

CYGNSS Constellation Ocean Level 1 Calibration and Wind Speed Retrieval Update

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CYGNSS consists of a constellation of eight satellites in a single orbit plane, launched using a single launch vehicle. Each CYGNSS satellite carries a GNSS Reflection (GNSS-R) instrument, which is capable of tracking up to four parallel surface reflections from the Global Positioning System (GPS) constellation. The CYGNSS instrument maps the reflected power in time/delay and Doppler space to form Delay Doppler Maps (DDMs) which can be used to estimate near surface wind and surface short waves over ocean and soil moisture and flood inundation over land.

This presentation will include an update on the latest CYGNSS Level 1 calibration algorithm and Level 2 wind retrieval performance. Multiple improvements have been made in the CYGNSS calibration since its launch (approaching) 2 years ago. These improvements will be summarized and the remaining error sources still being addressed will be discussed. Detailed top-down and bottom-up error budgets will be presented.

The CYGNSS calibration has faced a unique difficulty due to its utilization of GPS signals of opportunity, which were not designed to be used for remote sensing. This presents several new challenges in trying to accurately characterize the GPS transmit power and antenna gain patterns for over 30 GPS satellites and three different design (or Block) types. Understanding the GPS transmitters and compensating for variations in their transmitted signals is necessary to design a robust calibration algorithm and assure accurate observations of the surface.

To address this challenge a new differential Level 1 calibration technique using signals received from both the direct navigation antenna and reflection antennas will be presented. This new technique is expected to be significantly more robust in tracking power variations from the GPS transmitters, which are known to be a significant source of error in the calibration and wind retrievals.