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Oral

Advances in the assimilation of satellite radiances under all weather conditions has led to significant improvements in analyses and weather forecasts, especially using microwave radiances. Progress has also been made towards the assimilation of cloud-affect infrared radiances with recent studies showing improvements when assimilating infrared water vapor bands. However, due to uncertainties in the observation error distributions, forward operators, and cloud representation in the models, infrared window channels remain a challenge to the scientific community. In this study, we examine the assimilation of infrared window channel 13 from GOES-ABI and Himawari-AHI sensors over the ocean, using the Model for Prediction Across Scales – Atmosphere (MPAS-A) coupled with the Joint Effort for Data assimilation Integration (JEDI). The Community Radiative Transfer Model (CRTM) interfaced in JEDI-UFO is used as a cloudy radiance observation operator for the channel 13's assimilation and forecast evaluation. Two experiments are conducted using the hybrid-3DVar method of MPAS-JEDI with a global quasi-uniform 30km grid. The benchmark experiment assimilated “conventional” observations (radiosondes, aircraft, surface pressure, satellite AMVs, and GNSS radio occultation observations) and clear-sky radiances from AMSU-A and MHS. The sensitivity to ABI and AHI’s channel 13 is analyzed by assimilating these data in addition to the observations in the benchmark experiment. The cloud analyses and forecasts are verified in terms of the observed and simulated brightness temperatures at different wavelengths of ABI and AHI. This study provides guidance in understanding situation-dependent errors in the forecasts and for the future research direction of assimilating infrared window channels in all-weather conditions.

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