

Development of Multiparameter Eddy Tracking for Operational Applications

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SWOT Lightning Talk

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Overview of Eddy Tracking

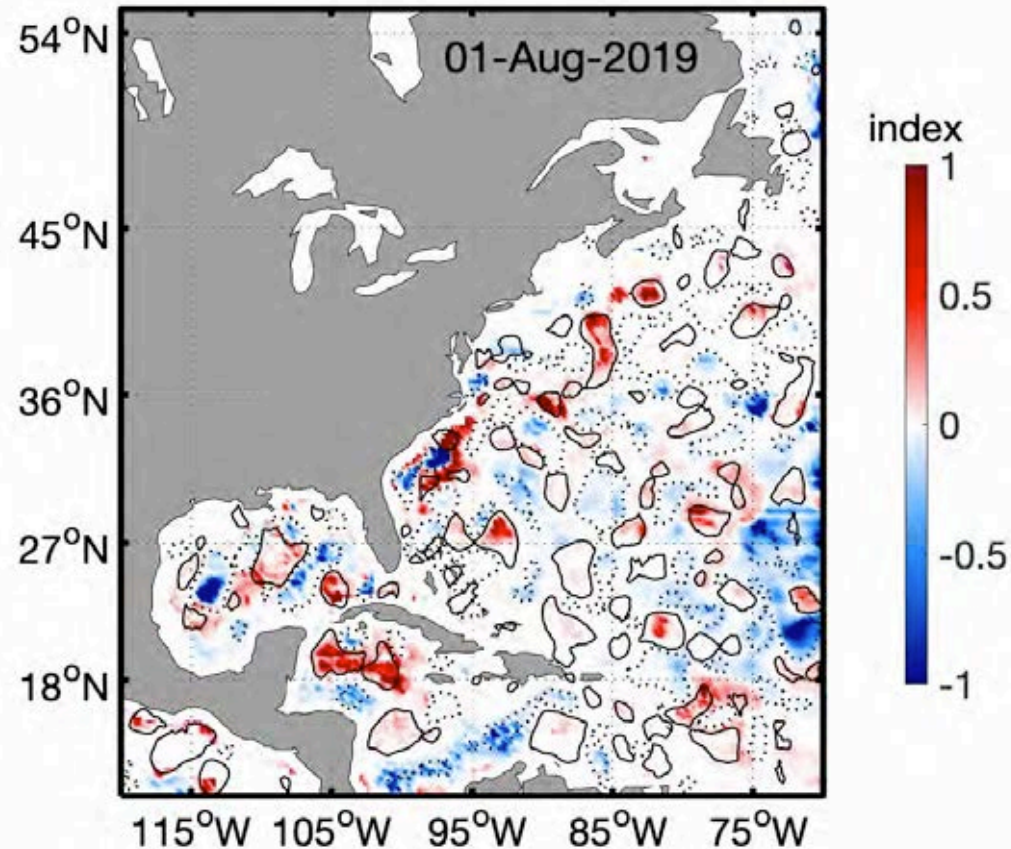
- Inputs:
 - NOAA Radar Altimetry Database System (RADS) NRT Altimetry $0.25^\circ \times 0.25^\circ$ daily grids (Sea Level Anomalies (SLA), U, V)
 - NOAA Geo-Polar Blended NRT L4 Analysis $0.05^\circ \times 0.05^\circ$ daily grids (night SST)
 - NOAA MSL12 NRT VIIRS multi-sensor ocean color DINEOF gap-filled analysis $0.083^\circ \times 0.083^\circ$ daily grids (Chl-a)
 - SMAP JPL V5.0 interpolated $0.25^\circ \times 0.25^\circ$ daily grids (SSS)
- Uses a closed-contour eddy tracking method adapted from Chaigneau et al. (2008, 2009) and Pegliasco et al., (2015)
- Threshold free so transient eddies are included
- Available from August 2019-present
- Observation based in entirety, does not require model input

Multiparameter Eddy Significance Index (MESI)

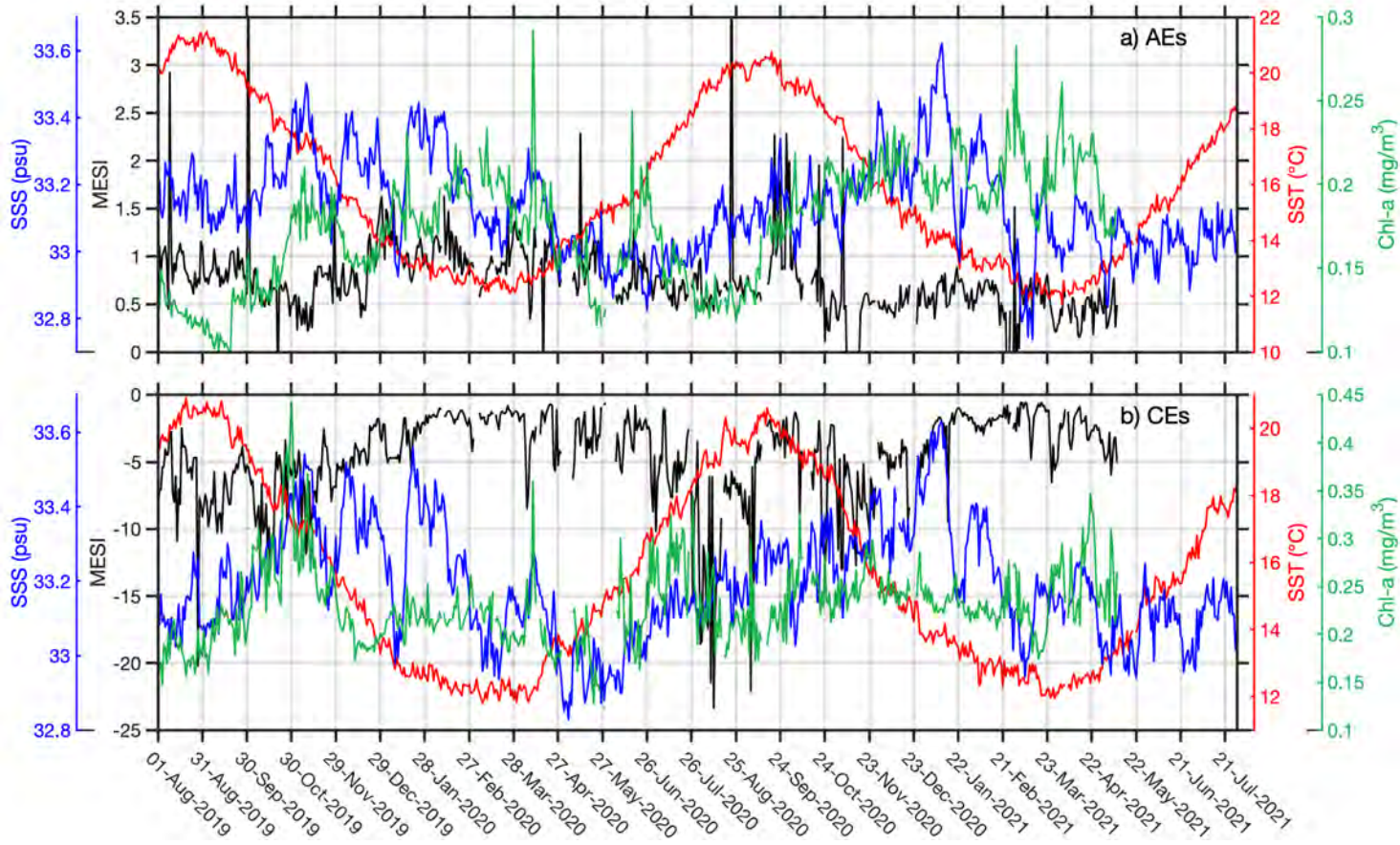
Normalized index of multiparameter eddy variability that describes the potential impact of a given eddy on mixed layer dynamics and nutrient pumping

$$MESI = Z_{SLA} * abs(Z_{SST}) * abs(Z_{SSS}) * abs(Z_{Chla}) * abs(\log_{10}(Z_{EKE}))$$

$$Z_{var} = \frac{var - \overline{var}}{\sigma_{var}}$$

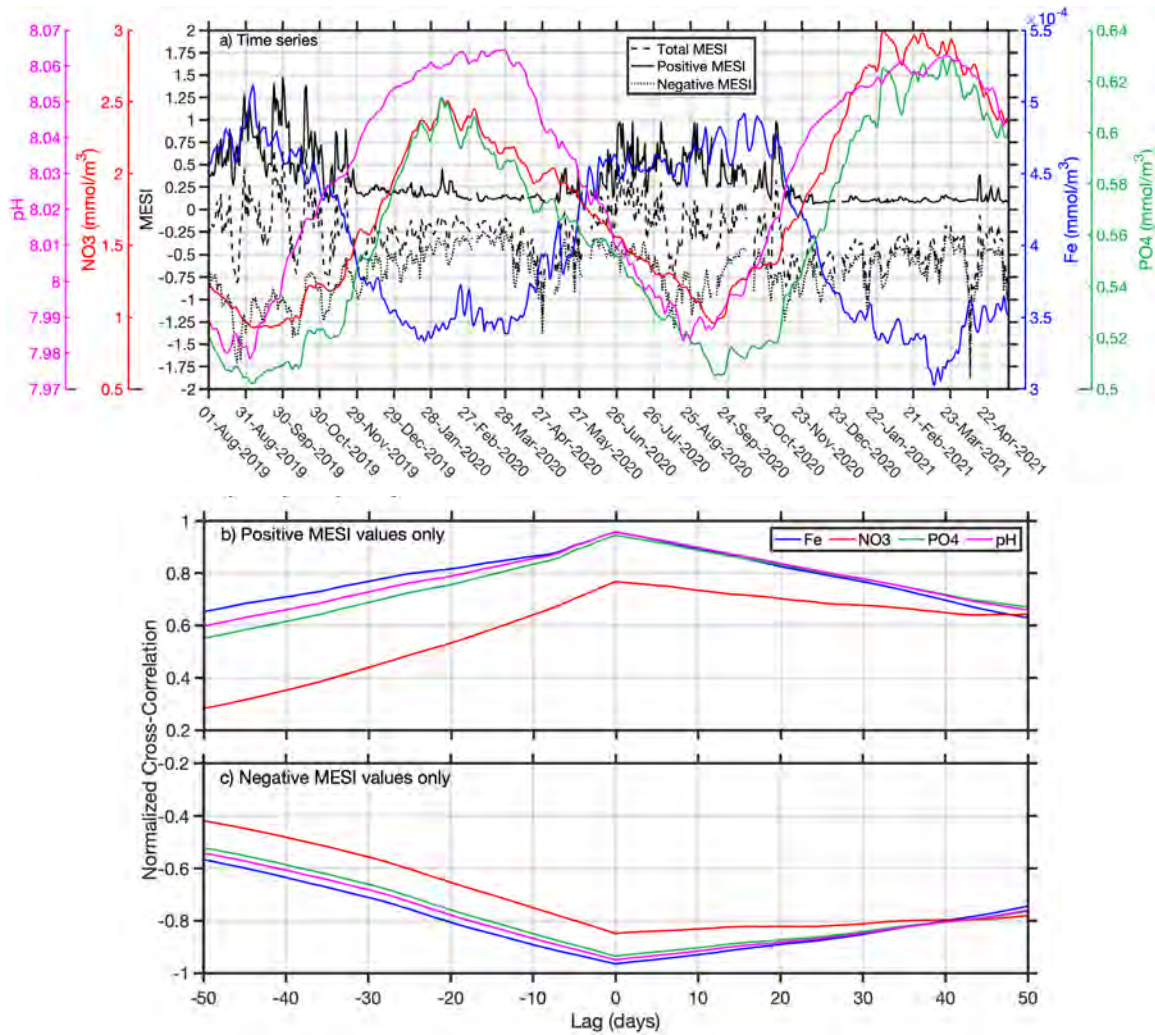


Eddy Characteristics



Daily time series of **mean MESI**, **mean SSS** (psu), **mean SST** (°C), and **mean Chl-a** (mg/m³) averaged across the research area (210-260°W, 10-55°N) for a) AEs and b) CEs from August 1, 2019-August 1, 2021.

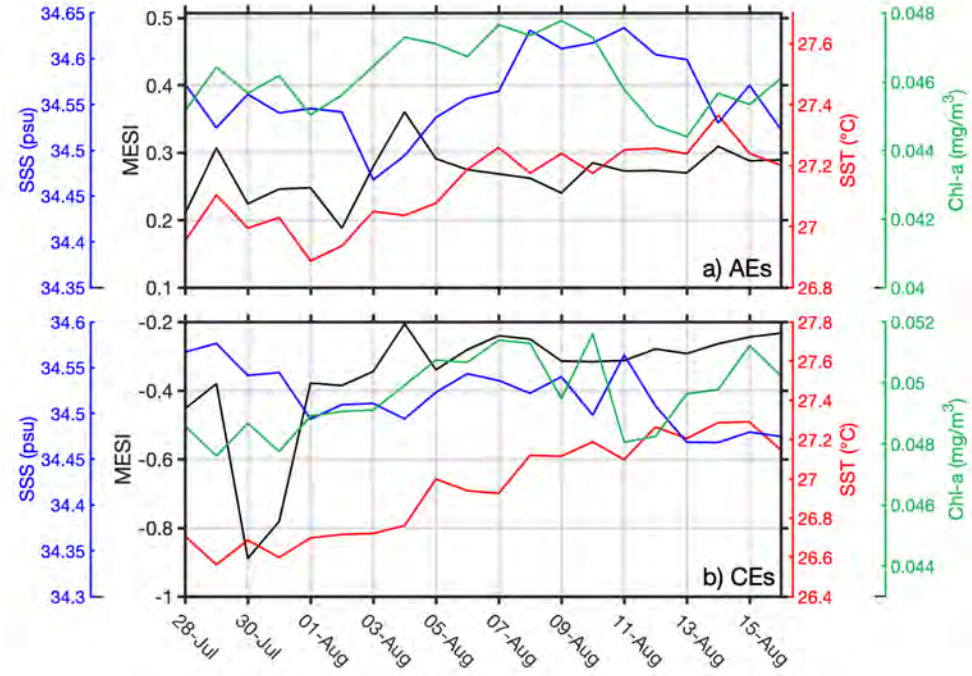
Biogeochemical Cycles and Eddies



- Up to 97% cross-correlation with no lag between MESI and Fe for the California Current System
- Nitrate has the lowest correlation through time of all the BGC variables tested
- Suggests that MESI can be used as a NRT indicator of biogeochemical activity and can be used to monitor systems using observations rather than model output
- Total and negative MESI values (CEs) vary more closely with BGC variables than positive MESI values (AEs)
 - Consistent with eddy activity in California Current System

Applications of Eddy Tracking

- Hurricane Erick (July 30-August 5, 2019)
- (Left): Satellite observations and eddy contours
- (Right): Time series of mean eddy properties





Summary

- Multiparameter eddy tracking allows for user-friendly analysis of NRT eddies in the California Current System and beyond
- Introduction of SWOT to blended SLA will improve accuracy and resolution of eddy tracking
- MESI can be used in concert with eddy tracking to rapidly identify eddies that may have strong biogeochemical and biophysical impacts, with applications across numerous fields of oceanography for both operational uses and research
- Multiparameter eddy tracking is presently an experimental regional product for NOAA CoastWatch, but will soon be global

Questions?

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Disclaimer: The scientific results and conclusions, as well as any views or opinions expressed herein, are those of the author and do not necessarily reflect those of NOAA or the Department of Commerce.

