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New observational strategies for operational global and hurricane model improvements using airborne Tropical Cyclone and Winter Storm surveillance flights

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A new aircraft observing strategy is proposed for obtaining much-needed atmospheric dropsonde observations throughout the entire depth of the troposphere within the inner core of Tropical Cyclones (TCs) and their environment during TC season, as well as over developing winter storm systems in the Central and Eastern Pacific (CPAC and EPAC) upstream from the U.S. West Coast Atmospheric River (AR) landfalls, Central Plains severe weather and rapidly developing East Coast winter storms. The observing strategy involves new and improved dropsonde instruments deployed utilizing new and improved dropsonde targeting strategies which define regions of model uncertainty using operational global ensemble forecast models. Data from these flights would be for the purpose of reducing model uncertainty in the prediction of TC track and intensity as well as location and intensity of winter storm systems. Secondly, initial analyses suggest that data from these flights would play a role in improving longer-range, down-stream forecasting of TC's such as Extratropical Transition (ET) and storms in other global basins as well as severe weather impacts over the CONUS region during the winter season. The use of emerging new dropsonde targeting techniques defining regions of operational model uncertainty is critical to the successful implementation of this new plan. Initial experimentation suggest that use of multiple global models (and their ensembles) with different uncertainty estimation methods helps to further reduce targeting uncertainty and maximize the use of dropsonde observations in the operational data assimilation system.

Preliminary results from targeting strategies implemented with the recent hurricane seasons using Global Hawk and G-IV aircraft will be discussed with respect to impacts on the new NCEP operational Global Forecast System (GFS) based on the Finite Volume Cubed Sphere (FV3) dynamic core, and operational Hurricane Weather Research and Forecast (HWRF) models. These strategies were further exploited during the Atmospheric Rivers Reconnaissance campaign in February 2019 using dual WC-130J aircraft. NWS has partnered with CW3E, Navy, NCAR and SUNY Albany in providing ensemble model based targeting strategies for dropsonde deployments for the ARR-2019 as a pilot project. Preliminary results from this campaign will be presented. Impact on numerical model guidance, local forecasts and downstream impacts will await further in-depth study.

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