CIRA Support to Connecting GOES-R with Rapid-Update Numerical Forecast Models for Advanced Short-Term Prediction and Data Fusion Capabilities

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Abstract

GOES-R will launch in October 2016, ushering in the next generation of geostationary satellite sensors. The Advanced Baseline Imager (ABI) and the Geostationary Lightning Mapper (GLM) will provide rapidly updating information that is ideal for assessing and improving forecasts for high impact weather events, including mid-latitude convection, tropical storms, and surface hazards such as wildfires. Forecasters are well-equipped to use the forthcoming high spatial, spectral, and temporal resolution forthcoming high spatial, spectral, and temporal resolution imagery in a largely qualitative fashion, but the pathways toward quantitative exploitation of the rapidly updating data in numerical models are less clear. Some models that are geared toward mid-latitude forecasting, such as the High Resolution Rapid Refresh (HRRR), are run hourly in an attempt to capture new data that may have an important impact on relatively short-term (0-6 hour) forecasts. Here, the veritable flood of new information slated to arrive from GOES-R would be ideal to assimilate into the model. In the tropics, GOES-R will provide timely and detailed information on the location and character of active convection, which in turn provides a critical input to statistical-dynamical models whose job it is to improve short-term intensity forecasts. GOES-R-derived information may also be used to aid in vortex initialization for tropical cyclone models.

This project addresses the general need to improve our abilities to leverage rapidly updating, high resolution information from the next-generation GOES-R sensors (ABI and GLM) for short-term forecasts of high impact and weather hazard related challenges. In the mid-latitudes, ABI and GLM data will be assimilated into the HRRR and/or combined via model/observation data fusion techniques to improve the analysis and evolution of convection. Anticipated downstream improvements to the distribution, timing, and interactions of convection bear high relevance to fire weather, severe storm development (including better representation of outflow impacts and interactions within complex multi-cellular storm environments). CIRA will coordinate with the Warn on Forecast group at NSSL, as they are working on assimilating cloudy radiances in order to better initialize convection in high resolution models. In the tropics, GOES-R information will be used to improve short-term tropical cyclone genesis and intensity forecasts, in addition to vortex initialization in numerical models. This proposal is designed as a four-year research program, comprised of an initial spin-up year for consolidation of observation/modeling tools alignment of NOAA/CIRA research partnerships, followed by three years of development, demonstration, and analysis.