

## Latent heating profiles from GOES-16 and its impacts in precipitation forecast

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The High-Resolution Rapid Refresh (HRRR), current operational forecast model in the United States uses latent heating (LH) derived from ground-based radars to initiate convection during short-term forecast. Although radar reflectivity is a good indicator for LH intensity, and it is efficient in initiating convection, ground-based radar data are not available over the ocean or mountainous regions. Data that are available continuously in such regions and that can be readily used in short-term forecast are from a geostationary satellite. Despite its inherent limitation of seeing only the cloud top, it can still be useful if taking advantage of its high spatial and temporal resolution data.

This study presents a method to retrieve LH profiles for convective clouds from the Geostationary Operational Environmental Satellite-16 (GOES-16) and evaluates its impacts in convective initialization for precipitation forecast. A lookup table for convective LH profiles is created using Weather Research and Forecasting (WRF) model simulations and Community Radiative Transfer Model (CRTM). Convective grid points defined by a GOES-16 convection detection algorithm are assigned LH profiles from the lookup table according to brightness temperature at channel 14 (11.2 $\mu$ m). LH profiles that are obtained from GOES-16 are compared with LH derived from Next Generation Weather Radar (NEXRAD) reflectivity that are used for convective initiation as well as LH profiles from Global Precipitation Measurement Mission (GPM) satellite. They show different vertical structures, but their values are very similar. Lastly, LH profiles from GOES-16 and NEXRAD are applied to WRF model simulation during pre-forecast hour for convective initialization, and their forecast results are compared to examine whether LH from GOES-16 improves precipitation forecast as much as LH derived from NEXRAD does. The results show that LH from GOES-16 significantly improves precipitation forecast, and it has similar impacts in the forecast if the detection is correctly made.