

SCIENCE DATA PROCESSING AND DISTRIBUTION OF CLOUDS AND THE EARTH'S RADIANT ENERGY SYSTEM (CERES) DATA FOR THE NPOESS PREPARATORY PROJECT (NPP)

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The CERES project at NASA Langley Research Center (LaRC) provides critical cloud and Earth radiation budget climate data records (CDRs) to support global climate change research. An international Science Team based at LaRC blends expertise in broadband radiometry, cloud and radiation remote sensing, and climate modeling. The team uses the Science Computing Facility (SCF) at LaRC for scientific analysis, investigations and development of CERES data products. CERES has produced over 30 Instrument years of data from the Tropical Rainfall Measuring Mission (TRMM), Terra and Aqua, and is preparing to collect, calibrate, process and distribute data from CERES Flight Model 5 (FM-5) on the NPOESS Preparatory Project (NPP).

The CERES project is organizing into a science component, a Data Management Team, and the Atmospheric Science Data Center. The science group derives, refines and validates CERES algorithms. The Data Management Team implements the algorithms and maintains the software, and the Atmospheric Science Data Center ingest, process, archive and distribute CERES data. In addition, a CERES instrument operations team manages CERES command and control operations.

A complex system of algorithm development, data collection, processing, archive and distribution is being developed called the Earth Radiation Budget Climate Analysis Research System (ERB CARS) to manage science data from CERES on NPP. The ERB CARS builds on existing process and resources already in place to support CERES data from Terra and Aqua. ERB CARS is an element of the NPP Science Data Segment, and receives NPP data from the Land Product Evaluation and Test Element (PEATE) at GSFC. [1]

CERES data processing is divided into two streams. The Instrument/ERBE-like stream is an autonomous process that is dependent only on CERES data, and is in production within 48 hours of receiving data. Separate data sets are produced from raw data from TRMM, Terra and Aqua, as well as data sets similar to those produced from the Earth Radiation Budget Experiment (ERBE). The Fused data processing stream uses input from the Moderate Resolution Imaging Spectroradiometer (MODIS) and other sources to produce higher quality climate data. This stream will not be in production immediately after NPP launch.

The CERES data system integrates data from multiple sources to produce an extensive set of high quality climate data records. In addition to imager data, aerosols, ozone, precipitable water, snow/ice, and meteorological and geostationary data are fused to produce hourly, 6-hour, daily and monthly averages. For NPP, CERES data will be fused with clouds and aerosol information obtained using VIIRS radiance and geolocation and aerosol optical depth data, allowing accurate and stable calibration of VIIRS radiances critical to maintaining high quality CERES CDRs. New science processing algorithms will provide improved clouds and aerosol information that feed flux calculations and time and space averaging, and will be applied to processing CERES NPP data. A more robust ground calibration campaign has also been developed for the CERES sensors.

CERES Raw Data Records (RDRs) and VIIRS geolocated radiances and aerosols will be retrieved from the NPP Science Data Segment Land Product Evaluation and Test Element (PEATE). VIIRS radiance data will be sub-sampled by software provided by the CERES project to reduce the volume of the data both spatially and spectrally. The interface between the ERB CARS and the Land PEATE already exists for the retrieval of MODIS data for the generation of fused CERES data products. [2]

A new state-of-the-art data archival and distribution system called Archive - Next Generation (ANGe) has also been developed at the Langley Atmospheric Science Data Center (ASDC) and now supports efficient data ingest, processing, archive, and distribution for CERES. The new system consists of over 800 processor cores and ~ 2 PB of disk storage, and is a major technology refresh of ASDC computing and storage capabilities. It provides faster and broader access to ASDC data holdings via large disk

cache mountable read-only servers. Data distribution is achieved via a local ASDC web-based ordering tool, or the NASA Earth Observing System Clearinghouse Warehouse Inventory Search Tool. Data subsetting options are available to reduce the volume of data ordered and isolate the parameters, geographic locations and time periods of interest.

Future CERES sensors beyond FM-5 include FM-6 on NPOESS, and a CERES follow-on to be flown on an as-yet undetermined platform. CERES FM-6 is being assembled by Northrop Grumman from spare parts. The CERES follow-on instrument will be a new design, with new detectors and a narrower field of view.

The addition of CERES data from NPP will extend critical Earth radiation budget climate data records well into the next decade. This paper will describe the data flow, science data processing, and distribution of CERES data from NPP.

BIBLIOGRAPHY/REFERENCES

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- [2] J.L. Gleason, "CERES Data Management Team Update" *Proceedings of the 12th CERES Science Team Meeting*, November 2009.