Assimilation of TC Inner Core Surface Winds by CYGNSS into Forecast Models

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The CYGNSS constellation of eight satellites was successfully launched in December 2016. Each satellite carries a four-channel bi-static radar receiver that measures GPS signals scattered by the Earth surface. Over ocean, near-surface wind speed is estimated from the measurements. Over land, estimates of near-surface soil moisture and imaging of flood inundation are possible. The measurements are able to penetrate through all levels of precipitation and vegetation canopy due to the low microwave frequency at which GPS operates. The rapid revisit time of sampling afforded by the number of satellites in the constellation makes possible the detection of tropical cyclone intensification, the diurnal cycle of tropical winds, and the rapid dry-down response of soil moisture after rain events. Engineering commissioning of the constellation was completed in March 2017 and the mission is currently in its science operations phase. Level 2 science data products have been developed for near surface (10 m referenced) ocean wind speed and ocean surface roughness (mean square slope). Level 3 gridded versions of the L2 products have also been developed. A set of Level 4 products have also been developed specifically for direct tropical cyclone overpasses. These include the storm intensity (peak sustained winds) and size (radius of maximum winds), its extent (34, 50 and 64 knot wind radii), and its integrated kinetic energy. Assimilation of CYGNSS L2 wind speed data into the HWRF hurricane weather prediction model has also been developed. Level 2 science data products over land related to near-surface volumetric soil moisture content and flood inundation extent are also in development. An overview and the current status of the mission will be presented, together with an update on the status of science applications related to data assimilation into numerical forecast model for purposes of tropical cyclone prediction of track, intensity and structure.