

Evaluation of MPAS forecasts in radiance space using the JEDI data assimilation system and ABI/GOES-16 observations over South America

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Abstract:

Numerical weather prediction (NWP) models are developed with the goal of providing high-quality meteorological products to society. The continuous improvement of forecasts depends on evaluation methodologies capable of identifying model limitations and, consequently, supporting advancements in NWP, particularly in regions such as South America. Considering the importance of understanding and improving the representation of atmospheric processes in numerical models, this study focuses on South America to assess the performance of the Model for Prediction Across Scales-Atmosphere (MPAS-A) in short-range forecasts in radiance space, using the MPAS-A coupled with the Joint Effort for Data assimilation Integration (JEDI) system and observations from the Advanced Baseline Imager (ABI) sensor aboard the GOES-16 geostationary satellite. 6-day forecasts with hourly outputs were generated using a variable-resolution mesh of 15–3 km, refined over South America. The Community Radiative Transfer Model (CRTM), integrated into the Unified Forward Operator of JEDI, was employed as the observation operator to simulate ABI brightness temperatures based on the MPAS-A forecast fields. The comparison between

observations and simulated brightness temperatures indicates that the model successfully represented the structure and evolution of Tropical Cyclone Akará, although it underestimated high clouds in several instances. The model also underestimated stratocumulus clouds over the southeastern Pacific, an issue that will be further investigated in future studies. The results demonstrate the effectiveness of the proposed methodology in assessing the model's atmospheric representation and identifying aspects that require improvement.

Keywords: Forecast verification. MPAS-JEDI. Radiance. GOES-16 ABI.