A new microwave observation-based Evapotranspiration (ET) product and a novel statistical technique make it possible to determine globally how much of the variation in ET is determined by soil moisture (i.e., terrestrial leg of land-atmosphere coupling).

For the first time, we can now mitigate random errors in remote sensing products and recover the true coupling strength from multiple soil moisture and ET estimates (compare Figure 1, 2). The result of this work gives modelers a benchmark to compare and improve their global land surface models (Figure 3).
References:


Data Sources: Global Land Data Assimilation System (GLDAS), https://ldas.gsfc.nasa.gov/gldas/. ET estimates based on thermal data from Aqua/Terra-MODIS, or passive microwave observations (e.g. GPM, AMSR-E). Soil moisture estimates based on Aqua AMSR-E, or ASCAT.

Technical Description of Figures:

**Figure 1:** Random errors associated with individual remote sensing products reduce the correlation between any two products to below that of the true signals. In this image, the correlation between the remote sensing products soil moisture and evaporation is low compared to the expected true value.

**Figure 2:** A novel statistical technique uses triplets of soil moisture estimates and triplets of ET estimates to mitigate such noise. This recovers the (higher) true coupling between soil moisture and evaporation.

**Figure 3:** The result is a benchmark that can be compared with land surface models (LSM), which tend to overestimate the coupling in many areas of the world.

**Scientific significance, societal relevance, and relationships to future missions:** The result of this work will help improve the representation of land-atmosphere coupling in models used to obtain future climate projections.
On-orbit Characterization of JPSS-1 VIIRS Thermal Emissive Band (TEB) Response versus Scan-angle (RVS)

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Characterization and validation of JPSS-1 (now NOAA-20) VIIRS thermal emissive band (TEB) response versus scan-angle (RVS) using data collected during spacecraft pitch maneuver.
References:


Data Sources:
All sensor raw and the calibrated data used to generate the image and validation results are from NASA GSFC Level 1 and Atmosphere Archive and Distribution System (LAADS). The response versus scan angle (RVS) algorithms used in this study were initially derived by the NASA MODIS Characterization Support Team (MCST) and extended by the VIIRS Characterization Support Team (VCST).

Technical Description of Figures:

Figure (a) VIIRS scan angles or angle of incidence (AOIs) of its half-angle mirror (HAM) corresponding to the Earth View and its on-board calibrators, including the space view, blackbody, and solar diffuser.

Figure (b) An image of JPSS-1 (now NOAA-20) VIIRS thermal emissive band (M15) constructed using data collected during the spacecraft pitch maneuver on January 31, 2018.

Figure (c) Top: JPSS-1 VIIRS TEB RVS derived using data collected during spacecraft pitch maneuver; bottom: comparison of RVS from pitch maneuver with that from pre-launch measurements (excellent agreement to within +/- 0.2%).

Scientific significance, societal relevance, and relationships to future missions:
The VIIRS is a key instrument on the JPSS-1 (now NOAA-20) satellite launched in November 2017 and also on the S-NPP satellite launched in October 2011. VIIRS observations and associated data products are used to measure and monitor many of the key properties of the Earth’s land, oceans, and atmosphere, to improve weather forecasting, and to enhance our understanding of global climate change. VIIRS collects data in 22 spectral bands via a rotating telescope assembly (RTA) and a double sided half angle mirror (HAM) rotating at half the speed of the RTA. The sensor’s response versus scan-angle (RVS) is a key parameter that has direct impact on the data quality across the entire Earth view swath (along scan direction); and it is extremely important to perform accurate characterization and on-orbit validation of RVS normally determined from pre-launch measurements. Methodologies and lessons from this study can be applied to VIIRS on future JPSS missions (e.g. JPSS-2, 3, and 4) and various scanning radiometers on other missions.