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The NASA Cyclone Global Navigation Satellite System (CYGNSS) Mission

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The NASA EV-2 Cyclone Global Navigation Satellite System (CYGNSS) is a spaceborne mission focused on tropical cyclone (TC) inner core process studies. CYGNSS attempts to resolve the principle deficiencies with current TC intensity forecasts, which lies in inadequate observations and modeling of the inner core. The inadequacy in observations results from two causes: 1) Much of the inner core ocean surface is obscured from conventional remote sensing instruments by intense precipitation in the eye wall and inner rain bands. 2) The rapidly evolving (genesis and intensification) stages of the TC life cycle are poorly sampled in time by conventional polar-orbiting, wide-swath surface wind imagers. CYGNSS is specifically designed to address these two limitations by combining the all-weather performance of GNSS bistatic ocean surface scatterometry with the sampling properties of a constellation of satellites. The use of a dense constellation of nanosatellite results in spatial and temporal sampling properties that are markedly different from conventional imagers. Simulation studies will be presented which examine the sampling as functions of various orbit parameters of the constellation. Historical records of actual TC storm tracks are overlaid onto a simulated time series of the surface wind sampling enabled by the constellation. For comparison purposes, a similar analysis is conducted using the sampling properties of several past and present conventional spaceborne ocean wind scatterometers. Differences in the ability of the sensors to resolve the evolution of the TC inner core are examined. The spacecraft and constellation mission are described. The signal-to-noise ratio of the measured scattered signal and the resulting uncertainty in retrieved surface wind speed are also examined.