IMPLEMENTATION OF THE LAND, ATMOSPHERE NEAR-REAL-TIME CAPABILITY FOR EOS (LANCE)

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ABSTRACT

The Earth Observing System (EOS) ground system was not initially developed for near-real-time applications, however numerous applications have demonstrated the utility of the timely data processing and delivery. These near-real-time applications range from numerical weather prediction and weather forecasting, to monitoring natural hazards and the environment (fires, volcanoes, floods, earthquakes, air quality), disaster relief, agriculture, and homeland security.

The Land, Atmosphere Near-real-time Capability for EOS (LANCE) data system was initiated by the National Aeronautics and Space Administration (NASA) Flight, Research and Analysis, and Applied Sciences Programs in order to ensure the availability of NASA satellite products to those partners and users who have grown to rely upon NASA data and information for their decision support systems. Most products from LANCE are available to end-users within three hours from satellite observation time. LANCE also provides a developmental processing capability for the prototyping of new and innovative near-real-time software to encourage the use of NASA satellite products by new users.

LANCE architecture leverages four existing near-real-time satellite data processing systems that are managed by the Earth Science Data and Information System (ESDIS) Project at Goddard Space Flight Center. LANCE uses a distributed approach utilizing the GSFC Earth Sciences Data and Information Services Center (GES DISC), the Ozone Monitoring Instrument Science Investigator-led Processing System (OMI SIPS), the Moderate-Resolution Imaging Spectroradiometer (MODIS) Adaptive Processing System (MODAPS), and the Advanced Microwave Scanning Radiometer-EOS Science Investigator-led Processing System (AMSR-E SIPS).

The goal of LANCE is to gather these multiple independent near-real-time systems under a common umbrella to increase the awareness of the availability of near-real-time data sets and to improve the consistency of service. The four systems will provide metrics for tracking product latency and a common

user registration system in order to allow better management oversight and to allow the LANCE operators to give users advance notice of system and algorithm changes. A LANCE User Working Group is being formed in order to provide better communications and obtain feedback from the user community.

LANCE is a part of the EOS ground system (See Figure 1) and all LANCE data originates from either the Terra-, Aqua-, or Aura-based instruments. Terra instrument data are downlinked to White Sands, New Mexico via the Tracking Data Relay Satellite System (TDRSS). Aqua and Aura instrument data are downlinked to the Polar Ground Stations (PGS) in Norway and Alaska. Data from all three spacecraft are processed by the EOS Data and Operations System (EDOS) to Level 0 and distributed to LANCE in near-real-time on an average of 85-130 minutes of satellite observation. The EOC Operations Center (EOC) provides the spacecraft command and control, the EOS Real Time Processing System (ERPS) provides the forward command link and the Flight Dynamics System (FDS) provides the orbit and attitude data. For routine science data processing, Level 0 data from EDOS is typically processed to higher level products at the Science Investigator-led Processing Systems (SIPS) and archived and distributed by Distributed Active Archive Centers (DAACs), although some hybrid SIPS or DAACs perform both functions of processing and distribution. For LANCE, data are distributed to users directly by the LANCE components via subscription or ftp. The algorithms are adapted from the science production algorithms, and in most cases are identical or nearly identical, with the primary difference being the production rules applied for the use of ancillary data.

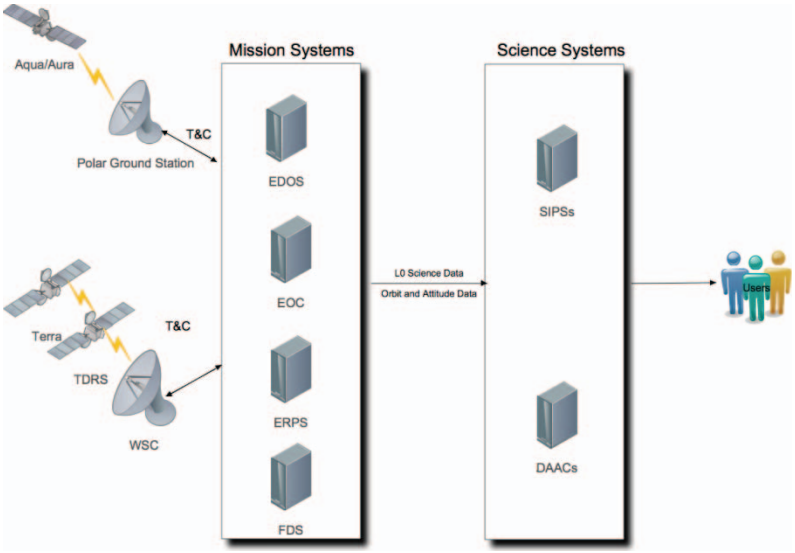

Figure 1

The LANCE near-real-time capability currently includes the following EOS instruments:

Terra Instrument: MODIS, Aqua Instruments: MODIS, Atmospheric Infrared Sounder (AIRS), and Advanced Microwave Scanning Radiometer-EOS (AMSR-E), Aura Instruments: Microwave Limb Sounder (MLS) and OMI.

The GES DISC and their respective science teams developed the AIRS and MLS near-real-time capabilities. The AIRS data are processed at the GES DISC to include L1 and Level 2 products, and are provided to the AIRS Team Leader Science Computing Facility at the Jet Propulsion Lab (JPL) as well as to users. The MLS data are converted to the standard science Level 0 format at the GES DAAC and provided to the MLS SIPS at JPL for processing to Level 2. The Level 2 products are then sent back to the GES DISC for distribution to users.

The Royal Dutch Meteorological Institute (KNMI) and the OMI SIPS developed the OMI near-real-time capability. The OMI data are processed by the OMI SIPS to Level 2 and provided to users. Additional OMI near-real-time products are generated at KNMI and distributed to users.

MODAPS developed the MODIS and the initial AMSR-E near-real-time capabilities. The MODIS data are processed up to Level 2 (and L3: Land Surface Temperature) and distributed to users. The AMSR-E system, which is still under development at the AMSR-E SIPS, will provide AMSR-E products through Level 2.

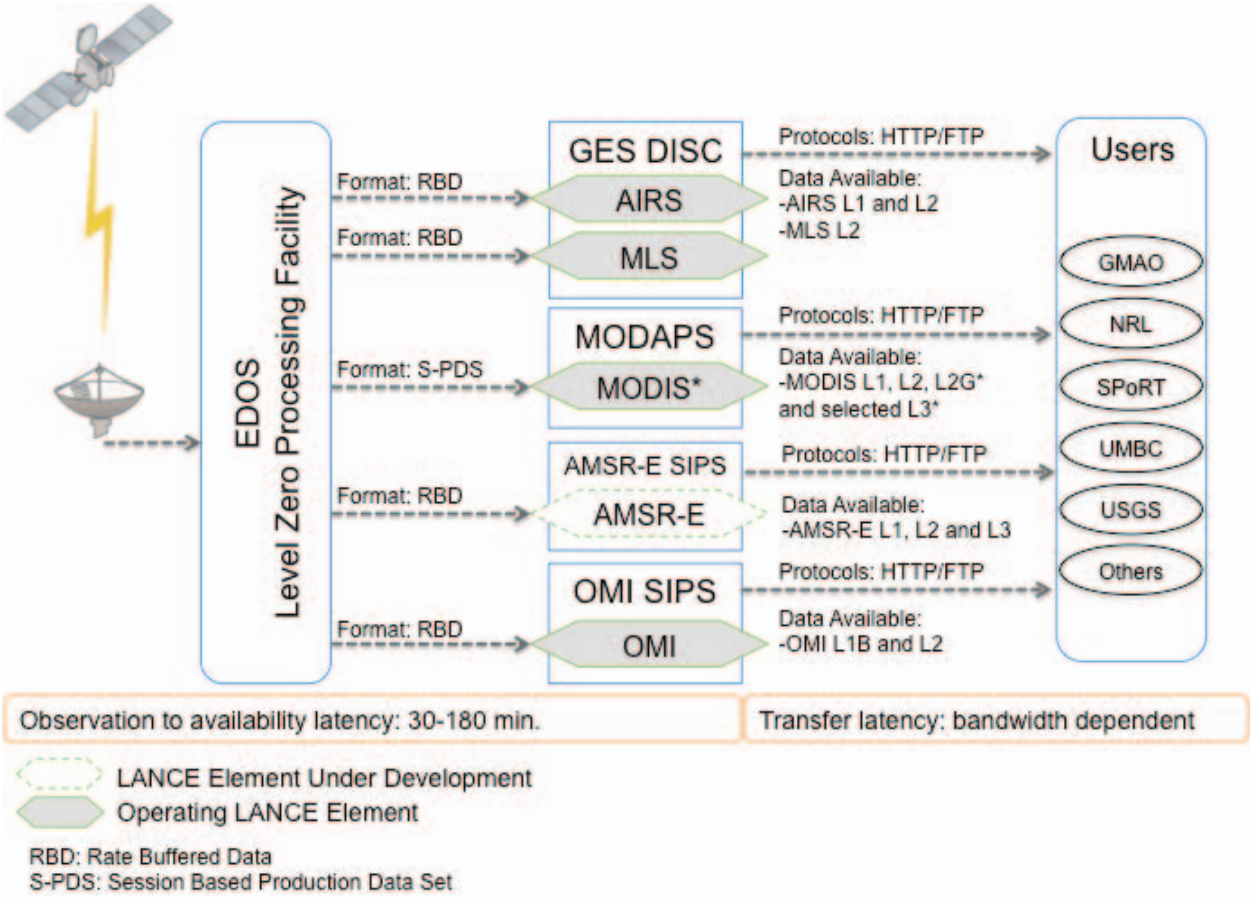

Figure 2

This paper provides an introduction to the Land and Atmosphere Near-real-time Capability for EOS and its current capabilities. It is anticipated that this system will continue to evolve as new requirements and needs emerge from the user community.

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