WHAT CAN AQUA AND TERRA DIRECT BROADCAST DO FOR YOU?

Kathleen I. Strabala, Liam E. Gumley, Hung-Lung Huang, Elisabeth Weisz

Cooperative Institute for Meteorological Satellite Studies (CIMSS), University of Wisconsin –Madison, Madison, Wisconsin, USA

1. INTRODUCTION

National Aeronautics and Space Administration (NASA) Earth Observing System (EOS) Aqua and Terra satellite direct downlink data is being used for a variety of applications including weather forecasting and improving the depiction of clouds and moisture in Numerical Weather Prediction (NWP) forecast models. Facilitating the use of this satellite data are the free software packages, such as the International MODIS/AIRS Processing Package (IMAPP)[1], that allow X-band antenna users the ability to calibrate, navigate and produce science products in real-time from the high spatial resolution MODIS radiometer, the high spectral resolution AIRS instrument suite and the microwave AMSR-E instrument. Open source software that will provide similar functionality for future polar orbiters is currently being developed in the form of the International Polar Orbiter Processing Package (IPOPP).

2. METHODOLOGY

NASA has fostered global use of Aqua and Terra data by supporting the creation and free distribution of software packages that will create calibrated, navigated data and science products from direct broadcast X-band data. These packages include MODIS software created by the Ocean Color group at Goddard Space Flight Center (GSFC) that will calibrate and geolocate Level 0 space craft downlinked data. From this Level 0 data, MODIS Level 2 products can be generated by packages including the International MODIS/AIRS Processing Package (IMAPP). This paper focuses on IMAPP products and their applications for all Aqua and Terra instruments.

Distribution of IMAPP to the user community required that the software be easy to install and use. With this in mind, the software package was developed with these requirements:

- IMAPP must be portable to a wide range of Linux platforms.
- Minimize the number of required toolkits.
- All ancillary data sets must be easily accessible.
- Overpasses of arbitrary size can be processed.
- The code must be efficient. A goal of end-to-end L0 to L1B to science product generation (Level 2) was set at 2 hours after overpass reception.

To download the software, please follow the directions found on the IMAPP web page at: http://cimss.ssec.wisc.edu/imapp .

3. PRODUCTS

The current suite of MODIS IMAPP products consists of MODIS cloud mask, cloud top properties (pressure, temperature, emissivity), cloud phase, cloud fraction, aerosol optical depth, atmospheric profiles (vertical profiles of temperature, moisture, total precipitable water vapor, total ozone and stability indices), sea surface temperature and near-infrared water vapor. Other MODIS utilities included are software to create high resolution 250 m true color imagery that can be viewed by Google Earth, as well as destriping software to remove non-physical detector to detector variations in the infrared MODIS bands. The most recent IMAPP MODIS release is a an NWP model that assimilates MODIS products to improve the depiction of clouds and moisture. This model is globally configurable, and produces a 72 hour forecast centered on the user domain. The AIRS product suite includes Level 1B and Level 2 retrieval v5.2 software provided by the Jet Propulsion Lab (JPL), as well as MODIS/AIRS collocation software, AIRS cloud mask and a single field-of-view (FOV) all sky retrieval algorithm. Finally, the IMAPP AMSR-E suite consists of software that will create calibrated and geolocated data products as well as Snow Water Equivalence (SWE), Rain Rate (RR) and soil moisture Level 2 products.

4. APPLICATIONS

The use of IMAPP continues to increase globally. Since the introduction of the new IMAPP web page in June 2007, users from 41 different countries have downloaded some portion of the package. Among the recent applications of MODIS data is support of US National Weather Service (NWS) forecasters. The improved spatial resolution of the products as well as the timeliness of the data offered by direct broadcast allows them to be useful to operational forecasters. So far, MODIS products have been mentioned by forecasters in their Area Forecast Discussions (AFD) at total of 61 times. Other examples of applications include the use of AMSR-E data and products by the Taiwan Central Weather Bureau, to monitor tropical cyclones in the Pacific. Many other applications will be identified in the final paper.

5. CONCLUSIONS

IMAPP software has been successful in supporting the NASA initiative to facilitate the use of Aqua and Terra direct broadcast satellite data. Many users around the globe are downloading and utilizing the products created by packages such as IMAPP to support a variety of global environmental applications. The success of these efforts has resulted in funding for future packages including the International Polar Orbiter Processing Package (IPOPP).

6. REFERENCES

[1] H.L. Huang, L.E. Gumley, K.I.Strabala, J. Li, E. Weisz, T. Rink, K.C. Baggett, J.E. Davies, W.L. Smith, and J.C. Dodge, "International MODIS and AIRS Processing Package (IMAPP): A Direct Broadcast Software Package for the NASA Earth Observing System," *Bulletin of the American Meteorological Society*, American Meteorological Society, Volume 85, Issue 2, p. 159-16, February 2004.