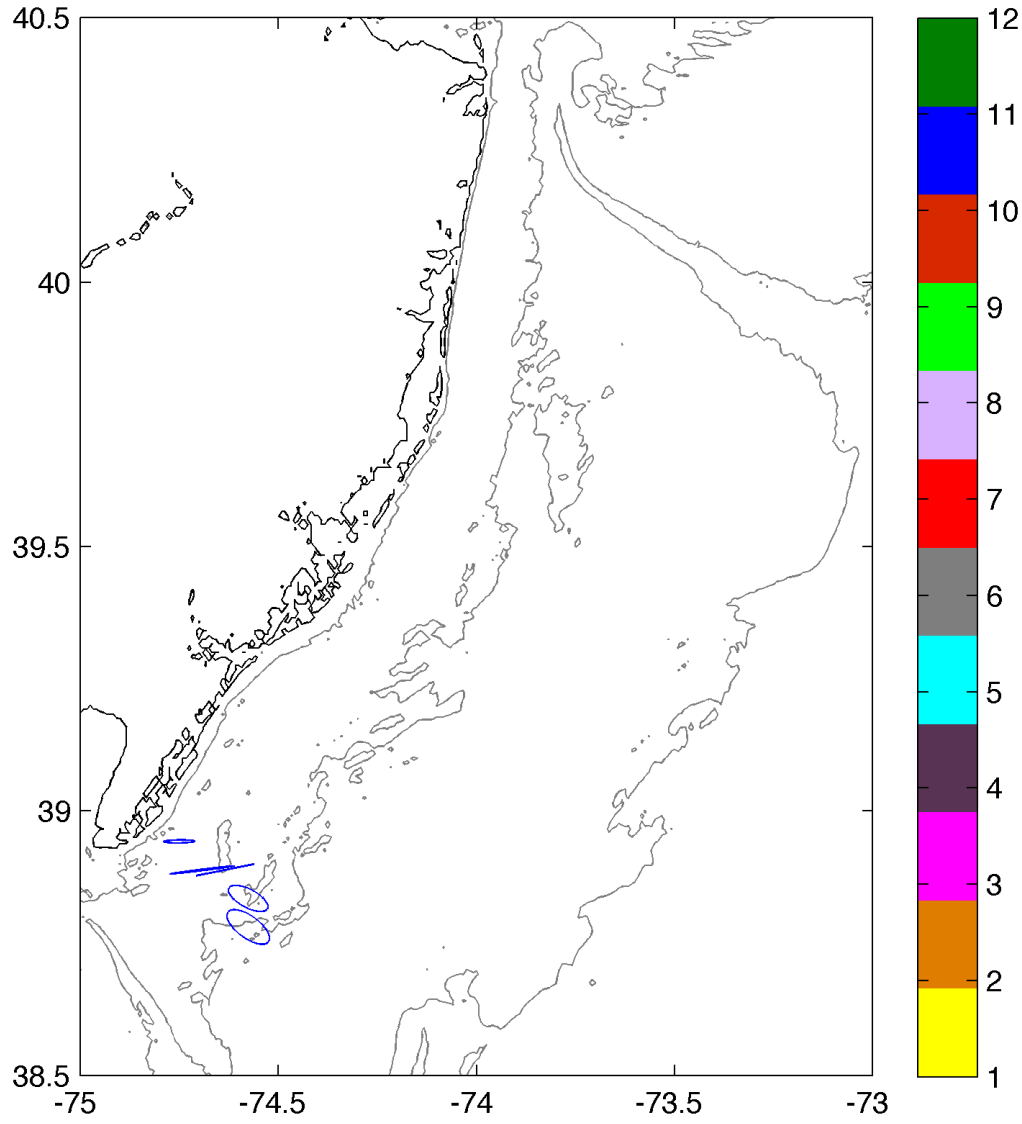




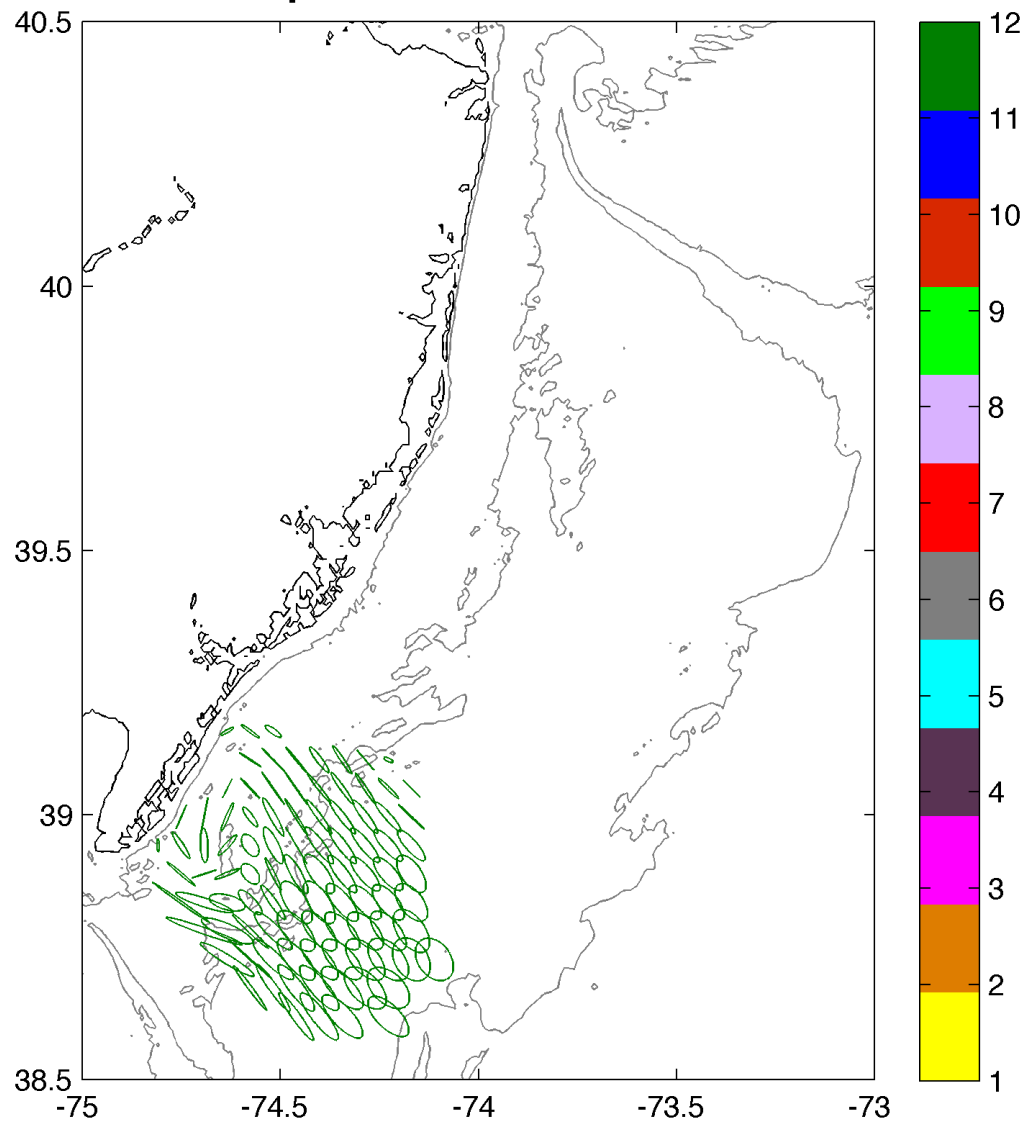
# M2 Tidal Ellipses > 50% dataOctober 2012



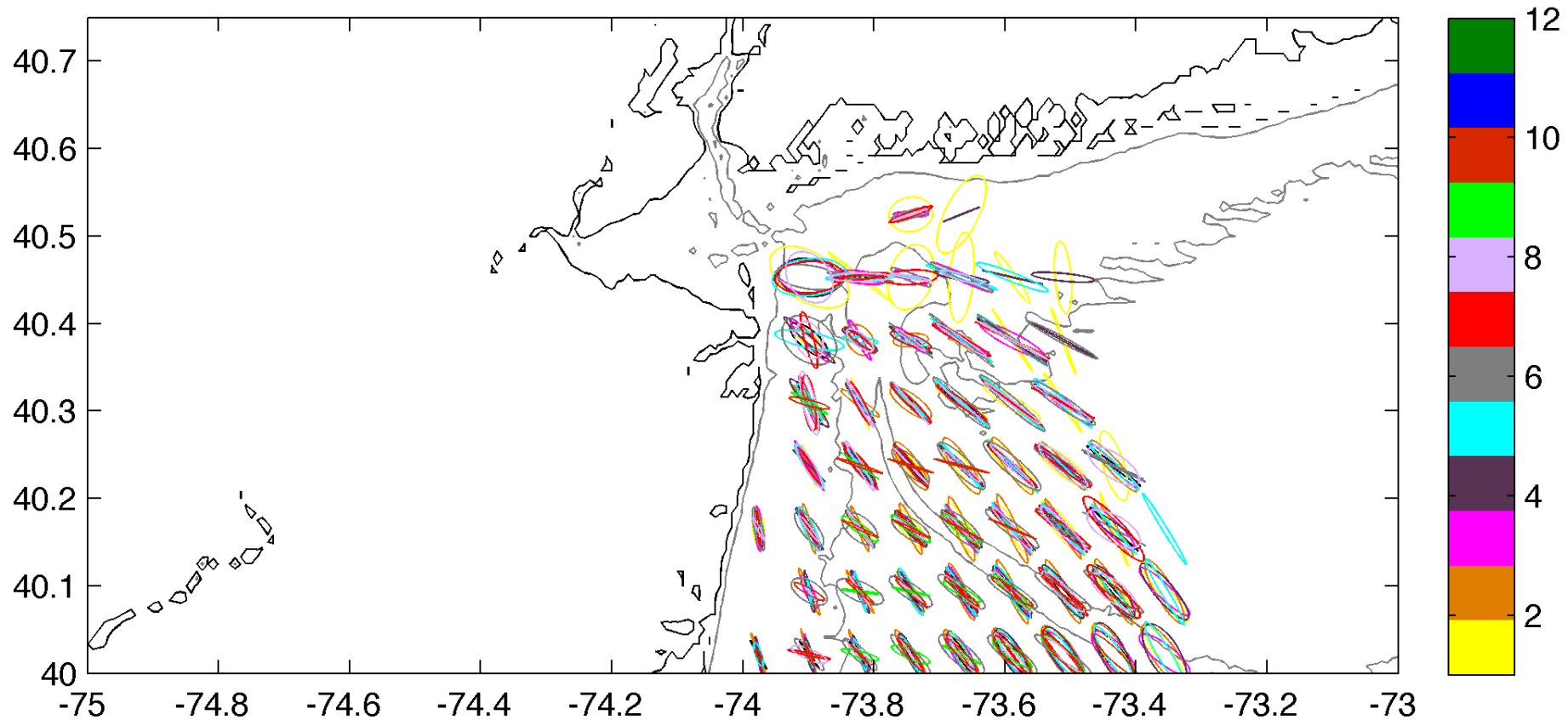
# M2 Tidal Ellipses > 50% dataNovember 2012



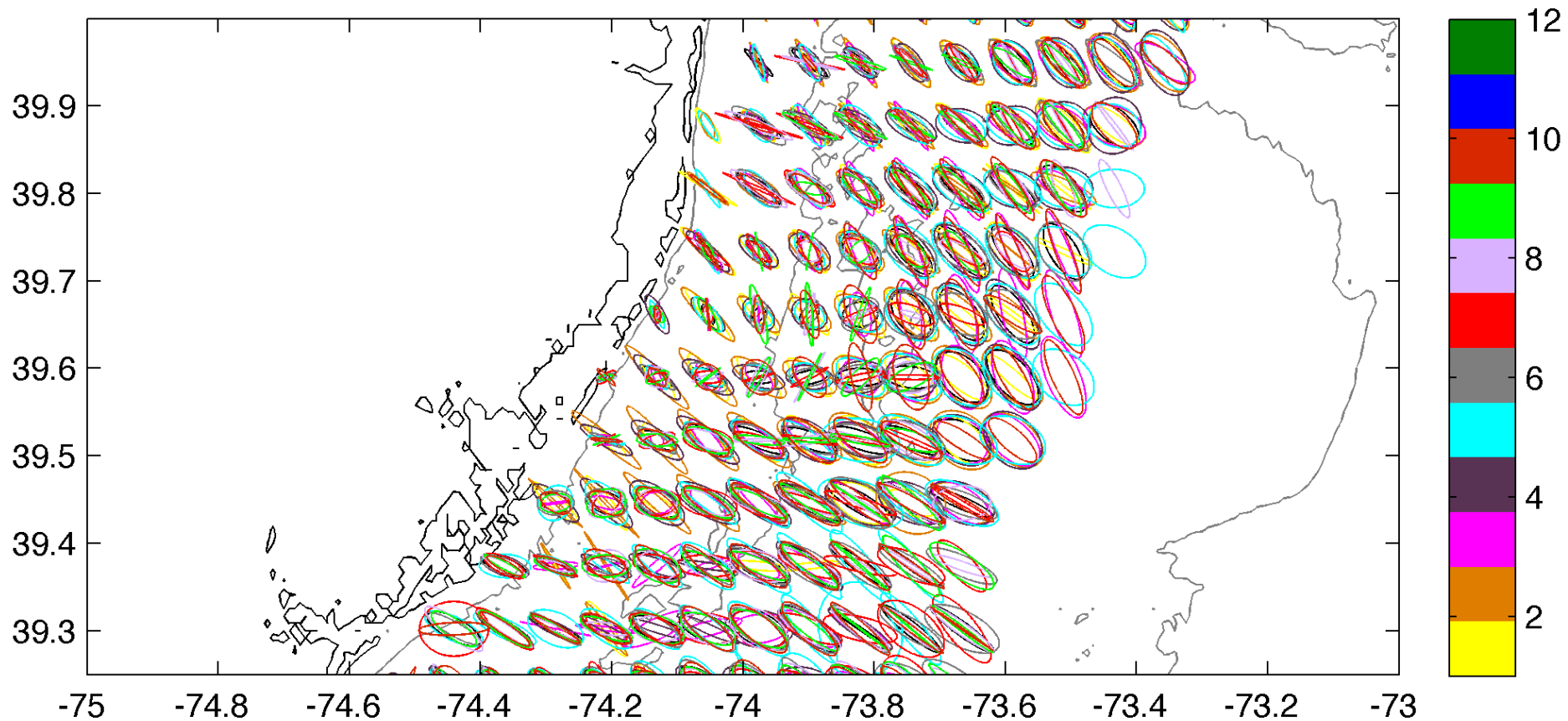
# M2 Tidal Ellipses > 50% dataDecember 2012



## M2 Tidal Ellipses > 50% data 2012



## M2 Tidal Ellipses > 50% data 2012



## M2 Tidal Ellipses > 50% data 2012

