Yi
Jin
Naval Research Laboratory, Monterey, CA
Qingyun Zhao, NRL, Monterey, CA
Nancy L. Baker, NRL, Monterey, CA
James D. Doyle, NRL, Monterey, CA
David R. Ryglicki, ACME Atron-O-Matic, LLC, Orlando, FL
Robert G. Nystrom, NCAR, Boulder, CO
XingChao Chen, Penn State
Yunji Zhang, Penn State
Oral
Tropical cyclone (TC) intensity prediction remains a challenge, especially for storms that go through rapid intensification (RI). One of the contributing factors for the TC intensity forecast errors comes from inaccurate representation of the TC initial state, in particular, the initial inner core structure. The poor representation is mainly associated with lack of observations and/or effective data assimilation procedures for the TC inner core. Recently, an all-sky radiance assimilation system, being developed for the Navy’s operational Coupled Ocean/Atmosphere Mesoscale Prediction System for TC (COAMPS-TC®), has demonstrated potential to improve TC RI forecasts through more realistic inner core structure at the initialization time by assimilating high-spatiotemporal resolution IR water vapor channel radiance data in both clear-sky and cloudy regions. For example, intensity forecast errors were reduced by more than half during Hurricane Patricia (2015) RI (Zhao et al. 2019), initialized with the ensemble mean analyses from a 60-member EnKF data assimilation system.

In this study, we examine the impact of the all-sky radiance data assimilation on the TC inner core structure along with the improved RI prediction for Hurricanes Patricia (2015) and Harvey (2017). Preliminary analysis for the Patricia case indicated that the radius of the initial vortex is reduced from ~24 km in the control test without the radiance assimilation to ~7 km with the all-sky radiances assimilated. The smaller eye compares better with the tight inner-core of the observed TCs. A much deeper layer of convection is present in the thin eyewall in the radiance assimilation experiment and this well-organized eyewall convective activity persists over the 72-h forecast for both cases. The impact from assimilating the all-sky radiance is assessed to better understand the thermodynamic processes associated with the RI.
Presentation file

Yi-Jin-dod-2023.pdf

YouTube link

View recording

Meeting homepage

DoD Cloud Post-Processing and Verification Workshop

Download to PDF