TERRA, AQUA, AND AURA DIRECT BROADCAST – PROVIDING EARTH SCIENCE DATA FOR REALTIME APPLICATIONS

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1. INTRODUCTION

The need for realtime data to aid in disaster management and monitoring has been clearly demonstrated for the past several years, e.g., during the tsunami in Indonesia in 2004, the hurricane Katrina in 2005, fires, etc. Users want (and often require) the means to get earth observation data for operational regional use as soon as they are generated by satellites. This is especially true for events that can cause loss of human life and/or property. To meet this need, NASA's Earth Observing System (EOS) satellites, Terra and Aqua, provide realtime data useful to disaster management teams. This paper describes the satellites, their Direct Broadcast (DB) capabilities, the data uses, what it takes to deploy a DB ground station, and the future of the DB.

2. TERRA, AQUA, AND AURA MISSION OPERATIONS

EOS Terra, Aqua, and Aura [1] [2] [3] were launched into polar, sun-synchronous orbits in 1999, 2002, and 2004, respectively and are the pathfinder missions of NASA's Earth Observation Program. They continue to provide high quality Earth science data from a total of 14 operational scientific instruments. The Earth Science Mission Operations (ESMO) Project, located at NASA Goddard Space Flight Center (GSFC), monitors and operates the 3 satellites around the clock from the EOS Operations Center (EOC). The EOS Data and Information System (EOSDIS) Distributed Active Archive Centers and the Science-Investigator-led Processing Systems process the Level-0 data to Level 1, 2, and higher level data products. The DAACs archive and distribute these data products to users around the world.

3. DIRECT BROADCAST OVERVIEW

The EOS Terra, Aqua, and Aura data sets are invaluable for disaster management and monitoring, but the personnel and agencies involved in relief efforts often cannot wait for the time it takes to schedule downlinks to the primary ground stations, perform processing, and distribute the data through the normal channels. Forunately, all 3 satellites have the capability to transmit their data in realtime using their onboard Direct Broadcast (DB) system. This capability enables the transmission of the Terra Moderate-Resolution Imaging Spectrometer (MODIS) data, the entire set of Aqua data, and the Aura Ozone Monitoring Instrument (OMI) data to Direct Readout (DR) capture stations on the ground. Terra and Aqua data are broadcast in realtime worldwide, except during periods when the science data on the solid state recorder are downlinked for capture at the EOS ground sites. The Aura OMI data are broadcast only to the ground station in Sodankyla, Finland. There are now over 150 DB/DR stations around the world.

The DB system allows the users to receive the Earth observation data in realtime as they are being captured on the satellite, i.e., there is essentially no latency from observation to reception. There are some limitations (e.g., users do not receive recorded data from other parts of the world; nor has the captured data been cleaned up), but the benefit is almost instant access. For some locations in the world, DB reception offers the additional advantage of easy and cost-effective access when broadband internet service is unavailable, restricted, or cost-prohibitive.

4. DIRECT READOUT LABORATORY

NASA GSFC operates the Direct Readout Laboratory (DRL) as a technology and information conduit for the Direct Broadcast (DB) community [4]. The DRL acts as an intermediary between missions and DB community members that are not directly involved in the missions. The paper describes this coordination and support, including training on the use and processing of the data and making the processing software easily available. Much of the software is free, so interested users have the choice of purchasing a ground station from a commercial provider or developing their own ground station using relatively inexpensive hardware.

This paper provides examples of the uses of the Terra MODIS data and the Aqua data by the various countries and organizations that capture the DB data. Some of the operational applications include weather forecasting, disaster prediction, monitoring, and management, fire identification and monitoring, fisheries, etc. preferred.

5. MAJOR USES

This paper provides examples of the uses of the Terra and Aqua MODIS data by the various countries and organizations that capture the DB data. Some of the operational applications include weather forecasting, disaster prediction, monitoring, and management, fire identification and monitoring, fisheries, air quality, etc.

6. REFERENCES

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