**8. CYGNSS Validation**

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**Links to IFEX:**

* **Goal 2:** Develop and refine measurement technologies that provide improved real-time monitoring of TC intensity, structure, and environment.

**Motivation:** The Cyclone Global Navigation Satellite System (CYGNSS) is a constellation of eight small satellites equipped with receivers to measure reflected signals from existing Global Positioning System (GPS) satellites to measure ocean surface wind speeds. One of the primary goals of the CYGNSS mission is to obtain wind speed measurements in tropical cyclones. In order to calibrate and validate CYGNSS in the tropical cyclone environment, collocated SFMR and dropsonde data will be used.

**Background:** Each of the eight CYGNSS satellites contains a Delay Doppler Mapping Instrument (DDMI) that measures GPS signals reflected off the ocean surface. The distribution of the reflected GPS signal depends upon the ocean surface roughness from which a wind speed is derived. The CYGNSS constellation is capable of obtaining 32 wind speed measurements per second around the globe. However, the inclination angle of the CYGNSS satellites restricts the coverage to ±35° latitude. The median (mean) revisit time for CYGNSS is 2.8 (7.2) hours. One of the main advantages of CYGNSS is that by utilizing GPS signals it is able to obtain wind speed measurements in all weather conditions without signal saturation at high wind speeds. More information on the CYGNSS mission can be found in the CYGNSS handbook (Ruf et. al. 2016).

**Hypotheses:** None

**Experiment/Module Description:** This module is designed to obtain CYGNSS, SFMR, and dropsonde data that is collocated in space and time. It will require aligning the P-3 flight track so that one leg is oriented in the direction that the CYGNSS satellites will be flying over the storm. Ideally, the P-3 will be at the storm center when the CYGNSS overpasses occur. In order to accomplish this module, it is vital to have knowledge of the expected location/time of the CYGNSS satellite overpasses during the P-3 mission. Prior to the flight, the information on the expected CYGNSS locations will be provided by the PIs to the LPS. Based on the CYGNSS locations, it may be necessary to adjust the IP and take-off time so that one of the P-3 flight legs (straight leg passing through the storm center) is aligned with the direction and as close in time as possible to where/when the CYGNSS satellites will be flying over the storm. If resources allow, RMW drops along with the standard drop locations for dropsondes is ideal.

**Analysis Strategy:** SFMR data will be averaged spatially to the footprint size of CYGNSS (25 km) and compared with the collocated CYGNSS data. The CYGNSS and spatially averaged SFMR data will also be compared to the dropsonde surface wind data. The storm structure will also be compared between the SFMR and CYGNSS measurements.

**References:**

Ruf, C., P. Chang, M.P. Clarizia, S. Gleason, Z. Jelenak, J. Murray, M. Morris, S. Musko, D. Posselt, D. Provost, D. Starkenburg, V. Zavorotny, CYGNSS Handbook, Ann Arbor, MI, Michigan Pub., ISBN 978-1-60785-380-0, 154 pp, 1 Apr 2016.