

Ocean Products from Spire Global, Inc

As part of the CSDA sustained purchase agreement with Spire Global, Inc., Spire has delivered ocean winds and mean square slope (MSS) retrieval

- These data can be directly requested from the CSDA program under the same licensing and restrictions as the other Spire products
- Further description of these data is provided on the following slides

To acquire the ocean products:

- If not already authorized to use Spire data, request authorization and access via NASA Earthdata
 - [CSDA Program Authorization Request Form \(nasa.gov\)](#)
- Once approved, data may be downloaded from the [Smallsat Data Explorer \(SDX\)](#)

Questions or Issues: Contact the CSDA Project Manager: Alfreda.A.Hall@nasa.gov

Evaluation of Level 2 Wind Speed Products Produced by Spire Global

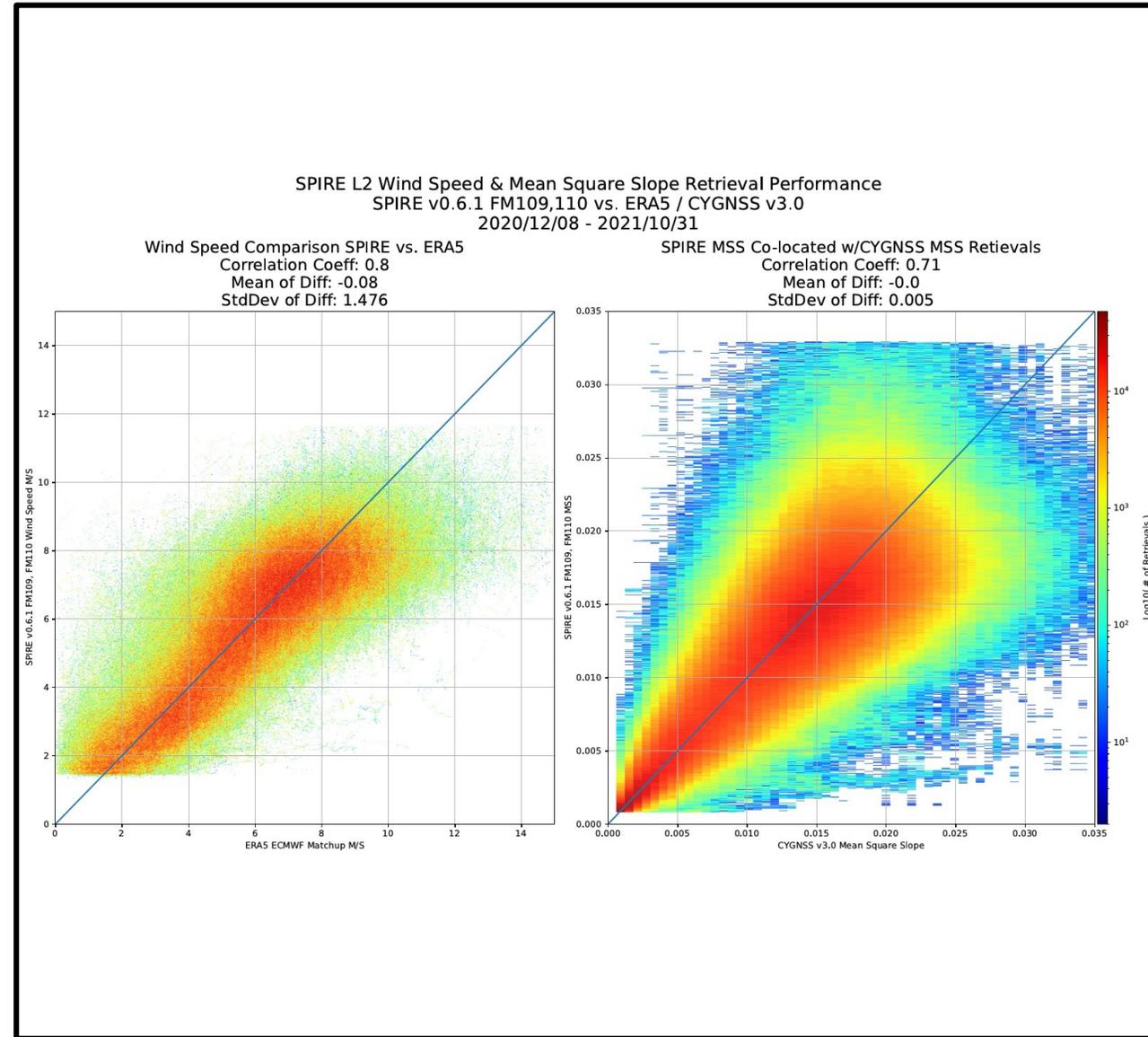
University of Michigan

Purpose: Assess Spire Level 2 over ocean wind speed and mean square slope (MSS) retrieval performance relative to existing reference products.

Data evaluated: Spire GNSS-R Level 2 Ocean Data v0.6.1 as of August 2022.

Study Objective: Assess Spire performance relative to model (European Centre for Medium-Range Weather Forecasts Reanalysis version 5 - ERA-5) and existing GNSS-R retrievals (Cyclone Global Navigation Satellite System - CYGNSS) as a function of GNSS-R relevant parameters (receiver, transmitter, observation geometry, SNR, reference retrieval).

Findings: The Spire wind speeds compare well to ERA-5 estimates matched to within 50 km and 30 minutes, with high correlation and low bias (left figure). Likewise, the Spire MSS estimates agree well with co-located CYGNSS MSS retrievals (right figure). Note that both the Spire wind speed and MSS estimates are limited to below ~ 11.5 m/s and 0.033 respectively to avoid low SNR data. Planned operational changes to increase antenna gain should address this issue.



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With the caveats above, we deem these Level-2 data to be of acceptable quality for wider release to the scientific community under the terms of the relevant CSDA EULA. Furthermore, CSDA welcomes any additional feedback on the data from future users.

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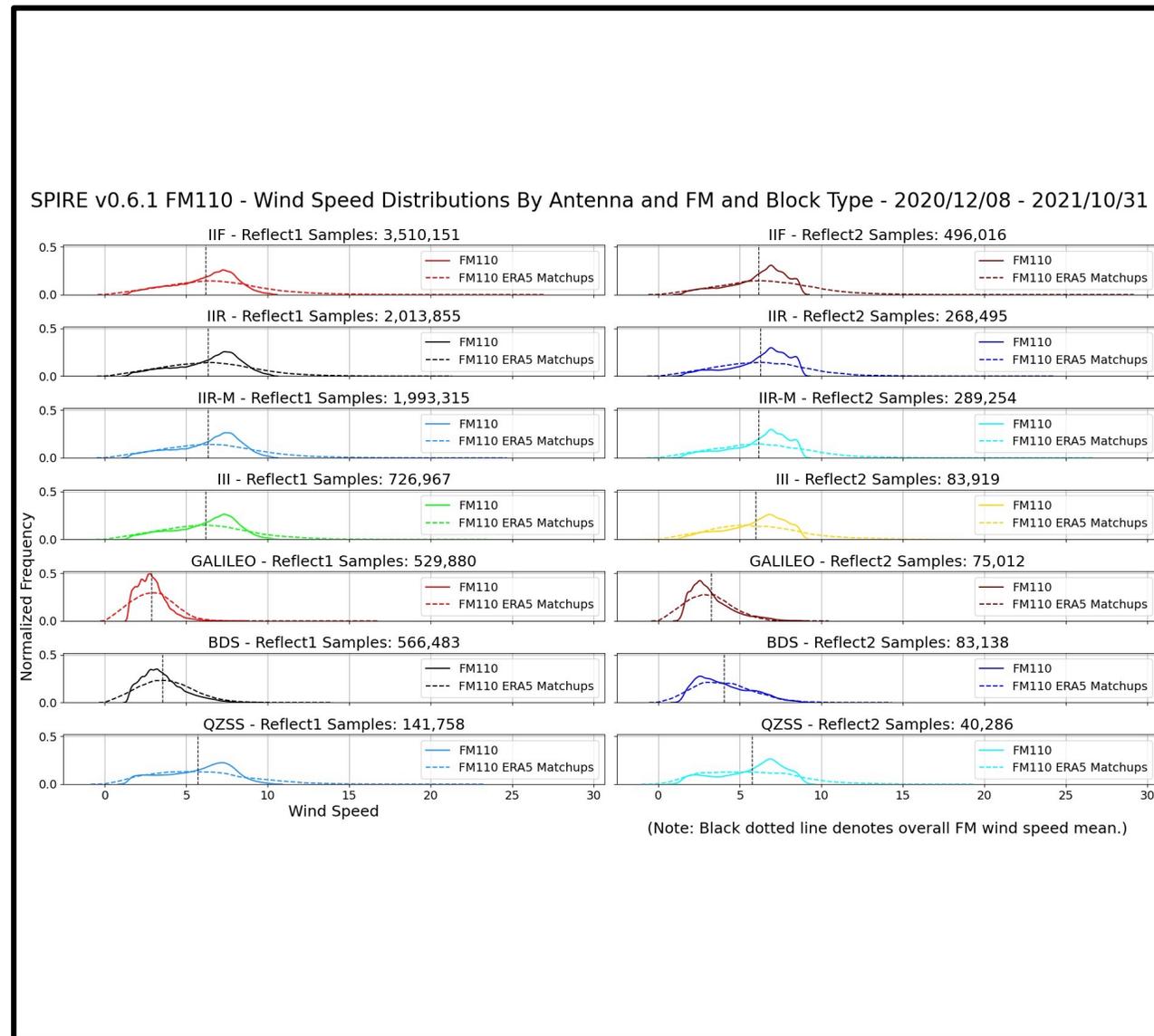
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Findings: The distributions of Spire retrieved wind speeds (solid lines) agree well between each of the antennas (columns) on each of the two receivers (FM109 not shown but very similar to FM110 shown here) and are similar to ERA5 winds (dashed lines). The Retrieved wind distributions for the BDS (China) and Galileo (EU) transmitters are significantly lower than for GPS (US) and QZSS (Japan) transmitters. Planned operational changes to increase antenna gain should address this issue as well.



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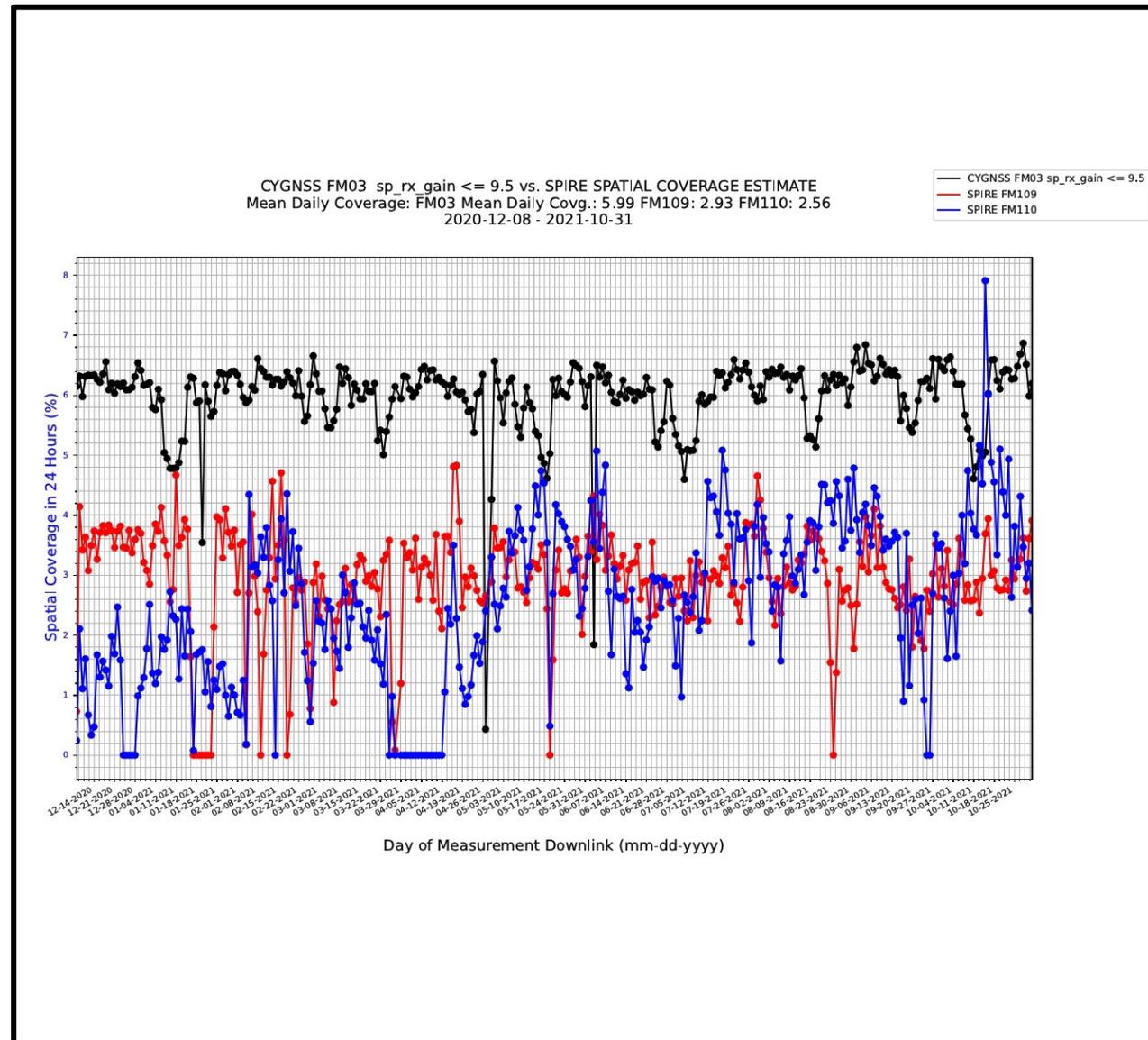
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Findings: Using just one of the CYGNSS receivers matched to the lower Spire antenna gain, comparisons were made of the spatial coverage per day as a function of time for the overlap region between the two constellations of 40° S to 40° N latitude. The effective number of receivers parallel processed by both constellations is around 4. The coverage from Spire is lower than that from the CYGNSS comparison data, consistent the lower



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