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Abstract: **Suomi NPP CrIS Reprocessed SDR Long-Term Accuracy and Stability**

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Since early 2012, the Cross-track Infrared Sounder (CrIS) on board the Suomi National Polar-Orbiting Partnership (S-NPP) Satellite has continually provided the hyperspectral infrared observations for profiling atmospheric temperature, moisture and greenhouse gases. The CrIS radiance data are also directly assimilated into global NWP models to improve the medium-range forecasts. The CrIS overall performance in spectral, radiometric, geometric calibrations and noise performance in previous studies demonstrated that the CrIS Sensor Data Record (SDR) data meet calibration requirements, thus making it an exceptional asset for weather applications. However, the operational SDR generated by the Interface Data Processing Segment (IDPS) have undergone several sciences and code changes, thus resulting in inconsistent long-term performance and not suitable for climate applications.

In this study, the CrIS SDR data are further improved for climate applications with its fine-tuning of calibration coefficients in NOAA reprocessing project. One specific code for CrIS SDR reprocessing was developed. This code was based on ADL5.3.1 PSAT16 with updates for calibration algorithm, non-linearity, and geolocation to improve the scientific results. The calibration coefficients are refined with the latest updates based on the work from CrIS science team, and are inserted in the Engineering Packet in the Raw Data Record (RDR) data stream. The resampling wavelength was updated based on the metrology laser wavelength and resulting in zero sampling error in the spectral calibration. All the SDRs are generated with the same calibration coefficients, resulting in improved consistency during the CrIS life-time mission. The reprocessed SDRs are essential for deriving the long-term climate trending such as tropical sea surface temperature trends and CO_2 trends. Evaluation of CrIS reprocessed SDR in term of spectral, and radiometric long-term accuracy and stability will be presented.