Dr. Lynn K. Shay

Mid-Year 1 Report: Eastern Pacific Ocean Heat Content Estimates For SHIPS Forecasts

RSMAS/MPO, University of Miami – 4600 Rickenbacker Causeway, Miami, FL 33149, USA
Phone: (305) 421-4075 - Fax: (305) 421-4696 - Email: nick@rsmas.miami.edu –
Internet: http://storm.rsmas.miami.edu/~nick

Introduction: Over the past six months of the grant, the effort has focused on processing data and synthesizing data sets discussed in Section I of the grant. The approach includes satellite data, XBT data (including moored data in the EPAC such as TAO arrays), and exploring the climatologies such as the US Navy's Generalized Digital Environmental Model (GDEM) in building a suitable climatology for EPAC..

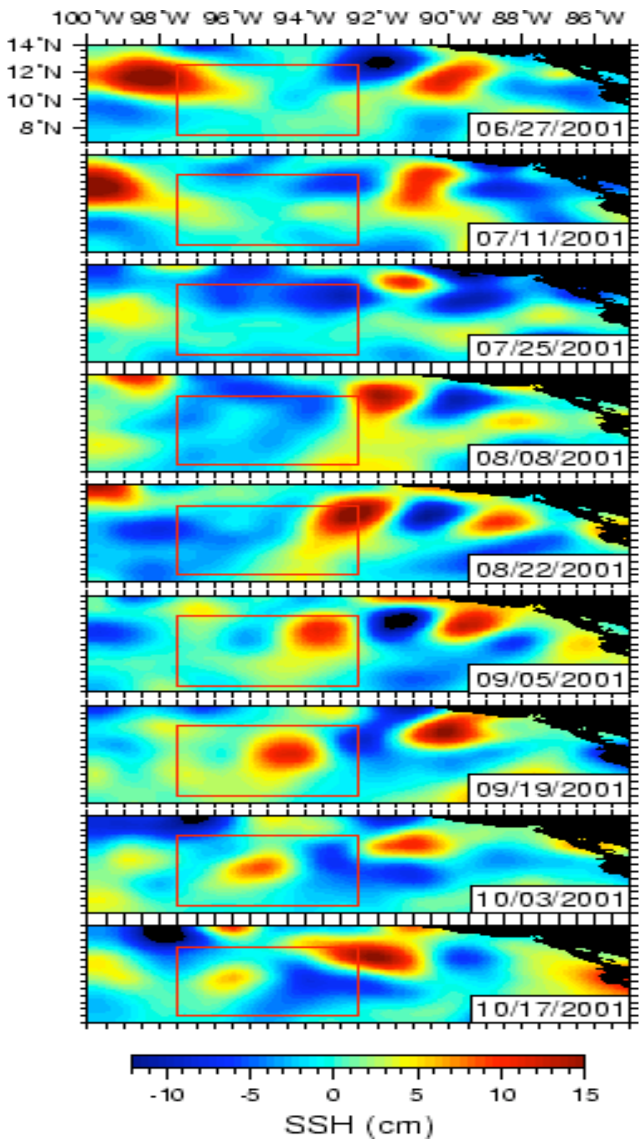

Fig 1: SSH field (cm) in the EPAC in summer of 2001 relative to the EPIC domain.

1. Altimetry: NASA's TOPEX/ Poseidon (T/P) and Jason-1 altimeter measures the sea level every 9.9 days along repeat ground-track spaced 3° longitudinally at the Equator. ERS-2 mission and NOAA Geosat Follow-On-Missions (GFO) have repeat tracks of 35 and 17 days, respectively. The availability of a merged SSH data is shown in Figure 1 for a merged product (http://www.jason.oceanobs.com/html/donees/produits/satellites_{uk}.html) for satellite altimetry product available 1992-2005 from AVISO. Weekly SSHs are used to track eddies from Aug through Oct 2001 using the AVISO product during the EPIC field program (Fig 1). By the time the eddy reaches the center of the EPIC domain, it starts to spin down in strength. The ring pathway, tracked over a three-month period based successive images, suggests that the warm features move at 13 to 15 cm s^{-1} towards the west southwest and have OHC heat content values of 55 to 60 kJ cm^{-2} (Fig.2). The. Using several years of altimetry data will help us understand the impact of warm ocean features (OHC) when the satellite data are merged with seasonal climatologies from GDEM.

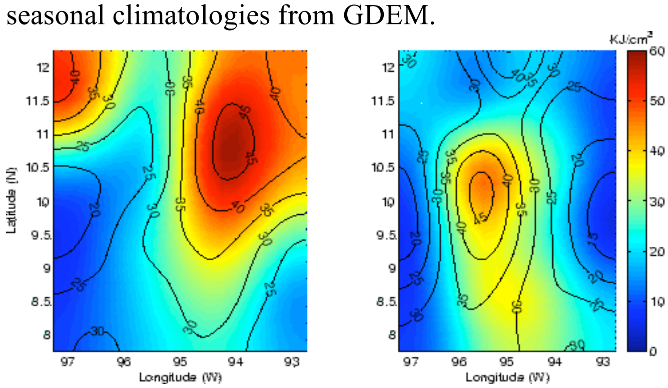

Fig 2: OHC (kJ cm^{-2}) from in situ profiles during EPIC in Sept (left) and Oct (right).

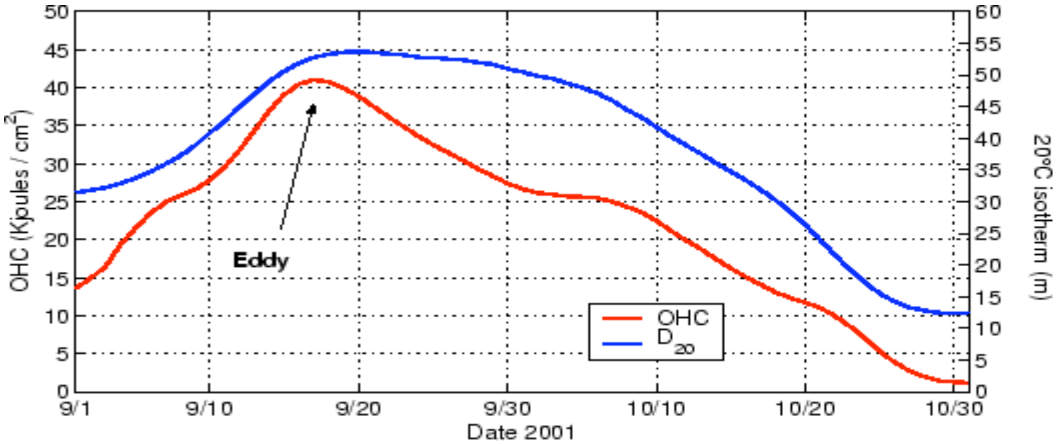

Fig 3: OHC (kJ cm^{-2}) and Depth of the 20ºC isotherm (m) determined from the TAO mooring at 10ºN95ºW during Sept and Oct of 2001 during the EPIC field program.

2. Mooring Data: We have downloaded time series of thermal structure measurements from TAO moorings in the EPAC deployed as part of the long-term monitoring by PMEL. As shown in Figure 3, here is an example of depressed thermocline (i.e. 20ºC isotherm depth) that occurs during the passage of a warm eddy at 10ºN and 95ºW. At this position, the OHC values exceeded 40 kJ cm^{-2} as the eddy began to spin down and weaken, consistent with Figures 1 and 2.

3. GDEM: Finally, we have downloaded the GDEM climatology and have begun processing the seasonal (and monthly) values of the average 20 and 26ºC isotherm depths, densities and the reduced gravities between the upper and lower layers on a 0.5º grid. We have done some comparisons between in situ data and the climatology and have noted some significant departures in thermal and salinity structure as well as the density (and density gradients). In general, isotherm depths shoal from west to east, and this has a large impact on not only the OHC, but perhaps more importantly the buoyancy frequencies (vertical density gradient). In the EPAC warm pool, these values may exceed 20 cycles per hour. This large buoyancy frequency has implications on both OHC and SST distributions through vertical mixing, and hence on intensity of hurricanes in the EPAC.

Summary: We had a personnel change in early October. We anticipate that over the next six months of the project, Objectives I and II will be met in this Joint Hurricane Testbed grant.