THE NASA NPP SOUNDER PEATE PRODUCTS SUPPORTING EDR ASSESSMENTS FOR CLIMATE RESEARCH

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INTRODUCTION

The NASA NPP Sounder Product Evaluation and Test Element (PEATE) provides tools and a computing environment where NASA scientists can assess the applicability of Environmental Data Records (EDRs) for use in NASA climate research. The sounder EDRs are atmospheric profiles of temperature, water vapor and pressure (altitude), are retrieved from spectrally resolved microwave and infrared radiances from the Cross-track Infrared Sounder (CrIS) and the Advanced Technology Microwave Sounder (ATMS). Satellite-measured temperature and water vapor data provide a global assessment of atmospheric thermodynamics, are an essential data source for characterizing climate and estimating change, [1,2,3].

CrIS and ATMS, collectively referred to as the Cross-track Infrared Microwave Sounding Suite (CrIMSS), will fly on the afternoon equator-crossing National Polar-orbiting Operational Environmental Satellite System (NPOESS). The NPOESS Preparatory Project (NPP) mission is developing and testing new sensors and ground systems that will fly on NPOESS as well as bridge between the current Polar Orbiting Environmental Satellites (POES) and NPOESS.   Climate data from CrIMSS will support research in the NASA Earth System Science Program, answering fundamental science questions about changes in climate, weather, and natural hazards, improving modeling of the hydrologic cycle, extending the global climate data record from POES and Aqua and supporting field campaigns.

CAPABILITIES

The Sounder PEATE has: three major capabilities; an ingest, archive catalog and export system; a science data processing system, and a algorithm test bed, described by eight top-level functional requirements. The ingest, archive and catalog system receives and archives NPP sounder and ancillary data and other information including:

- NPP pre-launch and operational CrIMSS products (RDR, SDR, TDR, IP, EDR)
- NPP ancillary data
- NPP calibration products
- NPP data from other sensor suites (VIIRS)

- Correlative data from NASA/NOAA/NSF/DOE campaigns and from international partners
- Aura, CloudSat, MetOp-A data
- Weather forecast and analysis data
- WMO radiosonde data

The science data processing system acts on data to produce derived products and analyses used for assessments. This includes processes for:

- Matching simultaneous observations from sounders on different platforms to assess instrument calibration biases [4], e.g simultaneous nadir observations (SNO) between ATMS on NPP and AMSU on Aqua, or NOAA-18.
- Interpolated weather forecasted temperature and water vapor at the sounder footprints [5], e.g. GFS forecast at CrIMSS fields of regard (FOR).
- Matched simultaneous satellite and correlative ground observations [6], e.g. WMO radiosondes with CrIMSS EDRs.
- Climate subsetting of observations by environmental conditions [7], e,g. clear scene climate subset.
- Calculated observations from correlative observations [8], e.g. calculated CrIS clear radiances from interpolated GFS forecasts.
- Specialized analysis tools developed by the science team.
- Gridding of EDRs and SDRs to global daily, weekly and monthly products to facilitate climate studies.
- Recasting products from different sensors into a common format for intercomparisons, e.g. converting relative humidity to mixing ratio, converting layer to level quantities and interpolating and smoothing to a common vertical grid.

 The algorithm test-bed provides an environment where modified SDR and EDR algorithms can be run to generate test data sets. This includes:

- Science algorithms used for prototyping the Interface Data Processing Segment (IDPS) operational algorithms
- The IDPS algorithms run at the NASA Science Data Segment (SDS) Integration and Test System Element (I&TSE).
- Modified science algorithms producing more detailed outputs including error covariance matrices and internal diagnostics.
- Modified ancillary files that can be used with both IDPS and science algorithms.
- Research algorithms provided by science team

PRODUCTS

One of the challenges of using products from different algorithms and platforms in climate research is identifying and correcting measurement differences which are often scene and time dependent, To facilitate analyses characterizing these differences, product created at the PEATE will provide many of the routine transformations.   Products created by the PEATE will be recast in a common vertical representation and format, use a common data dictionary and be implemented using netcdf and adhering to the Climate Forecast (CF) metadata standards. Using the approach outlined above the Sounder PEATE can best serve the NASA climate science community and accelerate the integration of NPP CrIMSS products into the climate research community.

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