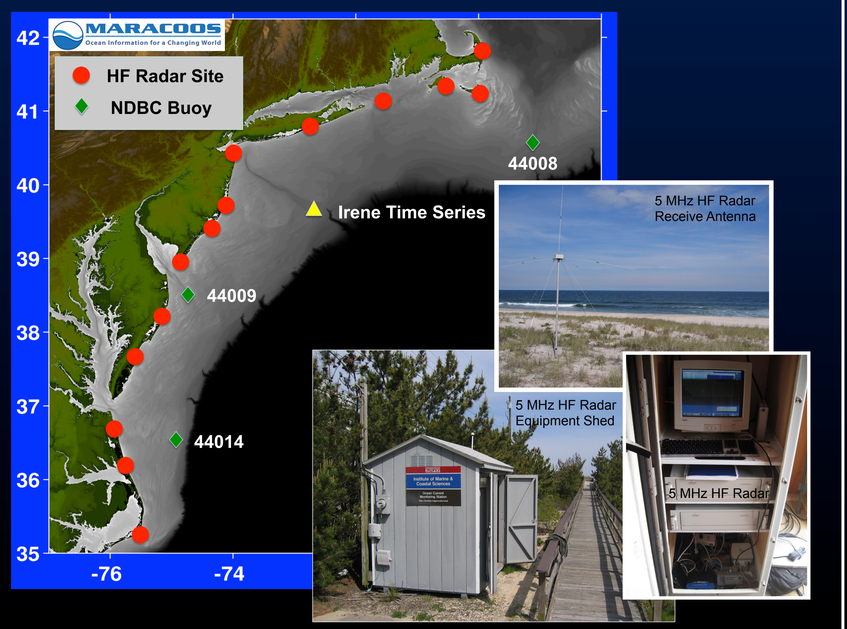
Surface Currents in the Mid Atlantic Bight

Hugh Roarty , Josh Kohut, Laura Palamara, Ethan Handel, Greg Seroka, Erick Rivera, Scott Glenn
hroarty@marine.rutgers.edu
Coastal Ocean Observation Laboratory
Institute of Marine & Coastal Sciences
Rutgers University

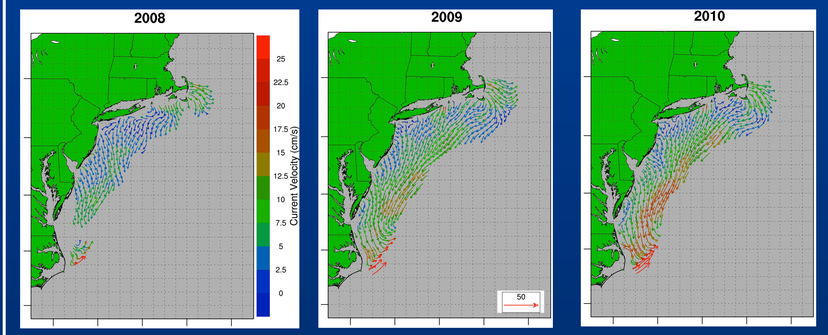
ABSTRACT

The maturation of ocean observing systems now allows scientists and engineers the opportunity to measure the ocean in never before seen ways. The Mid Atlantic High Frequency radar network has been in operation for four years with fourteen long-range SeaSonde type HF radars providing surface current measurements once an hour on a continuous basis. The network spatial and temporal coverage allows for research on the impact and response of the Mid Atlantic Bight due to wind forcing, stratification and river inputs. Surface currents from the network during a four-year study were summarized into seasonal and annual means. These means were examined and compared between each other and with meteorological observations. The network was also able to capture the surface current response to the passage of Hurricane Irene in August 2011. Initial findings indicate that the inertial currents are stronger on the outer part of the shelf. These inertial currents took approximately five days to decay after the passage of the hurricane.

METHODS



YEAR LONG MEANS

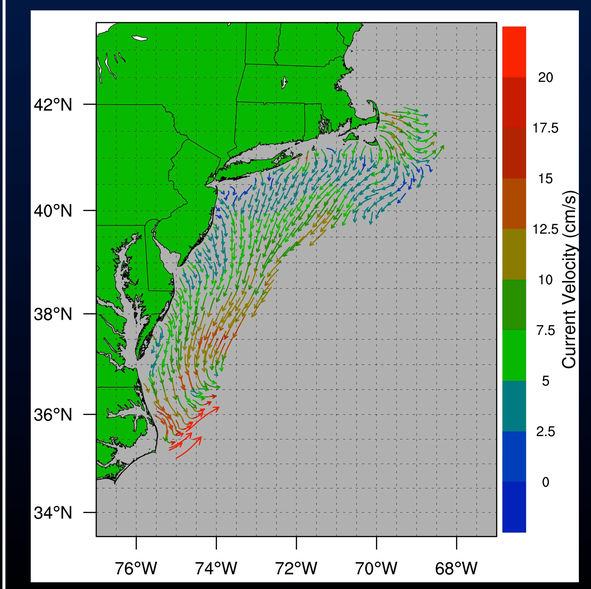


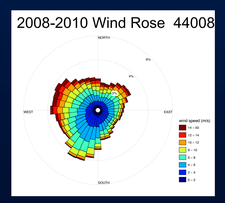
The surface current data was first detided using a least squares technique that accounted for the 5 major constituents in the region (M2, S2, O1, K1 and N1). The currents were then passed through a 30 hour low pass filter. The resultant was then averaged over a year time scale to produce the figures above.

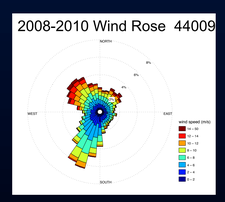
SEASONAL MEAN

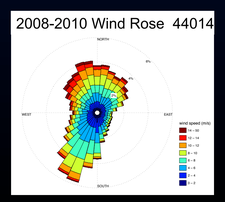
WINTER Jan - Mar | SPRING Apr - Jun | SUMMER Jul - Sep | FALL Oct - Dec

THREE YEAR MEAN

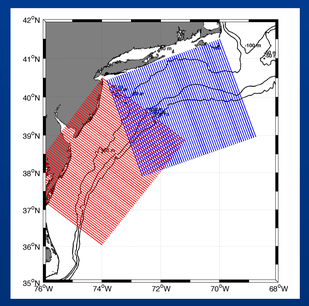




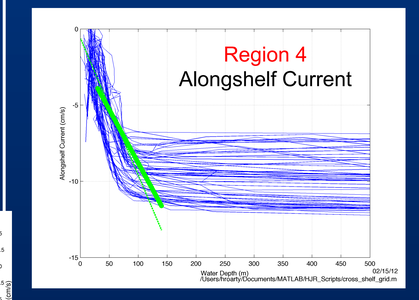


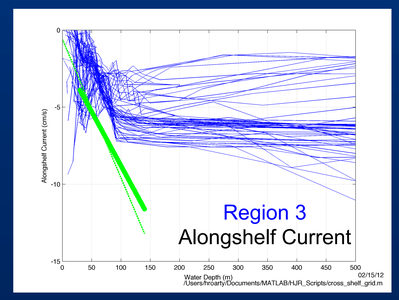


ALONGSHELF FLOW

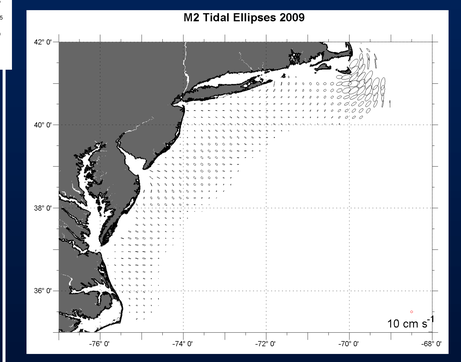


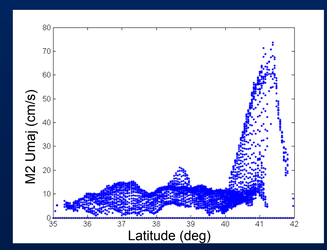
From the three year mean the along shelf flow was calculated every 6 km in the along shelf direction. The along shelf current was plotted as a function of water depth for region 4 (red lines) and region 3 (blue lines). The depth averaged along shelf velocity from the Lentz (2008) model is given as the solid green line and the linear regression of past current meter deployments is shown as the dashed green line.

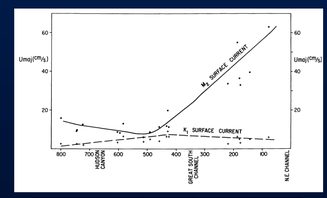




TIDAL CURRENTS







HURRICANE IRENE

A) Time series of total and near inertial surface currents during Hurricane Irene
B) Mean power for signals with periods between 16 and 20 hours
C) U velocity time series (top) and wavelet analysis (bottom) of grid point from A