FUTURE MICROWAVE IMAGER/SOUNDER (MIS) DATA PRODUCTS: TEMPERATURE DATA RECORDS (TDR), SENSOR DATA RECORDS (SDR) AND ENVIRONMENTAL DATA RECORDS (EDR)

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ABSTRACT

The National Polar Orbiting Environmental Satellite System (NPOESS) Microwave Imager/Sounder (MIS) is a conical-scanning radiometer scheduled to launch aboard NPOESS C2 spacecraft in 2016. MIS is also planned to fly on subsequent NPOESS C3 and C4 launches. MIS is a follow-on sensor for the Defense Meteorological Satellite Program (DMSP) Special Sensor Microwave Imager/Sounder (SSMIS). Development of the MIS sensor and its data products is a collaborative effort among the NPOESS Integrated Program Office (IPO), the Naval Research Laboratory (NRL) and Subject Matter Experts (SMEs) from multiple universities, government agencies and industry. Under the management of the NPOESS IPO, the first MIS sensor is being developed and built by NRL while the MIS Environmental Data Record (EDR) algorithms will be developed by SMEs.

The MIS channel set consists of vertical and horizontal polarized core imaging channels at 10, 18, 23, 37 and 89 GHz; atmospheric sounding channels at 50-60 GHz and 183 GHz; low frequency channels near 6.8 GHz; and polarimetric channels at 10, 18 and 37 GHz. The broad spectrum and polarimetric channels enable the MIS to produce a wide range of EDRs that are critical to not only to operational weather forecasting, but also to climate monitoring and earth science. Of those EDRs, key products are Soil Moisture, Sea Surface Wind Speed and Direction, Sea Surface Temperature and Atmospheric Vertical Temperature and Moisture Profiles.

The MIS Soil Moisture data record is expected to extend and improve upon the capability of the Advanced Microwave Scanning Radiometer (AMSR) on NASA's Earth Observing System (EOS) Aqua satellite (AMSR-E). It is well-known that 6-GHz measurements from AMSR-E are contaminated with RFI over many land areas including North America and Europe. The MIS 6-GHz channel design includes 4-sub-bands ranging from ~6.2 to 7.3 GHz and will utilize a sub-band selection algorithm in order to mitigate the impact of RFI over land and ocean. As a result Soil Moisture retrievals utilizing brightness temperature measurements near 6-GHz from MIS are expected to perform well over vegetated areas up to ~1.5 kg/m2 density.

Sea Surface Wind Direction represents a significant improvement in the utility of space-based ocean wind measurements to weather forecasting. The MIS sensor includes fully-polarimetric measurements at 18 GHz and three Stokes parameters at 10- and 37-GHz. Derived performance requirements of the polarimetric channel Temperature Data Records (TDR) and Sensor Data Records (SDR) require special consideration in MIS data processing architecture to ensure precise handling of Composite Fields-of-View (CFOV) originating from several different antenna feedhorns.

MIS will provide a total of 17 EDR products to the NPOESS mission, which includes 8 atmospheric EDRs, 3 oceanic EDRs, 3 land EDRs, 2 cold region EDRs, as well as the Imagery EDR. MIS will also provide TDR and SDR products at native resolution to meet requirements by users in the Numerical Weather Prediction (NWP) model community. Other SDR product is the collocated and re-sampled SDR data centered at CFOV.

This paper will discuss the MIS operational data products, TDRs, SDRs and EDRs, including performance requirements, processing flow and system architecting for the MIS algorithms.