ESTIMATING SEA SURFACE SALINITY IN COASTAL WATERS OF THE GULF OF MEXICO USING VISIBLE CHANNELS ON SNPP VIIRS

Ryan A. Vandermeulen[1], Robert Arnone[1], Sherwin Ladner[2], Paul Martinolich[3]

[1]University of Southern Mississippi, Department of Marine Science, Stennis Space Center, MS 39529
[2]Naval Research Laboratory, Stennis Space Center, MS 39529 ; [3]QinetiQ North America, Stennis Space Center, MS 39529

Real-time monitoring

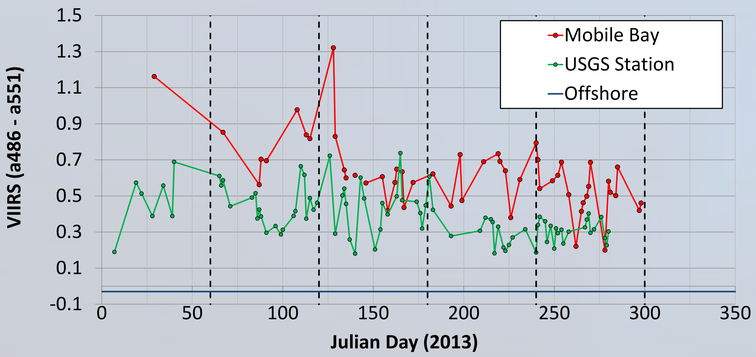
ABSTRACT

- Sea surface salinity is determined using the visible channels from the Visual Infrared Imaging Radiometer Suite (VIIRS) to derive a regional algorithms for the northern Gulf of Mexico. Data were collected over all seasons in the year 2013 in order to assess inter-annual variability. The seasonal spectral signatures at the river mouth were used to track the fresh water end members and used to develop a seasonal slope and bias between salinity and radiance.

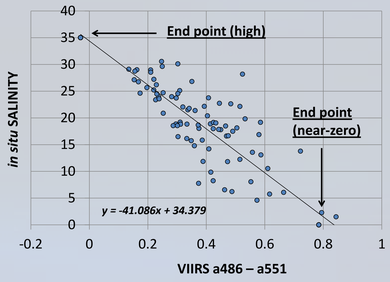
APPROACH

- For salinity algorithm development, *in situ* salinity data (Jan–Oct 2013) obtained from five USGS platforms and one NOAA/NDBC platform in the Mississippi Sound were compared to VIIRS spectral Rrs and absorption (QAA).

- A time-series of satellite data monitoring NEAR-ZERO salinity points (mouth of Mobile Bay) shows changes *assumed* to be independent of salinity, indicating a change in water mass that can be normalized throughout the year.

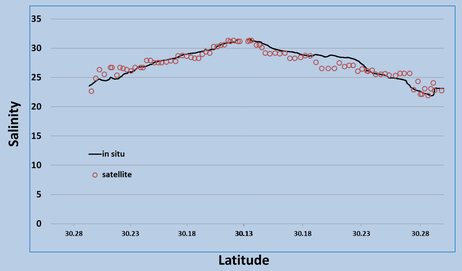


VIIRS absorption products (a486-a551, QAA), showed the highest consistent correlations. Bi-monthly means of VIIRS-derived products at the Mobile Bay mouth and oligotrophic waters (low and high end members, respectively) were used to constrain bi-monthly regression slopes of salinity to optical signatures.

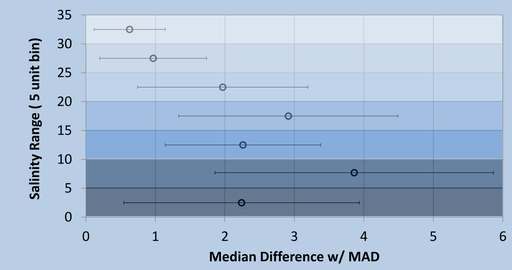


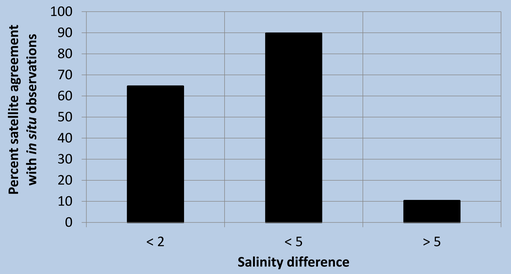
RESULTS & DISCUSSION

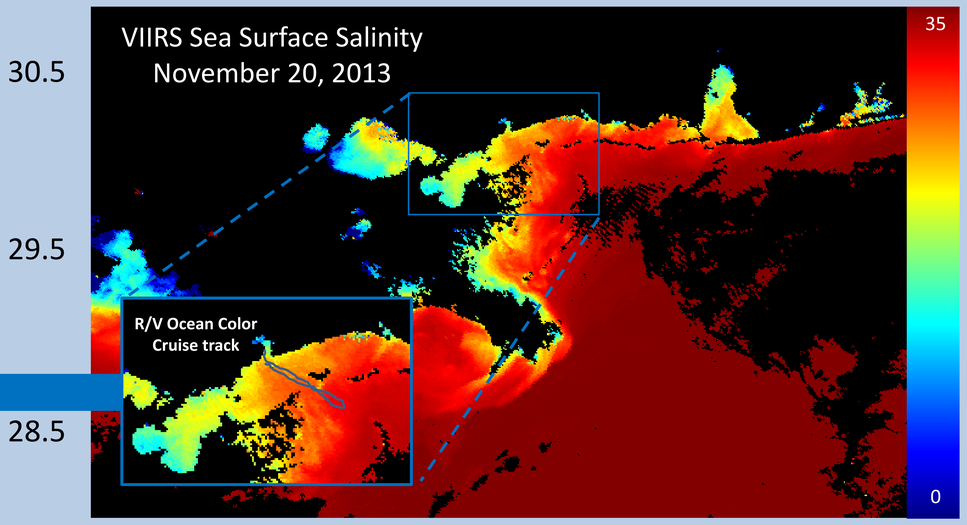
- Bi-monthly regression slopes were applied to VIIRS absorption data and evaluated using an *in situ* flow through data set in the MS Sound/Bight. Results (below) show good agreement of satellite data with *in situ* data along a range of salinity values.



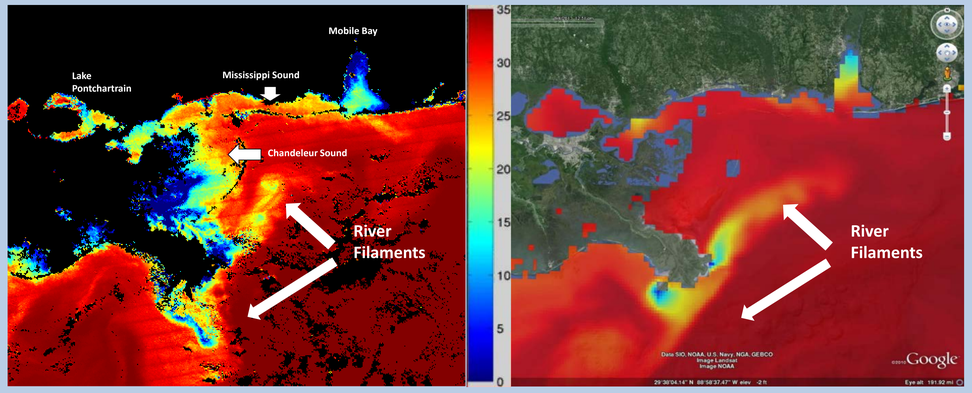
- An qualitative analysis of errors (below) shows that higher uncertainties were present in the 5-10 and 15-20 psu range. Further evaluation shows that 65% of satellite data points (n=419) were within 2 psu of *in situ* measurements.







The river-mouth normalized regressions are applied to VIIRS absorption data (a486-a551, QAA) to obtain a salinity map for the Northern Gulf of Mexico (shown above). Even with higher inherent error than current microwave scatterometers (Aquarius/SAC-D, SMOS), the high spatial (750-m) and temporal (daily) resolution obtained from VIIRS offer significant improvements.



A comparison of VIIRS salinity product (left) with NAVY Coastal Ocean Model (NCOM, right) salinity product on September 04, 2013 shows the detection of episodic freshwater river plumes originating from the Mississippi River. The higher resolution satellite data product can potentially provide direct data for assimilation into physical circulation models in near-real time.