NOAA ROSES Semi-Annual Report

Reporting Period: September 2020 – February 2021 (1st report)

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Project Title: Improved Monitoring of the Rapidly-Evolving Upper-Tropospheric Wind Fields over the Core of Hurricanes from High Spatiotemporal Resolution Geostationary Satellite Observations

Executive Summary (1 paragraph max)

The overarching goals are to build upon recent advances in extracting enhanced tropospheric wind information from meso-scan sectors provided by new-generation GEO satellites in hurricane environments and complete the research needed to bring this advanced capability to NOAA's operational hurricane applications.

Progress toward FY20 Milestones and Relevant Findings (with any Figs)

- Building upon previous research conducted under the GOES-R Risk Reduction program, this project aims to help transition the GOES-16/17 hurricane-scale AMV product to operational production at NESDIS, and work with data assimilation (DA) collaborators to optimize the assimilation of these data into the operational hurricane models such as HWRF and HAFS to improve hurricane predictions. We plan to demonstrate the maturity and quality of the data, and the real-time operability of the processing strategies. Resources permitting, Himawari cases will also be tested.

- In addition to setting the table for operational transition of the enhanced AMV product and assimilation into HWRF, we have received significant interest from the research community about the availability of these enhanced AMV datasets. It is apparent through networking with colleagues that these datasets will also contribute significantly to ongoing and planned tropical cyclone research studies.

- Milestone 1: We are completing the testing and quality analysis of the hurricane-scale AMV processing strategy elements, and are setting up for a real-time demo this coming Atlantic hurricane season. AMV datasets processed in 2020 during the prolific Atlantic hurricane season were used in conjunction with matched (space and time) aircraft dropsonde missions to assess vector quality in hurricane environments. The preliminary results are presented in Figure 5.1, and show the meso-scan AMVs are statistically consistent with operational AMVs in quality, despite the difficult dynamic environment. Discussions are underway with the STAR AWG AMV Lead Jaime Daniels to transfer this processing strategy over to STAR for operational assessment.

- Milestone 2: We have engaged NWP Collaborators at AOML-HRD and NCEP-EMC on the promising aspects of the enhanced AMV data through model impact studies, and have started to define the optimal DA path for these data. We are exploring DA options in the operational HWRF model and the experimental HAFS system. Post-processed

case study datasets are being provided to the DA collaborators (Xuguang Wang, OU; Jason Sippel, HRD, Zhan Zhang and Li Bi, EMC) and methodologies for assimilating these datasets are being tested.

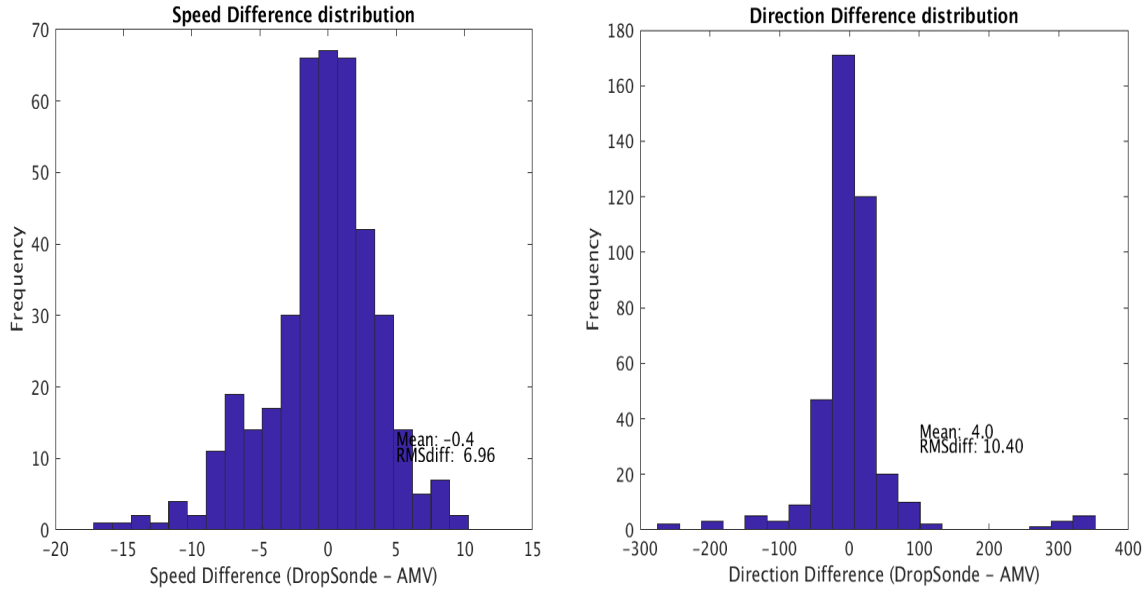

Figure 5.1. Comparisons of collocated (x,y,p,t) GOES-16 meso-scan AMVs with aircraft dropsonde winds around hurricanes from the 2020 Atlantic season. Left: Windspeed differences (kts), Right: Directional differences (degrees). Frequency is the number of matches. Sample mean values are plotted on the graphs.

Plans for Next Reporting Period

Publications and Conference Reports

Lewis, William E.; Velden, Christopher S.; Stettner, David, 2020: Strategies for Assimilating High-Density Atmospheric Motion Vectors into a Regional Tropical Cyclone Forecast Model (HWRF), Atmosphere 11, no. 6, 673. https://doi.org/10.3390/atmos11060673