

## International EOS/NPP Direct Readout Meeting 2005

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### Introduction

The International EOS/NPOESS Preparatory Project (NPP) Direct Readout Meeting 2005 was hosted by the Mediterranean Agency for Remote Sensing and Environmental Control (MARSec) in Benevento, Italy, October 3-6. This year's meeting attracted participants from the government, vendor and academic communities, representing 19 different countries. **Patrick Coronado** [NASA Goddard Space Flight Center (GSFC)] chaired the meeting, organized by **Liam Gumley** [University of Wisconsin (UW)], **Maurizio di Bisceglie** (University of Sannio), **Paolo Antonelli** (MARSec), **John Overton** [National Polar-orbiting Operational Environmental Satellite System (NPOESS) Integrated Program Office (IPO)], and **Darrell Robertson** [NOAA National Environmental Satellite, Data and Information Service (NESDIS) Direct Services Division.] Since the last international meeting in 2003, the Direct Readout community has made great strides in obtaining, developing, and utilizing science algorithms for real-time and temporal applications. At this year's meeting, participants presented and discussed the latest application algorithms and systems and their impact on science, commerce, and decision-making infrastructures, and charted direction for the role of Direct Readout in the NPP and NPOESS eras. (A complete set of posters and presentations is available online at [dbmeeting.gssc.nasa.gov/posters\\_presentations.cfm](http://dbmeeting.gssc.nasa.gov/posters_presentations.cfm).)

### Setting the Stage

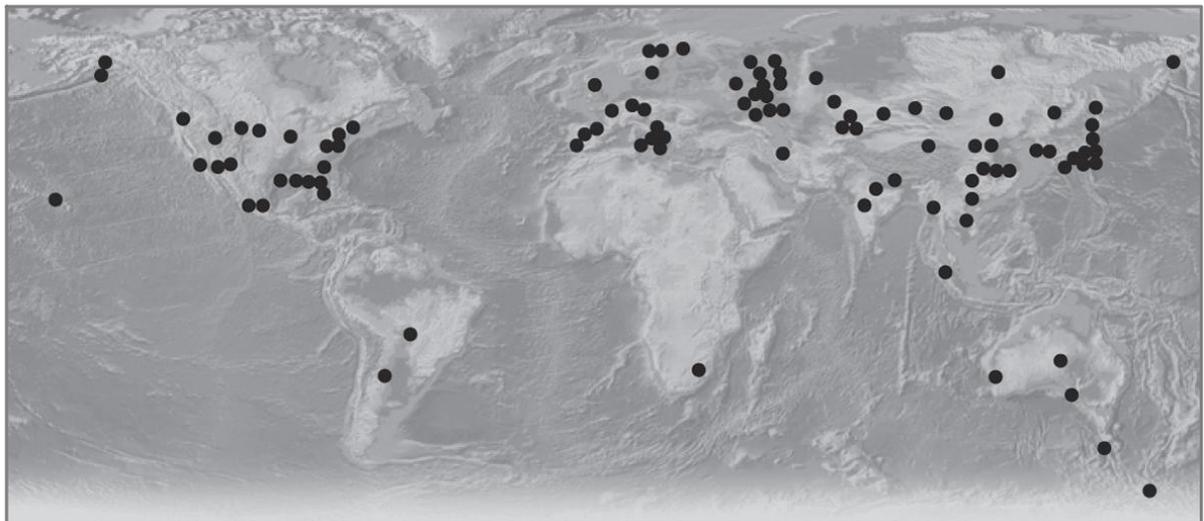
*Direct Readout*—the process of acquiring freely transmitted live satellite-data—originated in 1983, when NASA GSFC and NOAA joined forces to develop a complete satellite ground system based entirely on the use of Direct Broadcast data. (*Direct Broadcast* refers to the real-time transmission of

satellite data to the ground and has been available since the late 1960s.) Users with compatible ground receiving equipment and in direct line of sight to a satellite may receive Direct Broadcast data, and there are now 100 verified X-band EOS Direct Broadcast sites worldwide. As Direct Readout technologies have become more affordable and accessible (especially with the emergence of the World Wide Web), tools have been developed by the remote-sensing community to make satellite data easier to acquire, process, and utilize. As a member of this community, NASA supplies many of these tools to foster global data exchange and scientific collaboration. Live, local, and regional environmental data, in turn, benefit environmental, commercial, and public-interest decision making.

### Direct Readout Today: Awareness, Accessibility, and Impact

As awareness and accessibility of Direct Readout have increased, so has its impact. Presentations during the first three days of this year's meeting highlighted a multitude of new and innovative uses for Direct Readout data, such as synergistic processing, in which data from different sensors are combined to create new tools, e.g., new cloud-masking capabilities result from combining data from the Atmospheric Infrared Sounder (AIRS) and the Moderate Resolution Imaging Spectroradiometer (MODIS). Direct Readout data also continue to be valuable to a variety of environmental research topics, e.g., cloud research in Europe and climate research in Brazil. The real-time utility of Direct Readout makes it particularly useful, if not essential, for understanding and mitigating natural disasters. Firefighters in Montana use Direct Readout MODIS fire products to help allocate resources to fight wildfires. Direct Readout makes it possible for Polar wind data to be factored into

Map of MODIS Direct Broadcast sites worldwide.





**Top:** President of Benevento Carmine Nardone (L) with (L-R) Liam Gumley (UW), John Overton (NOAA IPO), and Patrick Coronado (NASA GSFC).

**Bottom:** Antenna tower at MARSec, designed by a local artist.

hurricane track forecasts in real time, improving accuracy by 50 nautical miles.

Direct Readout data are increasingly as accessible to the general public as they are to researchers, forecasters, and government agencies. Direct Readout data from stations all over the world are being shared and made available online with tools like Open-source Project for a Network Data Access Protocol (OPeNDAP), Open-source Abstract Data Distribution Environment (OpenADDE), and HTTP and FTP protocol-based Web clients. Web tools even allow users to create their own *virtual ground stations*, and receive global data from geographic locations of their choice. The vendor community continues to reduce the cost of X-band

EOS/NPP ground systems, making affordable ground systems more easily available worldwide, especially to developing areas which benefit substantially from access to data. Tools to process raw data are available for free online. For example, the International MODIS/AIRS Processing Package (IMAPP), developed by UW, allows users to calibrate, geolocate, and create environmental products from raw data, and the Sea-viewing Wide Field-of-View Sensor (SeaWiFS) Data Analysis System (SeaDAS), developed by the Ocean group at GSFC, provides users with a comprehensive image-analysis package for the processing, display, analysis and quality control of ocean-color data. Many more software tools are becoming available, and NASA will make an initial attempt at consolidating this list by the next meeting.

### Direct Readout Tomorrow: NPP and NPOESS

The fourth day of the meeting was largely devoted to presentations on upcoming continuity missions. Government agencies and corresponding contractors detailed the planned transitions from EOS to NPP and, ultimately, NPOESS. Highlights included presentations on science objectives, the transition from MODIS to the Visible Infrared Imager/Radiometer Suite (VIIRS), and insights into the Cross-track Infrared Sounder (CrIS) and Advanced Technology Microwave Sounder (ATMS). Also presented were plans for Sensor Data Records (SDRs) and algorithm wrapper developments at GSFC's Direct Readout Laboratory (DRL). IPO presented its NPOESS calibration and validation plans, and solicited input from participants as to how the Direct Readout community can contribute to these efforts. A new processing environment, called the International Polar Orbiter Processing Package (IPOPP) is being developed jointly between the IPO, UW, and NASA GSFC to support interdisciplinary processing for NPP and NPOESS data.

### Topics for Further Discussion

While justifiably proud of their achievements to date, meeting participants challenged themselves to further expand the reach and utility of Direct Readout. How can large datasets be moved as efficiently as possible, in order to make meaningful data more accessible to experienced and inexperienced users alike? What kind of standards might be developed or adopted to assist in this effort? There are currently 100 verified X-band Direct Broadcast sites worldwide, but very few of these are located in remote areas that would benefit greatly from the data, e.g., Africa and South America. How can the Direct Readout community better serve remote, often impoverished areas, given the relatively high cost of bandwidth? And as important, how can they help make available the resources and expertise to develop region-specific applications which could serve these areas of the world? The Direct Readout community looks forward to meeting these challenges and more prior to its next international meeting. For more information, go to [directreadout.gsfc.nasa.gov](http://directreadout.gsfc.nasa.gov) ■