**Sensitivity of G-IV Dropsonde Configuration on Tropical Cyclone Prediction using a Regional OSSE Framework**

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**MOTIVATION**

Study the impact of G-IV dropsondes on tropical cyclone analyses and forecasts

**DATA DESCRIPTION**

- Dropsone deployed via NOAA G-IV aircraft:
  - Temperature, moisture, pressure and wind observations
  - 100 observations per dropsonde
  - Deployed in various configurations relative to TC size

**OSSES for Hurricanes**

- **Observing System Simulation Experiments (OSSES):**
  - Aim to quantify the potential impact of a proposed observing system on tropical cyclone analyses and forecasts
  - Can also be used to assess current observing systems and methods for data retrieval

**Regional OSSES for Hurricanes**

The regional OSSE system developed at NOAA/AOML and UM/RSMAS uses synthetic observations produced from the Nature Run and assimilates them to create analyses used by a high-resolution regional forecast model.

**EXPERIMENTS AND RESULTS**

- Each experiment included the assimilation of simulated conventional and satellite data with 120-hour forecasts launched for each analysis. Impact experiments include various configurations of G-IV dropsonde deployments during the 36 hours leading up to rapid intensification.
  - Control: conventional and satellite observations
  - Circumnavigation: control plus G-IV dropsondes at a radius of 3 x radius of 34-knot winds
  - Concentric: control plus G-IV dropsondes at radii of 1.5 and 3 x radius of 34-knot winds
  - Star: control plus G-IV dropsondes at radii of 1.5 and 3 x radius of 34-knot winds

- Positive impact on track forecasts using all configurations:
  - Analysis track errors improve by about 40 km for all experiments compared to control and are dominated by differences in TC-environment interactions
  - Forecast track errors improve significantly for all lead times, with the most significant improvement produced by the concentric circumnavigation configuration
  - Experiments adding G-IV dropsonde data capture the strength and western extent of the subtropical ridge, where the control experiment forces the vortex to embed within the ridge

**FURTHER ANALYSIS**

**Near-storm environment differences**

- Figure 6. Impact of G-IV dropsonde data from concentric experiment on geopotential height field (top), geopotential height field from nature run (bottom left), and geopotential height from concentric configuration experiment (bottom right).

**Future Regional OSSE System Upgrades**

- New state-of-the-art Basin-Scale Nature Run
  - Large domain of uniform high-resolution
  - Allows for multi-Typhoon interactions

- Flexibility
  - Use of multiple nature runs
  - Implementation of multiple DA systems
  - Capability of evaluating model physics/parameterization schemes

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