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The NASA Cyclone Global Navigation Satellite System: A Constellation of MicroSats

Christopher Ruf[(1)], Hugo Carreno-Luengo[(2)], Clara Chew[(3)], Cynthia Gerlein-Safdi[(4)], and April Warnock[(5)]
(1) University of Michigan, Ann Arbor, MI USA, e-mail: cruf@umich.edu
(2) University of Michigan, Ann Arbor, MI USA, e-mail: carreno@umich.edu
(3) University Corporation for Atmospheric Research, Boulder, CO USA, e-mail: clarac@ucar.edu
(4) Lawrence Berkeley National Laboratory, Berkeley, CA USA, e-mail: cgerleinsafdi@lbl.gov
(5) SRI International, Ann Arbor, MI USA, e-mail: april.warnock@sri.com

The CYGNSS mission consists of a constellation of eight satellites, each of which carries a four-channel radar receiver to measure Global Positioning System (GPS) signal scattered from the Earth surface [1]. Over the ocean, surface roughness, near-surface wind speed and air-sea latent heat flux are retrieved. Over the land, retrievals of near-surface soil moisture and imaging of inland water bodies and flood inundation are derived from the surface reflections. The measurements are able to penetrate through heavy precipitation and dense vegetation canopies. The number of satellites and their continuous operation produce high spatial sampling density and low temporal revisit times. Over ocean, this permits reliable capture of tropical cyclone intensification and resolution of diurnal variability. Over land, diurnal soil moisture changes are resolved and rapidly changing flood inundation events can be mapped. The mission is currently in its science operations phase [2].

Science data products are produced over ocean for wind speed, surface roughness, and sensible and latent heat fluxes and over land for volumetric soil moisture. Data products currently in development over ocean include tropical cyclone intensity (peak sustained winds) size (radius of maximum winds), extent (34, 50 and 64 knot wind radii) and storm center location. Over land, data products in development include improved volumetric soil moisture content, flood inundation extent, inland water body maps, and river streamflow rate. The spatial resolution of ocean wind and soil moisture measurements is 25 km. Inland water bodies can be resolved with ~ 1 km resolution due to the coherent nature of reflections from smooth water surfaces [3].

An overview and current status of the CYGNSS mission will be presented, together with recent scientific results and applications.

References

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