GROUP ON EARTH OBSERVATIONS

# Fifth Meeting of Global High Frequency Radar Network

Hugh Roarty
Rutgers University

# AGENDA

| Monday, December 12, 2016 | |
|---|---|
| 6:00 pm to 6:15 pm | Ice Breaker, Marriot Marquis |
| 6:15 pm to 6:30 pm | Opening Remarks, Hugh Roarty |
| 6:30 pm to 6:45 pm | Update from Europe, Anna Rubio |
| 6:45 pm to 7:00 pm | Update from Asia, Dongxiao Wang |
| 7:00 pm to 7:15 pm | Update from the Middle East, Libe Washburn |
| 7:15 pm to 7:30 pm | Update from the Americas, Lisa Hazard |
| 7:30 pm to 7:45 pm | HF Radar as a New Observing Element of GOOS, Hugh Roarty |
| 7:45 pm to 8:00 pm | ITU Bands and National Efforts Discussion, Simone Cosoli |
| 8:00 pm | Meeting Ends |

THANKS to
Dongxiao Wang and
South China Sea
Institute of Oceanology
for sponsoring
refreshments

# Previous Meetings

- London 2012
- Norway 2013
- Taiwan 2014
- Greece 2015

# Fourth Meeting of the Global High Frequency Radar Network

September 22-23, 2015
Heraklion, Crete, Greece

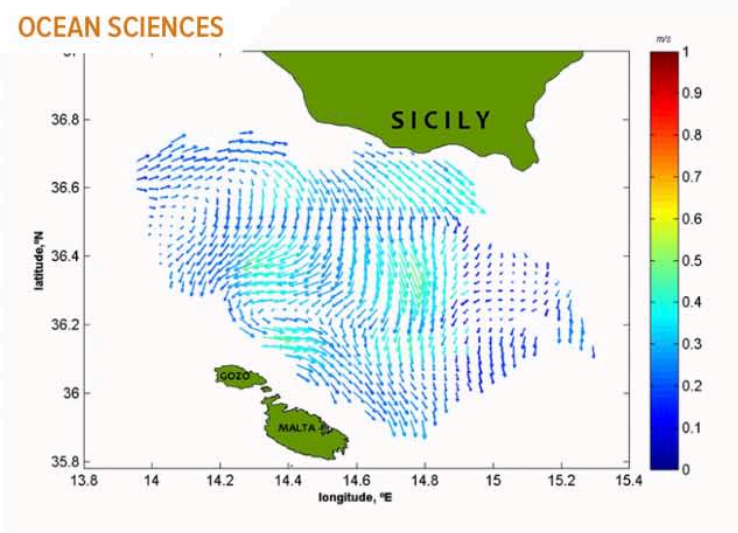
EOS Earth & Space Science News



# Meeting Reports

Dispatches from scientific meetings and conferences around the world

OCEAN SCIENCES




5 April 2016

## Growing Network of Radar Systems Monitors Ocean Surface Currents

Fourth Meeting of the Global High Frequency Radar Network; Heraklion, Crete, Greece, 22–23 September 2015

earthzine.org http://earthzine.org/2014/10/30/the-global-high-frequency-radar-network/

# The Global High Frequency Radar Network

Amanda
Lewan

By Dr. Hugh Roarty
Research Project Manager
Coastal Ocean Observation Laboratory
Rutgers University

Co-authors: Ms. Lisa Hazard, Dr. Lucy Wyatt, Dr. Jack Harlan and Dr. Enrique Alvarez Fanjul

The Global High Frequency Radar Network is a vision for a global operational system measuring ocean surface currents to support monitoring of marine and coastal ecosystems. The measurement of ocean currents is fundamental to ocean forecasting. High frequency (HF) radar has proven to be an efficient tool for the measurement of surface currents along the coast out to 200 kilometers.

# Goals for Global HF Radar Network

1) **Increase the number of coastal radars**
2) **Ensure HFR data is available in a single standardized format in near-real-time,**
3) **Assimilate data into ocean and ecosystem models**
4) **A set of easy to use standard products**
5) **Worldwide Quality Standards**
6) **Develop emerging uses of HF radar**

# 1) Increase the number of coastal radars

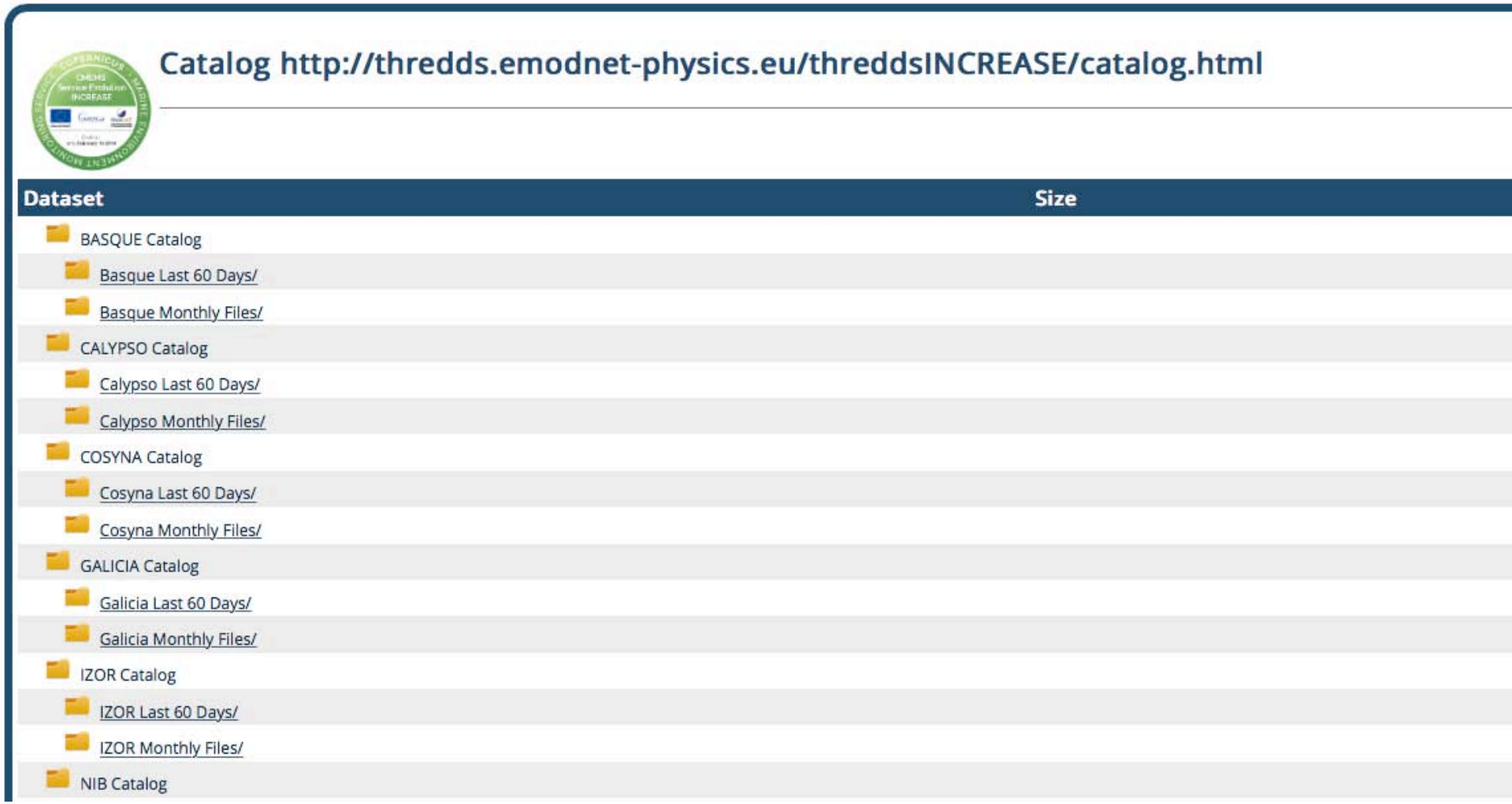
- United States 130
- Canada 8
- Mexico 2
- Brazil 2
- Bahamas 2
- Honduras 2

- Norway 6
- Portugal 4
- Italy 6
- Croatia 2
- Spain 16
- Ireland 2
- Russia 1
- France 2
- Israel 2

- Japan 22
- Korea 24 42
- China 8
- Thailand 6
- Malta 2
- Taiwan 20
- India 12
- Vietnam 3
- Indonesia 2
- Jordan 1
- UAE 2
- Egypt 2
- Azerbaijan 2
- Australia 5

Total Sales: ~298

# 2) Ensure HFR data is available in a single standardized format in near-real-time,



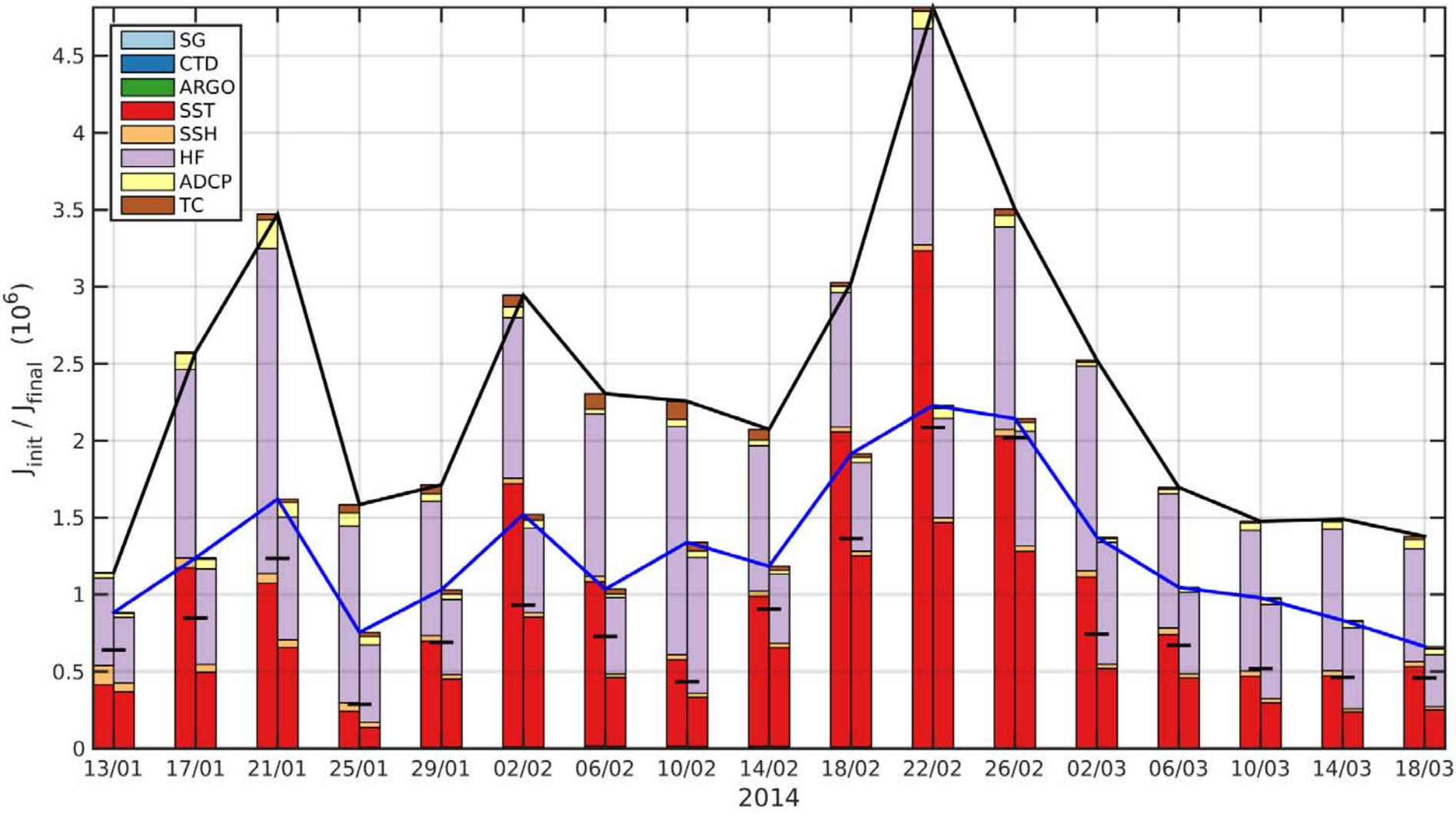
Catalog http://thredds.emodnet-physics.eu/threddsINCREASE/catalog.html

| Dataset | Size |
|---|---|
| BASQUE Catalog | |
| Basque Last 60 Days/ | |
| Basque Monthly Files/ | |
| CALYPSO Catalog | |
| Calypso Last 60 Days/ | |
| Calypso Monthly Files/ | |
| COSYNA Catalog | |
| Cosyna Last 60 Days/ | |
| Cosyna Monthly Files/ | |
| GALICIA Catalog | |
| Galicia Last 60 Days/ | |
| Galicia Monthly Files/ | |
| IZOR Catalog | |
| IZOR Last 60 Days/ | |
| IZOR Monthly Files/ | |
| NIB Catalog | |

# 3) Assimilate data into ocean and ecosystem models

## Data Assimilation: WA (3 months)

~30 million data points assimilated

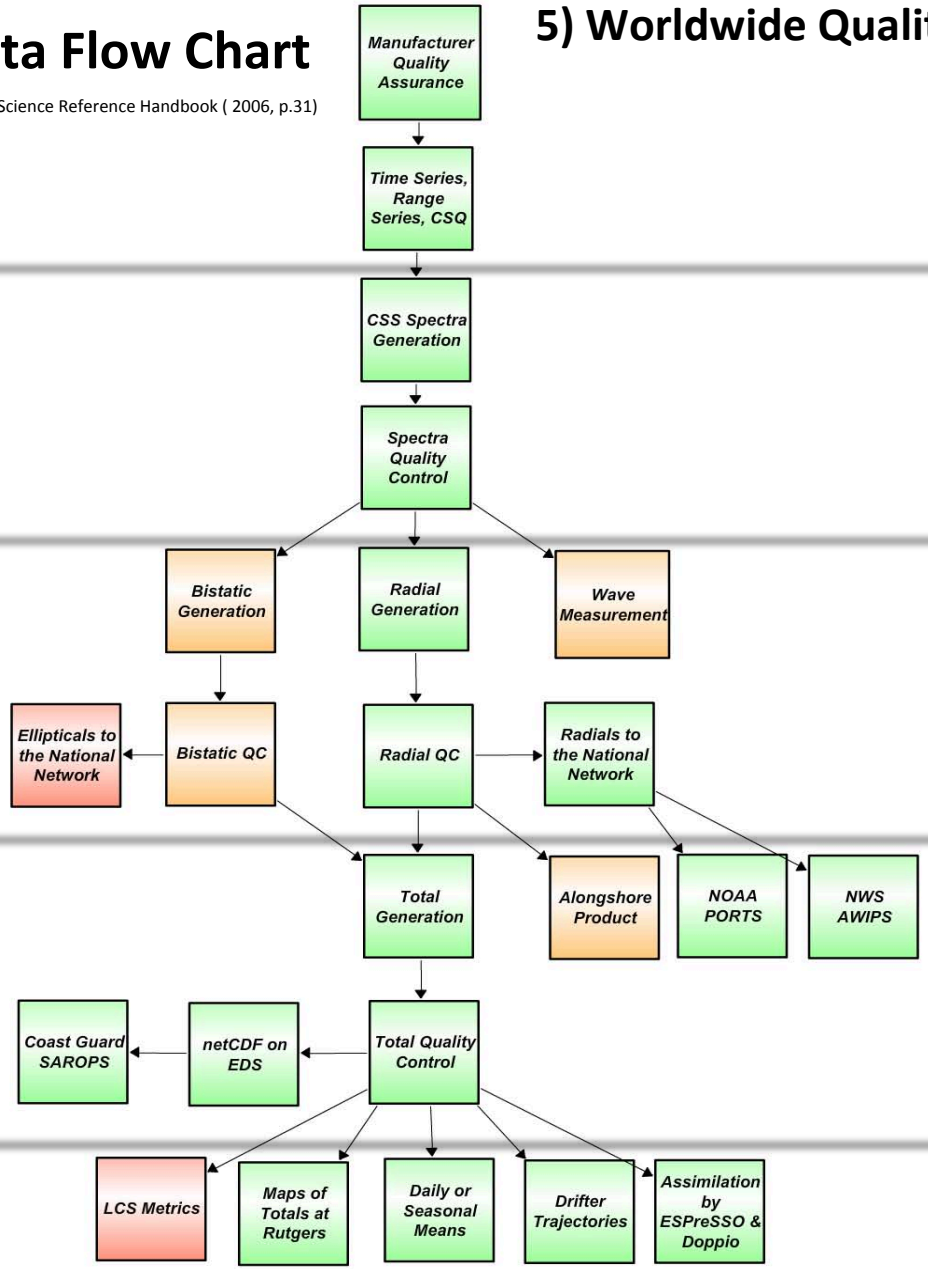


# HF Radar Data Flow Chart

Data levels defined by NASA Earth Science Reference Handbook ( 2006, p.31)

Nov. 2016

## 5) Worldwide Quality Standards




## Quality Control Steps

- Manufacturer recommended Antenna Patterns not older than 1 year
- Weekly 11-point remote site inspections
  - Frequency
  - GPS Alignment
  - Visible Bragg
  - Interference
  - Sea Echo Phases
  - Forward/ Reflected Power
  - Terminal Errors
  - Chassis Temperature
  - Computer Memory Space
  - Ideal radial generating
  - Measured radial generation
- Physical site inspection every 6 months
- QARTOD
  - Global range test (300 cm/s)
  - Local range Test (by station)
  - Stuck sensor (0.01 cm/s / 3 hours)
  - Gradient (18 cm/s•hr)
  - Spike (0.1 cm/s )
- Filter based on manufacturer supplied uncertainty parameters
- Human-in-the-loop visual inspection of radial data
- Global range test (300 cm/s)
- Filter based on uncertainty values for each optimal interpolation vector after Kohut (2012)
- Discrete Cosine Transform spatial filter after Fredj (2016)
- Comparison of radar velocity with in situ drifters

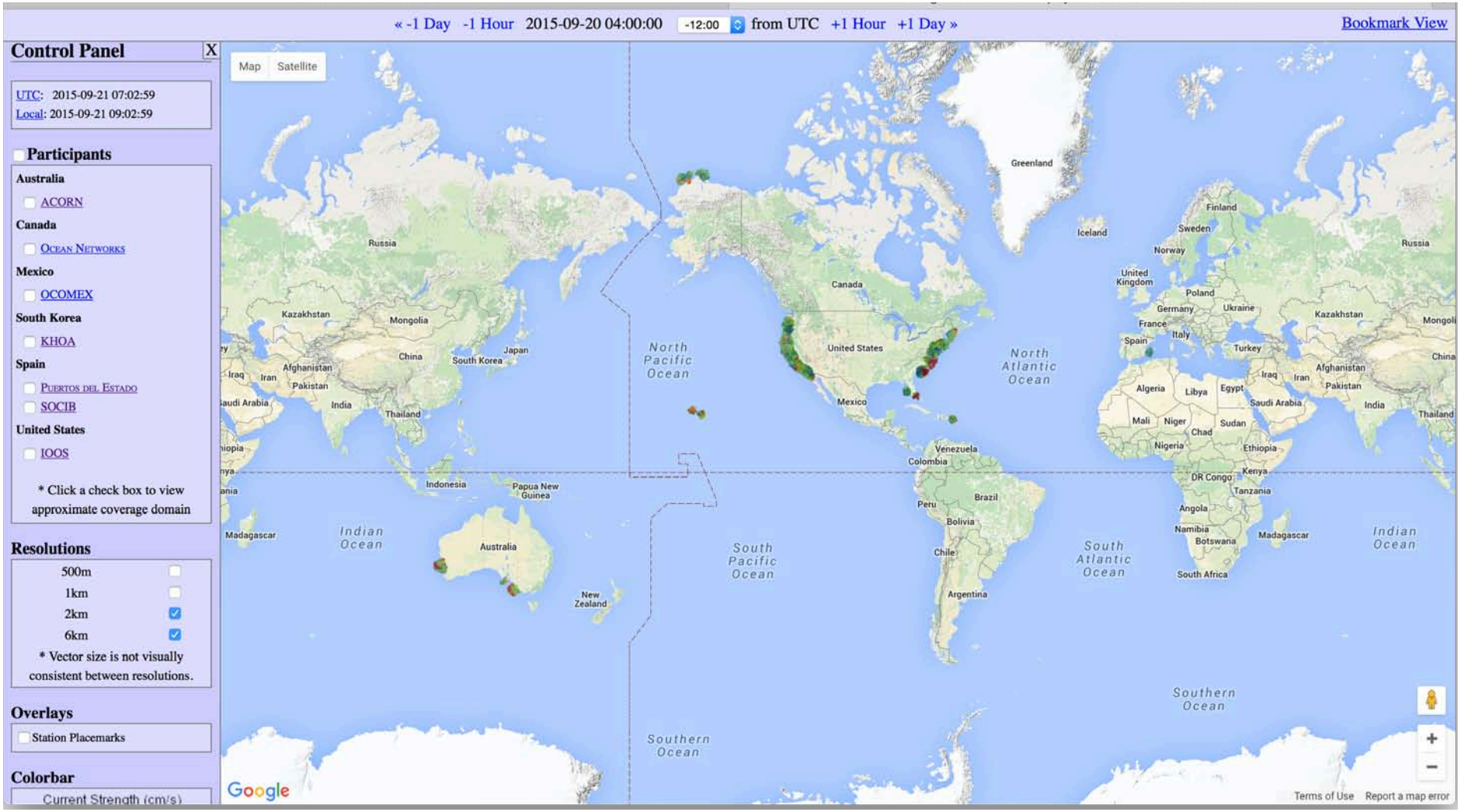
Green – Operational
Orange – Development
Red - Planned

# Global HF Radar Network

- Co Chairs
  - **Hugh Roarty (USA)**
  - **Lisa Hazard (USA)**
  - **Simone Cosoli (Australia)**
  - **Jack Harlan (USA)**
  - **Lucy Wyatt (UK)**
  - **Enrique Alvarez-Fanjul (Spain)**

http://global-hfradar.org

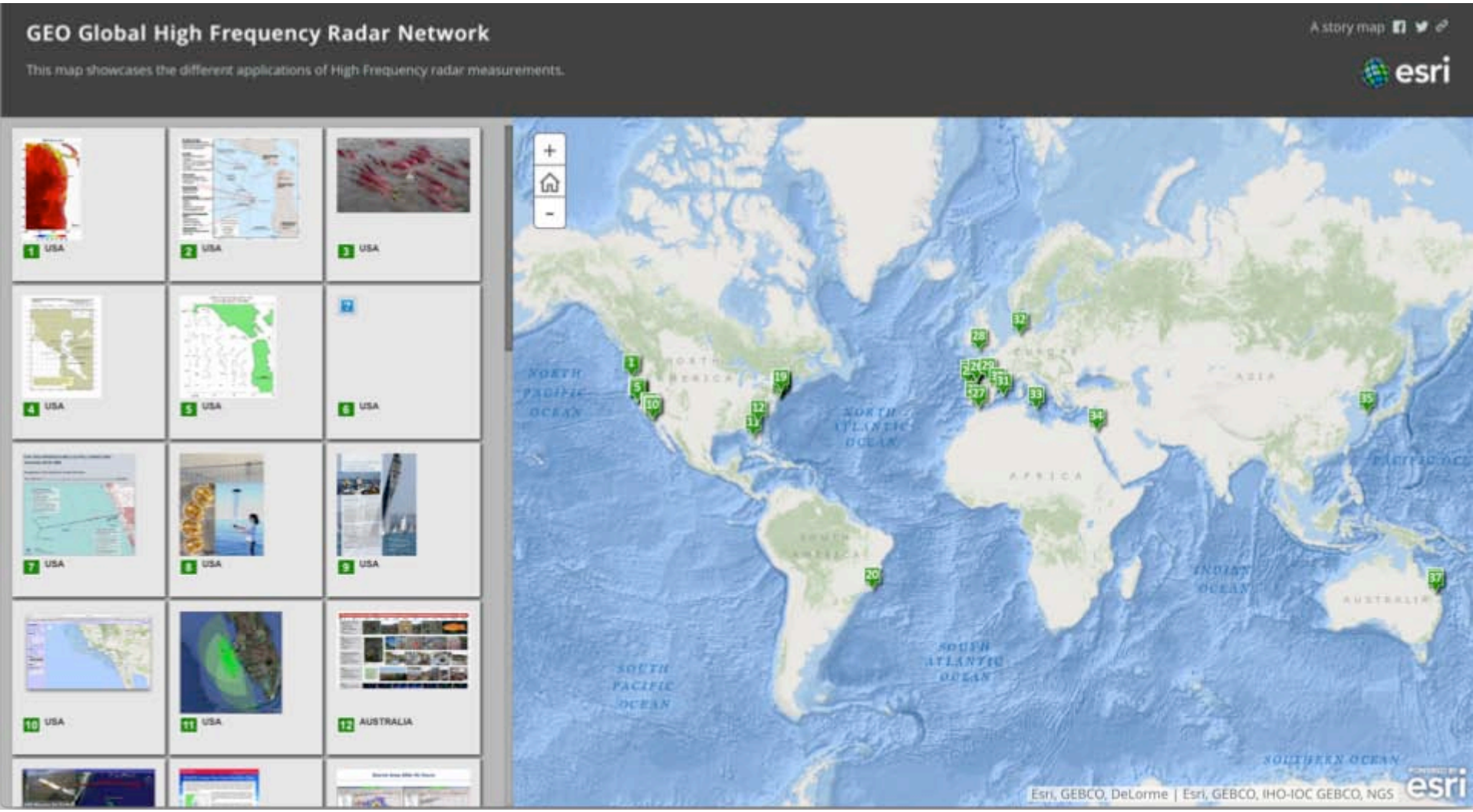
# Global HF Radar Viewer




IOOS INTEGRATED OCEAN OBSERVING SYSTEM

MARACOOS
Ocean Information for a Changing World

# Application Success Stories



# Role of Global Network