

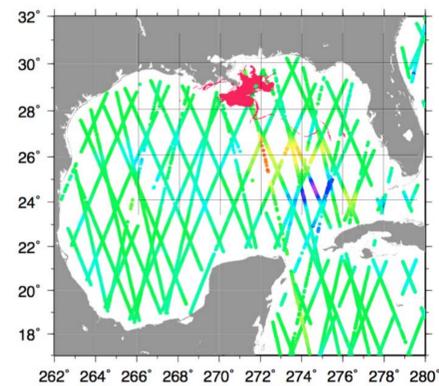
# Evaluation of Altimeter Observations & Model Forecasts of the Gulf of Mexico Oil Spill

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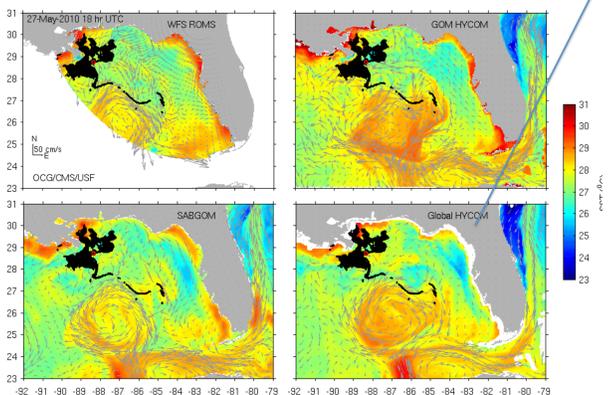
**ABSTRACT:** The Deep Horizon oil spill, located just 70 km off the coast of Louisiana, has presented an enormous challenge to NOAA, the primary federal agency responsible for dealing with marine environmental emergencies. Knowing the present position of the spill and forecasting where it will go over the next few hours and days, whether onto the Gulf coast or into the Loop Current and beyond, is critical to formulating a successful response strategy. Satellite altimetry data is playing a large role in the initialization of the forecast models. Here we present an evaluation of the spatial and temporal sampling provided by the present altimeter constellation and the performance of several different model forecast systems in relation to the surface outline of the spill, as determined from a composite of SAR and visible imagery, including TerraSAR-X, Cosmo-SkyMed-1, Envisat, and Radarsat-1 data

Spill on 27 May Superimposed on J-1,-2, & Envisat SSHA



**The Scale Problem: The Oil Spill and Altimeter Track Spacing Have Similar Horizontal Scales.** The figure above shows in red the surface area covered by the Deep Horizon oil spill on 27 May 2010, superimposed on all Jason-1 & 2 and Envisat ssha track data collected over a 10-day interval (21-31 May 2010). Although one filament of the spill extended ~500 km to the southeast at this time, in general the surface manifestation of the spill remained closely confined to a 200-by-200 km area close to the coast, where several altimeter tracks intersect. Unfortunately, the inter-track spacing leaves gaps of about ~100 km, making it possible to miss small eddy features. Simple interpolation is adequate for mapping the large (~400 km) eddy that detached from the Loop Current, but smaller scale features require model/data assimilation.

**Comparisons of Oil Spill Outline with Altimeter Assimilated Model SSH Output:** On the right we show some comparisons of SSH hindcasts, forecasts and nowcasts from two US Navy high resolution HYCOM models, their 1/12° Global and 1/24° Intra-Americas Sea models, with composite SAR and visible imagery spill outlines produced by NOAA/NESDIS's Satellite Analysis Branch. In general, all three model runs show good agreement between the spill outline and ssh contours down to approximately the 100 km scale. Often the 1/12° forecasts do as well (or better) than the hindcasts and (somewhat surprisingly) often both of these appear to better than the 1/24° nowcasts.



The above figure from the U of South Florida Ocean Circulation Group (<http://ocgweb.marine.usf.edu/index.html>) shows 4 different model nowcasts of surface velocity for 27 May 2010, with the NOAA composite oil slick imagery superimposed. The USF West Florida Shelf (WFS) ROMS is embedded in the NRL Gulf of Mexico (GOM) HYCOM. The NCSU South Atlantic Bight Gulf of Mexico (SABGOM) ROMS is embedded in the NRL Global HYCOM. In general the two HYCOM models do a good job by themselves of tracing the long filament extending to the southeast (see the "hook" at the end). Flow near the oil well (identified by the red dot) seems best represented by the GOM HYCOM (see westward flow at 29°N, pinching the slick from the east).



**Daily Along Track U.S. Coastal Data Now Available.** As part of a NOAA CoastWatch project to make coastal altimetry more readily available, we have established an ftp site<sup>1</sup> where daily postings are made of all available near real time (OGDR) Jason-1, -2 and ENVISAT along-track data within 500 km of the US coast. A simple ascii format is used to present 1-second SSHA, significant wave height and wind speed data. Typically, the most recent data is less than 3 hours old. OGDRs are updated to IGDRs and GDRs as they become available. Also, to help visualize the data set, a daily Google Earth kmz file is included, showing the location of all data points collected over the past 10-days.

<sup>1</sup><ftp://ibis.grdl.noaa.gov/pub/johnk/coastal>

## NRL 1/12° Global HYCOM SSH Forecast Hindcast

## NRL 1/24° IASNFS SSH Nowcast

