

## **Data Assimilation of GLM Observation in HWRF/GSI System**

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### Abstract

In this research we plan to exploit the unique capabilities of the Geostationary Lightning Mapper (GLM) instrument through data assimilation with the NOAA Hurricane WRF operational system. We propose to add the GLM assimilation capability to the HWRF data assimilation system, which is based on the hybrid Gridpoint Statistical Interpolation (GSI) algorithm. The new HWRF/GSI system with the GLM assimilation capability will be evaluated in detail. Given high spatiotemporal coverage of GLM over open oceans, this research represents a great opportunity for potential improvement of the NOAA operational HWRF forecasts, in particular the prediction of rapid intensification of tropical cyclones.

The assimilation of GLM lightning data requires a transformation from HWRF model forecast to lightning flash rate, referred to as a lightning observation operator, which will be adapted/developed for tropical cyclone applications in this research. Note that the same transformation can be used for post-processing of the HWRF forecast, effectively producing a GLM lightning flash rate forecast. This is similar to lightning threat forecasts for severe weather, however now applied to tropical cyclones and customized for such application. The GLM lightning forecast for hurricanes will be developed and evaluated in collaboration with the National Hurricane Center (NHC). Although NHC does forecast lightning, the comparison of the GLM forecasts to real GLM data for the early part of the forecast in real time, and for the entire forecast post-storm, will provide information on the realism of the HWRF model. Feedback from the NHC evaluation will also be provided to the HWRF team to improve the lightning observation operator. Collaboration with EMC HWRF team will assure that our research is aligned with EMC/HWRF operational plans, with clear path to operations. The proposed research will be the first application of assimilation of real GLM observations with NOAA HWRF/GSI assimilation/prediction system.