

Soil Moisture Data from Spire Global, Inc

As part of the CSDA sustained purchase agreement with Spire Global, Inc., Spire has delivered a set soil moisture data

- 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 slide

To acquire the soil moisture data:

- If not already authorized to use Spire data, request authorization and access via NASA Earthdata
 - [CSDA Program Authorization Request Form \(nasa.gov\)](#)
- Once approved, request the data from the CSDA Program Data Management Team by emailing csdap@uah.edu

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

Evaluation of Spire Level 2 GNSS-R soil moisture product against remote sensing observations

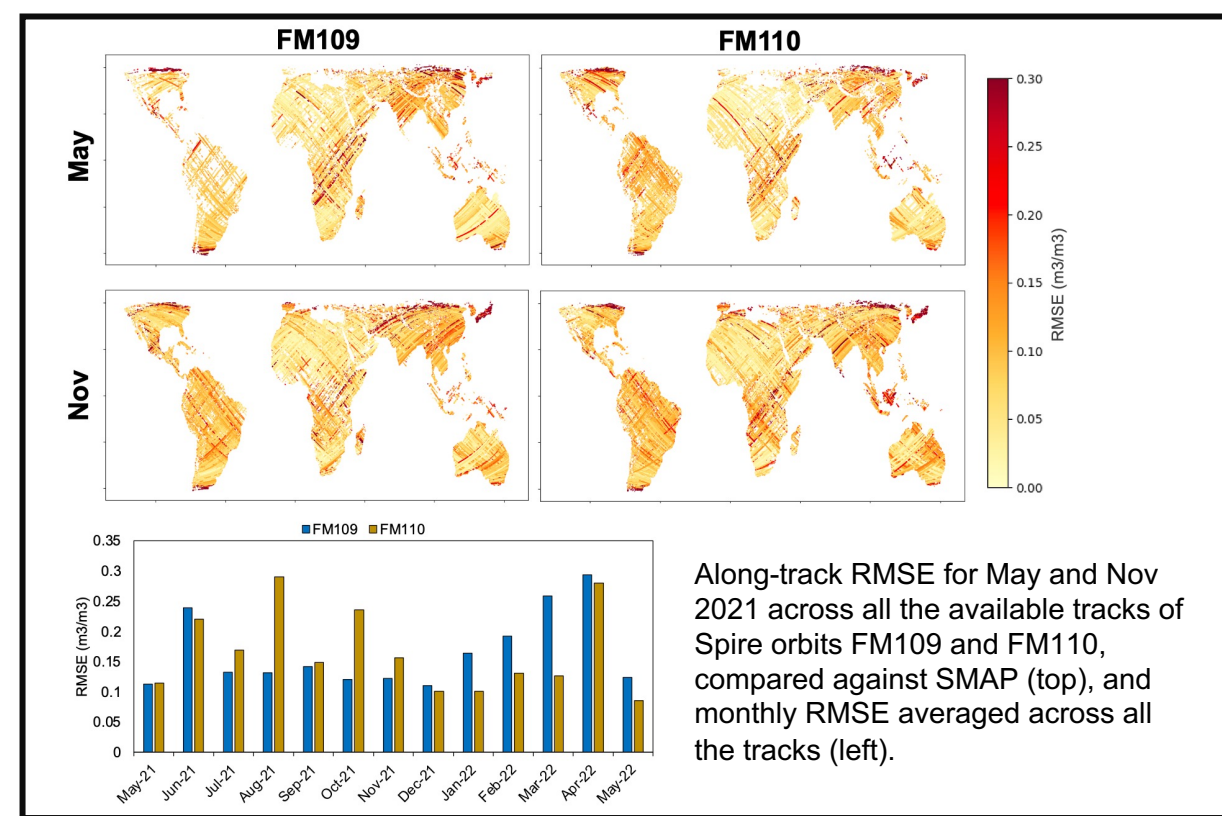
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Purpose: Evaluate and assess level of noise for Spire GNSS-R surface soil moisture measurements

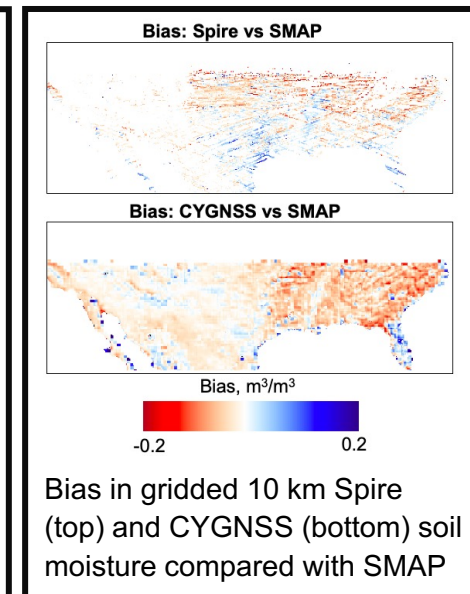
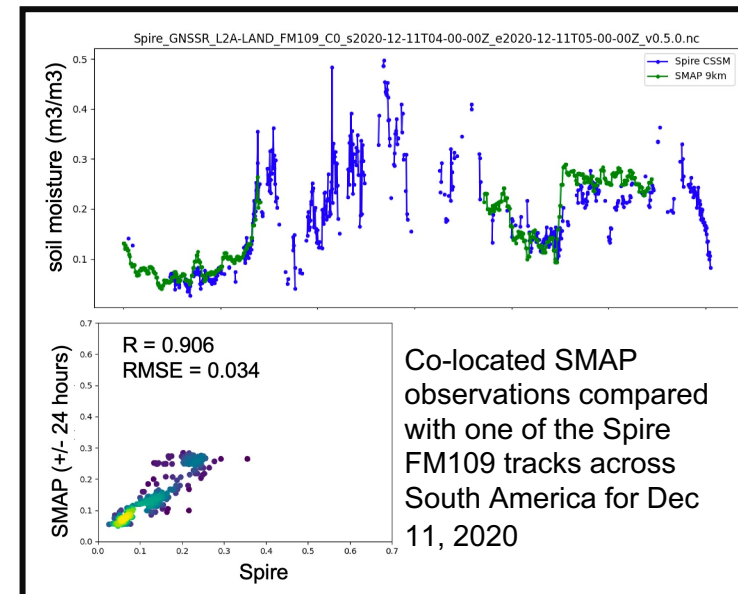
Study objective: Perform a quantitative trackwise and pixelwise comparison of Spire soil moisture product with remote sensing observations.

Data: Spire L2, SMAP L3, and CYGNSS soil moisture

Findings: The Spire L2 soil moisture product can provide trackwise surface soil moisture measurements across the globe. Though the number of observations and coverage is limited with the existing orbits, trackwise soil moisture is in reasonable agreement with SMAP 9 km observations (top and bottom-left panels). Generally, RMSE is lowest during winter period while tracks in higher latitudes exhibit larger deviations from SMAP. During 2020-21, analysis suggested better agreement of FM109 and SMAP in summers compared to FM110. A spatial comparison of Spire observations gridded to 10 km during Jan- Apr 2021 also suggest low biases across the CONUS, with Western US showing negligible differences. A similar gridded comparison of CYGNSS soil moisture showed relatively larger bias against SMAP (bottom-right panel). The Spire soil moisture data is believed to be of acceptable quality for general release to the wider scientific community for research and further evaluation.



Along-track RMSE for May and Nov 2021 across all the available tracks of Spire orbits FM109 and FM110, compared against SMAP (top), and monthly RMSE averaged across all the tracks (left).



Bias in gridded 10 km Spire (top) and CYGNSS (bottom) soil moisture compared with SMAP