Jason Outreach at the Colorado Center for Astrodynamics Research

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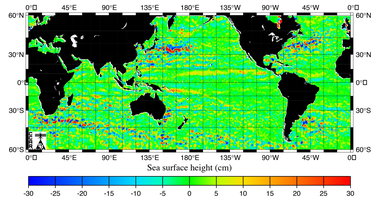
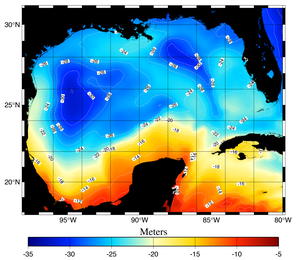
Since 1996, global maps of mesoscale sea surface height anomalies derived from tandem observations of the earth's oceans by altimeters aboard the TOPEX/POSEIDON (T/P) and ERS-2 satellites have been processed and posted on the World Wide Web at the Colorado Center for Astrodynamics Research (CCAR) in near real-time. In 2001, we added Geosat Follow-On (GFO) altimeter data and are prepared to include data from Jason and Envisat, as soon as operational data streams are publicly released for those satellites.

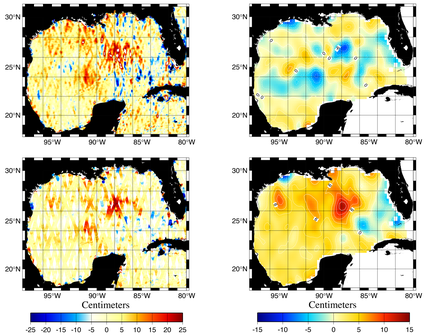


We have updated the mean reference surface used in our quick-look mesoscale processing to prepare for the release of the operational Jason data stream. The original near real-time system was based on a quick-look analysis that referenced the data to a high-resolution gridded mean sea surface available at the time. Recently, state-of-the-art mean sea surfaces have been derived that are based on a more complete record of altimeter observations. An updated mesoscale monitoring system using a new mean sea surface has been implemented and provides results that improve on the successful system implemented in 1996.



GSFC mean sea surface GSFC00.1_MSS in the Gulf of Mexico. This global mean sea surface replaces the OSUMSS surface used in the ordinal processing system.

Evaluating Change of Mean Reference Surface

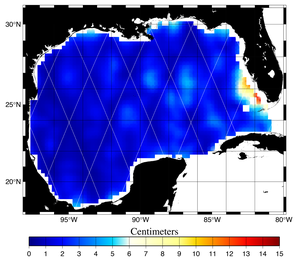


Top Panel: Difference map of OSUMSS95 (1/16 spatial resolution) minus GSFC00.1_MSS (1/30 spatial resolution). OSUMSS95 was interpolated to the resolution of the GSFC00.1_MSS before differencing.

Bottom Panel: Along-track shaded swaths of mean sea surface differences along the T/P and ERS reference ground tracks (OSUMSS95 minus GSFC00.1_MSS). The altimeter footprint (~2 km) is exaggerated to allow visual comparison with the gridded difference map

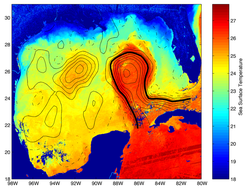
Top Panel: Residual mean in the 1993-1999 GOM sea surface height anomaly maps referenced to OSUMSS95.

Bottom Panel: Residual mean in the 1993-1999 data referenced to the GSFC00.1_MSS. The large differences in the residual means fields reflect the change in the mean circulation associated with the disparate sampling time periods used to construct the mean surfaces.



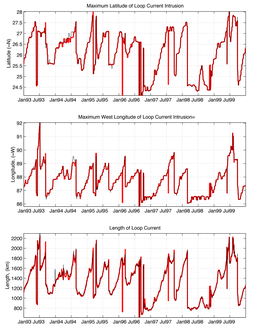
The spatial pattern of the rms daily differences of the 1993-1999 height anomaly archives referenced to the original and new mean surfaces show the influence of T/P data on the two reference surfaces, as seen in the low rms differences along T/P tracks. Between track rms differences approach 5 cm, reflecting the additional geoid information contained in the new mean sea surface that incorporates Geosat and ERS geodetic mission data.

Loop Current Metrics



The Loop Current 17-cm sea surface height contour from the altimeter map on January 12, 1998 is shown overlaid on the 3-day composite SST image for the same date. Automated tracking and computing of metrics use these contours to monitor the Loop Current from a Matlab based toolbox.

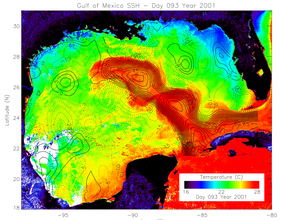
Loop Current fronts database is useful for evaluating sites within the Gulf for scientific and operational activities. The time series above was used to interpret measurements at a mooring on the West Florida shelf.



The panel above shows the time series of the Loop Current northward and westward penetration and length for 1/1/93 through 12/31/99 based on the old (thick red line) and the new (thin black line) mesoscale monitoring system. The new metrics have fewer blunders, which are associated with erratic 17-cm contour paths that affected LC tracking in the original system.

SSH/SST Overlay Web Page

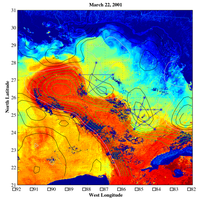
To improve the utility of our altimeter data outreach, we have developed a web-based form to overlay contoured sea surface height on sea surface temperature (SST) imagery. Multichannel SST imagery from the JHU/APL Ocean Remote Sensing Group Gulf of Mexico website is imported into an IDL script that overlays contoured sea surface height fields from our near real-time system. This tool combines the all-weather capabilities of altimetry with the high resolution afforded by satellite imagery during cloud free conditions.



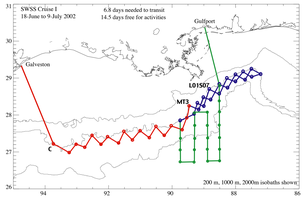
Applications of Near Real-Time Data

Survey Design and Habitat Monitoring

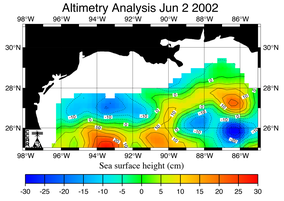
Oceanographic habitat analysis is being provided to researchers at Texas A&M to design surveys of sperm whales in the Gulf of Mexico. This summer researchers will attempt to attach satellite tags to sperm whales in the northern gulf. A total of 18 tags have been permitted for the June 18 through July 9 cruise. Altimeter data is being used to detect cyclonic eddies, regions where sperm whales have been found to be locally



Minerals Management Service (MMS) and National Marine Fisheries Service (NMFS) survey of two cyclonic eddies in the Gulf of Mexico in March and April 2001.



Cruise plan for Sperm Whale Seismic Study Cruise I planned for this summer to attempt tagging of 18 sperm whales in the Gulf of Mexico.

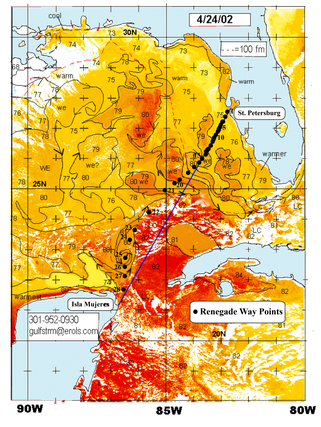


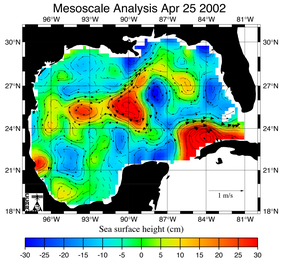
Sport Sailing

On April 26, 2002, the St. Petersburg Yacht Club held the 34the Annual Regata del Sol al Sol sailboat race from St. Petersburg to Isla Mujeres on Mexico's Yucatan Peninsula. The race is a challenging 456 nautical mile course across the Loop Current, where unsuspecting sailors may encounter one of the world's strongest ocean current.

Several weeks before the race, Rob Amsler the navigator for the Renegade contacted Bob Leben at CCAR to discuss current conditions in Gulf of Mexico and what race day tactics might take advantage of those conditions. They discussed several options concerning the best route across the Loop Current; however, the prerace briefing by Jenifer Clark, the "Gulf Stream Lady" whose feature map is shown at the right, persuaded the Renegade team to take a route skirting the edge of the Loop Current. Bob Leben proposed crossing perpendicular to the Loop Current and sailing near Cuba before recrossing the current to arrive at Isla Mujeres.

The Renegade was the first sailboat to reach Isla Mujeres, arriving nearly two hours ahead of the nearest competition.





Station	Time	Latitude	Longitude	GPS Speed	Boat Speed	Current	Depth
01	15:00	27 31.4	82 48.5	9.4 Knots	9.2	0.4	
02	16:00	27 23.0	82 52.3	8.2	7.7	0.5	
03	17:12	27 15.6	82 55.5	6.3	6.3	0.0	
04	18:10	27 09.5	82 58.5	8.3	8.3	0.0	
05	19:20	27 01.5	83 02.4	7.3	7.5	-0.2	
06	20:00	26 57.3	83 05.0	7.4	8.4	-1.0	
07	21.22	26 49.5	83 11.8	6.4	6.7	-0.3	131'
08	22:00	26 46.1	83 11.6	6.7	5.9	0.8	135'
09	22:42	26 44.4	83 15.8	5.5	4.2	1.3	
10	23:00	26 42.1	83 14.9	6.4	5.4	1.0	152'
11	00:00	26 34.6	83 14.8	7.7	7.2	0.5	156'
12	01:03	26 26.9	83 18.3	9.4	9.0	0.4	138'
13	02:00	26 19.1	83 24.5	11.0	9.9	1.1	215'
14	03:00	26 11.4	83 31.5	11.1	10.4	0.7	240'
15	04:05	26 02.8	83 42.3	10.9	11.2	-0.3	
16	05:00	25 54.8	83 49.5	10.9	11.4	-0.5	
17	06:00	25 42.7	83 59.4	11.8	11.5	0.3	
18	07:55	25 32.5	84 15.7	12.5	12.2	0.3	
19	10:15	25 17.9	84 41.4	11.8	12.4	-0.6	
20	11:30	25 08.0	84 53.1	11.3	12.4	-0.9	
21	13:00	24 55.8	85 07.8	12.0	12.1	-0.1	
22	19:15	24 13.0	85 52.3	9.0	11.7	-2.7	
23	23:30	23 39.8	86 12.9	10.8	11.5	-0.7	
24	01:00	23 23.7	86 18.5	11.7	12.2	-0.5	
25	05:00	22 40.0	86 15.9	10.8	10.9	-0.1	
26	07:15	22 17.7	86 41.4	10.8	10.8	0.0	
27	09:00	22 09.7	86 41.6	10.6	11.1	-0.5	
28	10:50	21 41.2	86 42.6	10.3	11.4	-0.1	