Abstract: Land and Atmosphere Near-real-time Capability for Earth Observing System

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The past decade has seen a rapid increase in availability and usage of near-real-time data from satellite sensors. The EOSDIS (Earth Observing System Data and Information System) was not originally designed to provide data with sufficiently low latency to satisfy the requirements for near-real-time users. The EOS (Earth Observing System) instruments aboard the Terra, Aqua and Aura satellites make global measurements daily, which are processed into higher-level ³standard² products within 8-40 hours of observation and then made available to users, primarily earth science researchers.

However, applications users, operational agencies, and even researchers desire EOS products in near-real-time to support research and applications, including numerical weather and climate prediction and forecasting, monitoring of natural hazards, ecological/invasive species, agriculture, air quality, disaster relief and homeland security. These users often need data much sooner than routine science processing allows, usually within 3 hours, and are willing to trade science product quality for timely access. While Direct Broadcast provides more timely access to data, it does not provide global coverage.

In 2002, a joint initiative between NASA (National Aeronautics and Space Administration), NOAA (National Oceanic and Atmospheric Administration), and the DOD (Department of Defense) was undertaken to provide data from EOS instruments in near-real-time. The NRTPE (Near Real Time Processing Effort) provided products within 3 hours of observation on a best-effort basis. As the popularity of these near-real-time products and applications grew, multiple near-real-time systems began to spring up such as the Rapid Response System. In recognizing the dependence of customers on this data and the need for highly reliable and timely data access, NASA¹s Earth Science Division sponsored the Earth Science Data and Information System Project (ESDIS)-led development of a new near-real-time system called LANCE (Land, Atmosphere Near-Real-Time Capability for EOS) in 2009. LANCE consists of special processing elements, co-located with selected EOSDIS data centers and processing facilities. A primary goal of LANCE is to bring multiple near-real-time systems under one umbrella, offering commonality in data access, quality control, and latency.

LANCE now processes and distributes data from the Moderate Resolution Imaging Spectroradiometer (MODIS), Atmospheric Infrared Sounder (AIRS), Advanced Microwave Scanning Radiometer Earth Observing System (AMSR-E), Microwave Limb Sounder (MLS) and Ozone Monitoring Instrument (OMI) instruments within 3 hours of

satellite observation. The Rapid Response System and the Fire Information for Resource Management System (FIRMS) capabilities will be incorporated into LANCE in 2011. LANCE maintains a central website to facilitate easy access to data and user services. LANCE products are extensively tested and compared with science products before being made available to users. Each element also plans to implement redundant network, power and server infrastructure to ensure high availability of data and services. Through the user registration system, users are informed of any data outages and when new products or services will be available for access.

Building on a significant investment by NASA in developing science algorithms and products, LANCE creates products that have a demonstrated utility for applications requiring near-real-time data. From lower level data products such as calibrated geolocated radiances to higher-level products such as sea ice extent, snow cover, and cloud cover, users have integrated LANCE data into forecast models and decision support systems. The table above shows the current near-real-time product categories by instrument.

The ESDIS Project continues to improve the LANCE system and use the experience gained through practice to seek adjustments to improve the quality and performance of the system. For example, an OGC-compliant Web Map Service (WMS) will be added shortly that will allow users to download geo-referenced MODIS images for arbitrary bounding boxes. Further, an OGC-compliant Web Coverage Service (WCS) will be added later this year that will expedite user access to arbitrary data subsets or re-formatted products. AIRS images are now served through WMS and available in multiple formats (PNG, GeoTIFF, KMZ). NASA has established a LANCE User Working Group to steer the development of the system and create a forum for sharing ideas and experiences that are expected to further improve the LANCE capabilities.
The LANCE system has proved a success by satisfying the growing needs of the applications and operational communities for land and atmosphere data in near-real-time. NASA¹s Earth Sciences Division was able to leverage existing science research capabilities to provide the near-real-time community with products and imagery that support monitoring of disasters in a timely manner.