Temporal variability of air-sea fluxes and ocean surface variables under extreme events

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Abstract

Extreme weather events such as hurricanes cause loss of lives and property; intensity typically being correlated with the extent of damage caused. From a forecasting perspective, track and intensity predictions at a longer lead time are helpful in limiting losses. Here our interest is in the role played by the oceanic surface and subsurface conditions on track and intensity forecasts. Because of the fact that the surface is in contact with the atmosphere, and under such extreme conditions (wave height, currents, winds, etc), in-situ measurements using non-autonomous platforms (viz., ships) are rare and almost non-existent. As for spaceborne measurements, such as from satellite imagery- infrared radiometers (e.g., which provide SST and atmospheric column measurements) cannot be used due to clouds and heavy precipitation, the same limitations also apply to the usability of data from microwave data. Due to these limitations, modeling and data assimilation systems that are used to generate predictions must operate with sparse (or no!) observations in the vicinity of such extreme events. Given this scenario and air-sea feedbacks that vary with resolution of the model, exploring choices of model parameters that lead to improved (or worse) predictions is an important task. This presentation takes a first step in this direction by comparison of ocean-ice (only) forecasting system from the Global Real-Time Ocean Forecasting System (RTOFS) of the Office of Modeling and Development (part of the US NOAA), the GLORYS12V1 of the Copernicus Mercator Ocean and L4 satellite data products for surface variables such as Sea Surface Temperature, Salinity, Height (SST, SSS, SSH respectively). Following a consensus from such an inter-comparison we investigate how the temperature and salinity (T and S) change directly under the track. We'll explore correlations between intensity of the event with changes in surface and subsurface quantities and propose metrics for the sake of easier comparison- that could guide model improvements. It is anticipated that this presentation is of interest to ocean and coupled modelers and data assimilators and observationalists who collect oceanographic data.