

Challenges in Using Current Generation Imager Solar Reflectance Observations for Climate Change Detection and Future Directions

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Solar reflectance bands on satellite imagers have been used for many decades to retrieve critical components of the climate system, including aerosol, cloud, land surface, and ocean color properties. Depending on the spatial scales involved, the retrieved parameters typically require stable multi-decadal data records before expected climate change signals can be detected in the presence of natural variability. The first MODIS imager was launched on the NASA Terra satellite in late 1999, beginning a new generation of global imaging capability with onboard radiometric calibration systems and the ability to observe the moon. However, despite these advanced capabilities, the ability to characterize the MODIS instrument to the level needed for climate change detection has not been demonstrated, and the task becomes more problematic as the instruments age. The next generation sensor for U.S. global environmental imaging is VIIRS which currently flies on Suomi-NPP and the future JPSS series. Many of the technical challenges encountered by MODIS for climate change detection are likely to be common to VIIRS as well. The radiometric stability required by imagers for climate studies requires a new paradigm for acquiring accurate and stable reflectometry in orbit. In this talk, we present an overview of the radiometric performance of current day satellite imaging systems and show examples of instrument temporal trends aliasing into data product climate records. A new design approach where imaging reflectometry is based on direct solar views is presented.