# Toward Assimilating SWOT Altimetry Data into the Current and Next-Generation GMAO Subseasonal-to-Seasonal Forecast System

David Russell[1,2], Doruk Ardag[3,2], Eric Hackert[2], Veronica Ruiz-Xomchuk[4,2]

[1]*University of Maryland Earth System Science Interdisciplinary Center*
[2]*NASA Global Modeling and Assimilation Office*
[3]*Science Systems and Applications, Inc.*
[4]*University of Maryland, Baltimore County*

**Abstract**

At NASA's Global Modeling and Assimilation Office (GMAO), efforts are underway to assimilate wide-swath ocean altimetry data from the Surface Water and Ocean Topography (SWOT) satellite's Ka-band Radar Interferometer (KaRIn) into our flagship forecast and reanalysis systems, based on the Goddard Earth Observing System (GEOS), our suite of coupled Earth system models (including atmosphere, oceans, sea ice, land, and aerosols). To pave the way for such new observation types, the next version of the GEOS Subseasonal-to-Seasonal (GEOS-S2S) prediction system will transition from legacy data assimilation (DA) systems to the new JEDI (Joint Effort for Data assimilation Integration) system, which provides a unified framework for multiple DA methods and Earth system components.

As a first step, assimilation of data from SWOT's nadir altimeter is being tested within both the current GEOS-S2S-3 and JEDI's marine interface Sea-ice, Ocean and Coupled Analysis (SOCA), which will become part of GEOS-S2S-4. For ocean DA, GEOS-S2S-3 uses a solver based on the local ensemble transform Kalman filter (LETKF), whereas SOCA testing at GMAO has thus far used variational methods (3DVar, 3D-FGAT). In this work, the impact of SWOT nadir data on analyses and forecasts in the two DA systems is explored using Observing System Evaluation (OSE) experiments. Each OSE is comprised of two experiments: One in which the SWOT data are assimilated, and one in which they are withheld. The impact of assimilating SWOT data is assessed by comparing these experiments for both GEOS-S2S-3 and SOCA-based systems, as well as seasonal forecasts initialized from the two experiments. Beyond SWOT nadir assimilation, we intend to show progress towards assimilation of wide-swath KaRIn data, which will require careful attention to the problem of correlated errors in the high-resolution swath data.