GSICS VIS/NIR Sept 12, 2024 Monthly Web Meeting

Junwei Wang (CMA), Pseudo Invariant Pixel (PIPS) algorithm details for sensor degradation monitoring

He discussed the PIPS methodology in detail.

Dave asked how long the record would need to be get acceptable stability results. Also, how can this method tell the difference between inter-annual calibration change and a surface reflectance change. The imager data is reprojected onto a 1-km. Ali asked if they have tried OLCI with the PIPS method, since the OLCI radiances have been calibrated. Also, is there someway to reduce the scatter about the timeline.

Bei Zhang (CMA), FY-4A/AGRI and FY-3D/MERSI-II DCC calibration implementation

He described the GSICS DCC invariant target implementation for FY-3D/MERSI-II and FY-4A/AGRI, which are nearing the end of their lifetimes, to assess the stability of the sensors. He discussed the sensitivity studies of BT threshold with the PDF distribution. The PDF mode is a better statistic for 0.65μm channel and the mean is better for the 1.6μm channel for monitoring stability. Noted that the CERES TRMM Thick-Ice-Cloud BRDF improved the stability assessment over the Hu model for visible channels. Noted that the distribution of DCC are consistent for the same month across multiple years. Most of the DCC occurs over the TWP. The Hu BRDF did not have an impact on the 1.61 μm, when no BRDF the 1.61μm channel has a seasonal cycle and is less consistent for the same month inter-anually and used a simple moving average to remove the seasonal cycle. The DCC method produced similar degradation rates as the other multi-site approaches.

Dave commented that this was a very comprehensive DCC analysis, confirming most of the major findings over the years. NASA will provide a seasonal BRDF. Raj asked. Was the temperature dependence before or after Hu model on slide 6?

Prathana Khakurel (NASA), Ocean/Land characterization of DCC for improved satellite stability analysis

She improved the DCC SWIR methodology by applying land and ocean seasonal empirical BRDFs. The land and ocean DCC SWIR band reflectances differ and must be taken into account when combining land and ocean results. She then performed several sensitivity studies to obtain the best sensor stability approach. She found that the visible bands had very consistent PDFs, whereas the SWIR bands differ inter-annually by month. She looked at the KDE inflection point, mode, mean and median statistics to find the lowest trend standard error. For visible bands the KDE inflection point provided the most stable trend, whereas for SWIR band it was the mean and for some SWIR channels the median.

The question was if she tried deseasonalization instead of using a seasonal BRDF. You can generate a BRDF with previous satellite to get stability analysis right away. The deseasonalization takes at least 2 years. The inflection point does not work for SWIR bands

because the year to year PDFs are varying in radiance. Dave suggested to try half frequency maximum.

Conor Haney (NASA), DCC calibration sensitivity studies in support of radiometrically scaling GEO imagers with VIIRS

He presented the DCC invariant target intercalibration methodology for visible channels. This was accomplished by applying DCC ray-matching between VIIRS and Himawar-8 30-km calibration footprint radiances to obtain the Himawari-8 gain. Once the Himawari-8 gain is known than the DCC inter-calibration approaches can be tested. In order to avoid discretization in the PDF due to the radiance interval, a kernal density estimation (KDE) is used to construct a smooth histogram. The KDE inflection point, mode, mean and median are used to inter-calibrate VIIRS and Himawari-8. Several sensitivity studies were performed including DCC BT threshold, spatial homogeneity threshold, and Himawari-8 BT difference with respect to VIIRS. It was found that the KDE inflection point provided the most accurate intercalibration and for cold thresholds the median also works. Future work includes applying to the SWIR bands and other months.

Masaya asked how does the DCC ray-matching VIIRS/Himarari-8 inter-calibration gain compared to the all-sky tropical ocean ray-matching. Sebastien mentioned that all of these inter-calibration methods could be used to determine the linearity of the detector response. For example bright DCC clouds, mid-range desert targets, and low reflectance lunar target. Sebastien asked about pixel size. Conor had done some work from a previous SPIE meeting with Landsat and high resolution VIIRS and will show at a future GSICS monthly web meeting.