# Altimeter sea level anomaly data in the Middle Atlantic Bight and the Gulf of Maine Asseseement and application

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## I. Introduction

This poster shows two tasks of coastal altimetry in the US northeast coastal region including the Gulf of Maine and Mid Atlantic Bight ( Figure 1). The first is to assess appearing coastal altimeter Sea Level Anomaly (SLA) products from coastally-reprocessed 1HZ and retracking 5HZ SLA data ( Section II) . The second is to analyze along-track (#024, 202, 065,126,243,050,228 ) SLA time series along selected isobathes (Section III).

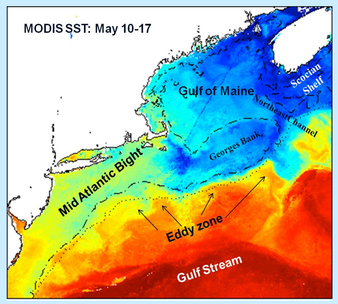
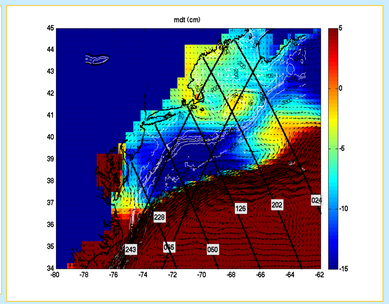



**Figure 1**: Study region

**Left**: a MODIS SST image shows 1) cold-fresh Scotian Shelf Water inflow and 2) offshore warm-salty Gulf Stream induced meso- to submeso-scale eddies near shelf breaks. This is a very dynamic oceanic region with all forcings ( local winds/river inflow) varying significantly in space and time.

**Right**: AVISO MDT ( mean dynamic topograph) and MDT-based geostraphic cueernts with TOPEX/Jason1/ Jason-2 satellite ground tracks whose numbers are labeled) as well as isobaths (100, 200, and 1000, 2000 and 3000 m).




## III Assessment

### Objectives

- to identify the differences among the three SLA products from OSTM/Jason2
- to understand what new SLA information is being added in the 5Hz SLA

### SLA data products

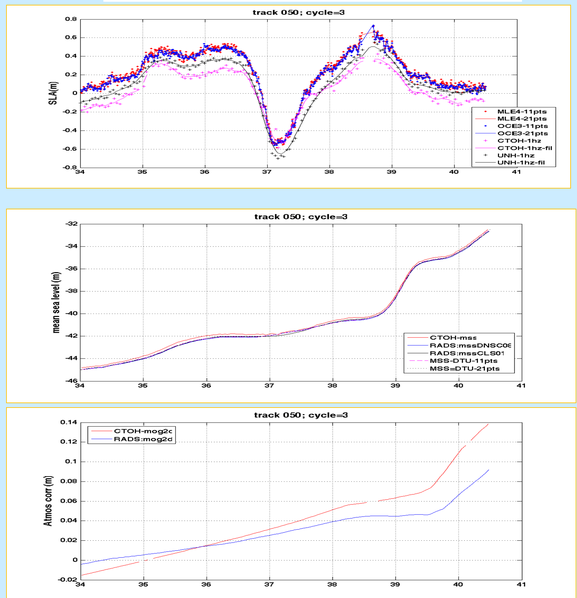
- UNH-RADS ( University of New Hampshire-Radar Altimeter Database System) reprocessed 1-HZ along-track SLA product( Feng and Vandemark, 2011; Scharroo 2008) with corrections applied:
  - -Tide: GOT 4.7
  - -Atmos: MOG2dG
  - -Mean Sea Level: DNSC08
- CTOH (Centre de Topographie des Oceans et de l'Hydrosphere) reprocessed 1-HZ along-track SLA product (Roblou eta l., 2011) with corrections applied :
  - -Tide: GOT 4.7;
  - -Atmos: MOG2dG;
  - - Mean Sea Level: Local MSS
- CLS- PISTACH retracking 5Hz along-track SLA products
  - -MLE4 = standard MLE4
  - -RED3 = MLE3 performed on a reduced waveform;
  - -OCE3 = MLE4 applied to a filtered waveform

Note each with 2 low pass along-track filters with cut off frequencies of 21 pts (7km) and 11pts (3.5 km) and with corrections applied:
- -Tide: GOT 4.8;
- -Atmos:????
- - Mean Sea Level: DTU

### Preliminary summary in II

- There are higher energy in CTOH 1HZ data in wavelength from 20km-100km, most likely from local MSS diffentent from the other two ,
- There are apparent "bias" in SLAs among the products,
- There appares new variation of SLA signals (or noise?) in the 5Hz data in wavelength of 10-30 km scales, and
- Further assessment needs in-situ data

### Case 1: Track 50




### Case 2: Track 126

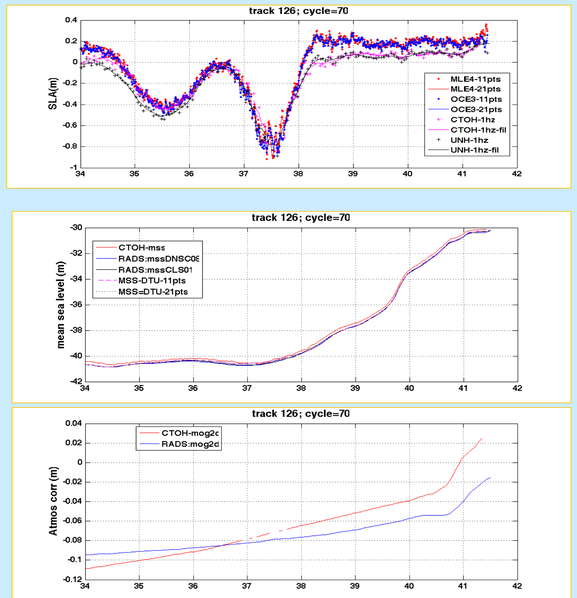
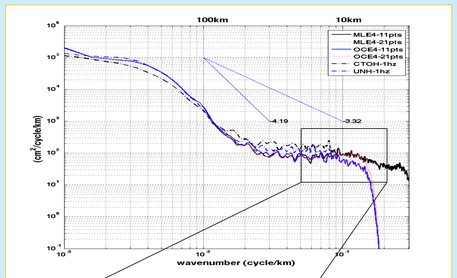
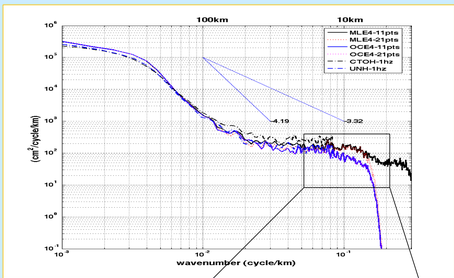
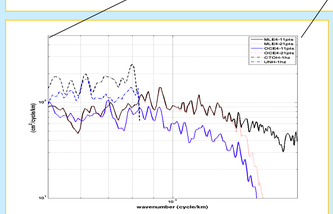



**Figure 2**: Different OSTM/Jason 2 SLAs ( sea level anomalys, the top panels), MSSs (mean sea sufaces, the middle panels) and Atmospheric force corrections ( lower panels ) for two cases of track 50 on Cycle 3 ( left ) and track 126 in Cycle 70 ( right )



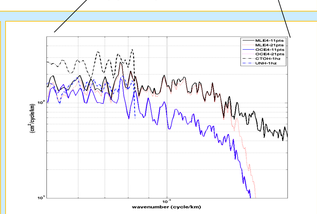


**Figure 3**: Average Power Spectral Densities (PSD) of OSTM/Jason2 SLA spatial variability for track 50 ( left ) and track 126 (right) from June 2008 to June 2010 (Cycle s1-72) for different SLA products. Wavenumber is given in cycles per km and PSD in $cm^2$/cp/km. The enlarged boxes (lower panels) indicates wavenumbers 0.05- 0.2 corresponding to 50km to 5km. Two reference spectral slopes ( $k^{-3.2}$ to $k^{-4.10}$ ) are givens. The spectral slopes from this study in the region are consistent with those by Xu and Fu (2011)

## III Applications

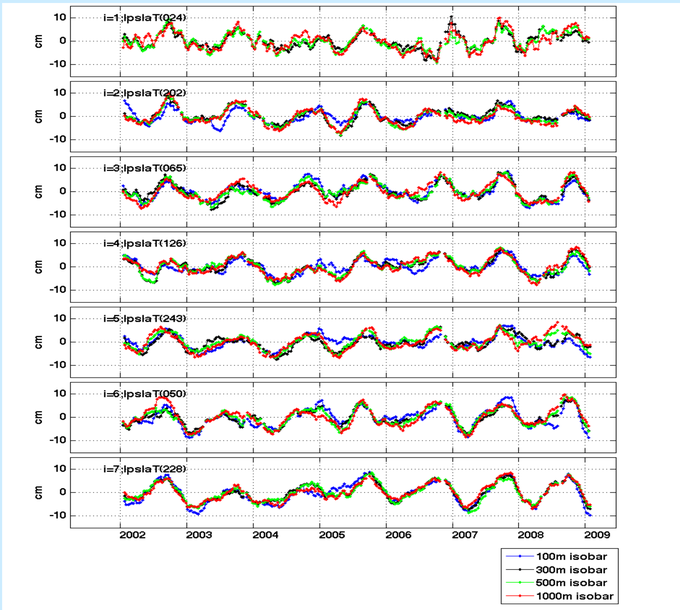
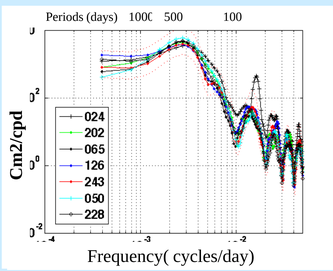



**Figure 4**: Low-pass filtered ( 10 point boxcar running mean) SLA time series at selected isobars ( 100, 300,500 and 1000m) from altimeter Jason 1 for the tracks #024, 202, 065,126,243,050, and 228 from top to the bottom.



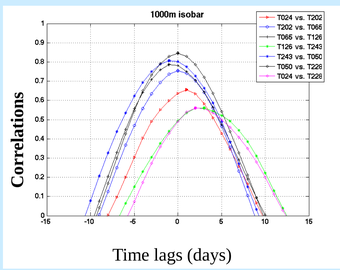




**Figure 5**
**Left** : Power Spectral Densities (PSD) of Jason1-1 low-pass SLA temporal variability for the along-tracks 024, 202, 065,126,243,050, and 228 ( shown in different colors) at the 1000m isobarth from June 2002 to June 2009. Frequency is given in cycles day (cpd) and PSD in $cm^2$/cpd. **Right**: Time-lag cross-correlations between selected track pairs ( as indicated in colors and in the legend ) of the low-pass SLA at the 1000m isobath.

### Preliminary summary in III

- The most and secondly energitic SLA signals appper in 360 days and 60-70 day time scales respectively,
- the nature of the coastal SLA propogation along the 1000m isobath and other isobaths (not shown) is documented.
- Further assessment will be needed.

**References**

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**Acknowledgements**

- NASA's Science Directorate Physical Oceanography Program
- CLS-PISTACH's OSTM/Jason2 retracking 5HZ SLA products
- CTOH's reprocessed coasal SLA products

**5th Coastal Altimetry Workshop, San Diego, 16-18 October, 2011**