Global use of IMAPP Software by the Direct Broadcast Aqua and Terra Community
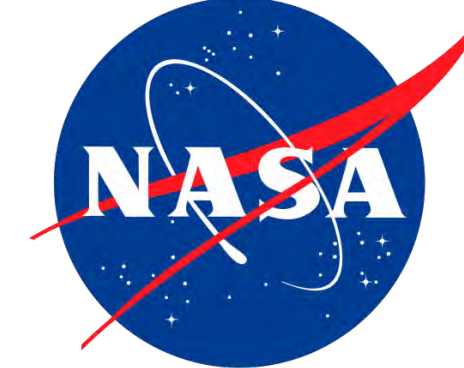
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International MODIS/AIRS Processing Package (IMAPP)

http://cimss.ssec.wisc.edu/imapp/

MODIS products (Terra and Aqua)
Atmosphere (NASA Collect 6) and Polar Products (Jeff Key NOAA)
- Cloud mask (MOD35)
- Cloud top pressure and temperature (MOD06CT)
- Cloud optical depth and effective radius (MOD06OD)
- Temperature and moisture profiles (MOD07)
- Total precipitable water (MOD07)
- Stability indices (MOD07)
- Aerosol optical depth (10km and 3km) (MOD04)
- Ice Surface Temperature
- Snow Mask
- Ice Cover and Ice Concentration
- Inversion Strength and Inversion Depth

Land Products
- Land surface reflectance (MOD09)
- Nadir BRDF-adjusted reflectance Image Products (BRDF)
- True color GeoTIFF and KML (DB Google Earth and Polar2Grid)

AIRS and AMSU Products (Aqua)
Sensor Products - Software provided by NASA JPL
- Calibrated and geolocated radiances and reflectances (AIRS)
- Calibrated and geolocated antenna temperatures (AMSU)

Atmosphere Products
- Temperature, moisture profiles (JPL 3x3 AIRS FOV)
- Temperature, moisture profiles, clouds (single AIRS FOV)
- Collocated AIRS/MODIS temperature and moisture profiles (single AIRS FOV; clear and cloudy sky)

Utilities
- AIRS HDF to BUFR converter (Nigel Atkinson – Met Office)

AMSR-E Products (Aqua)
Sensor Products - Calibrated and geolocated antenna temperatures
Atmosphere Products - Rain rate
Surface Products - Soil moisture and snow water equivalent

IMAPP GeoTIFF Web Mapping Service
- Tool for display of local Polar2Grid GeoTIFFs in a Google Earth Interface.

Aviation Products
- Software that identifies convective thunderstorm overshooting tops using MODIS Infrared Band 31 brightness temperatures

NWP Products
- The Direct Broadcast CIMSS Regional Assimilation System (DBCRAS) is a regional numerical weather prediction model that assimilates MODIS products in real time and creates forecasts up to 72 hours at 48 km and 16 km resolution.

Virtual Appliance
- The IMAPP Virtual Appliance is an automated processing system for MODIS L0->Level 2 data acquired by direct broadcast. It is easy to install and run on platforms including:
    - Microsoft Windows (7, Vista, XP), Apple OS X and Intel Linux

Air Quality Forecasting Products
- Infusing Satellite Data into Environmental Applications – International (IDEA-I) is a globally configurable tool that uses IMAPP MODIS and AIRS retrievals to initiate trajectories that show the vertical and horizontal movement of pollutants over the next 48 hours.

List of Countries That downloaded at Least 1 IMAPP Software Package (76)

Italy	Pakistan	United Arab
Argentina	Nepal	Emirates
Brazil	Portugal	Lithuania
Kazakhstan	Poland	United States
Ukraine	Saudi Arabia	Thailand
Indonesia	El Salvador	Romania
China	Colômbia	Malaysia
Denmark	Serbia	Algeria
South Africa	Kenya	Reunion
Taiwan	Oman	Austria
Japan	Sweden	Finland
Morocco	Uzbekistan	Nigeria
Iran	Mexico	New Zealand
Singapore	Hungary	Guatemala
India	Belgium	Uruguay
Germany	Norway	Israel
United Kingdom	Venezuela	Azerbaijan
Australia	Sri Lanka	Cuba
Czech Republic	France	Kuwait
Canada	Russia	Syria
Spain	Vietnam	Dominican
Chile	Mongolia	Republic
Philippines	Switzerland	Belarus
Peru	Iceland	Sudan
Slovenia	Suriname	Laos
Netherlands	Uganda	Ethiopia

Geographic Distribution of CSPP Registrants (> 2300)

Map legend:
- 1 user
- 2 to 9 users
- 10 or more users

Unique IMAPP Software Features

IMAPP Built Upon Extensive Direct Broadcast Software Experience
More than 30 years of Support for Direct Broadcast Users
- IAPP (International TOVS Processing Package) since 1985
- ITPP (International ATOVS Processing Package) since 1998
- IMAPP (International MODIS/AIRS Processing Package) since 2000
- CSPP (Community Satellite Processing Package) since 2011

The goal is to allow DB users the capability to create their own local products for local applications.

Needs of Users are _THE_ Priority
Reach out to Find the Needs of the Community
- Meetings (like this one)
- IMAPP Forum:
  https://forums.ssec.wisc.edu/viewforum.php?f=3
- Direct Broadcast Applications Workshops:
  http://cimss.ssec.wisc.edu/dbs/
  13 workshops taught on 6 continents including partnering with the following organizations:

  World Meteorological Organization (WMO)
  Global Earth Observation System of System (GEOSS)
  IEEE Geosciences and Remote Sensing Symposium (IGARSS)

Software Standards
- Software must be robust, portable, efficient and reliable
- Software must have high scientific integrity – include peer reviewed references
- Software must be thoroughly tested prior to release
  IMAPP has Beta testers on 6 continents
- All Packages must be well documented
- Timely and helpful software support is available from the IMAPP Team

Collaborations
Work with Other Groups In their Areas of Expertise
- NASA Jet Propulsion Laboratory
- NASA Ocean Biology Group
- Boston University BRDF Group
- UK Met Office
- Australia Bureau of Meteorology
- Taiwan Central Weather Bureau
- South Africa CSIR
- NOAA Cryosphere Scientist Jeff Key

Cost and Good Quality of the Aqua and Terra Data
Free Distribution of Data, Software and Visualization Tools
- Result is explosion in the use of the data!

Future Enhancements

Current Funding Through May 2017

- **Updated MODIS Level 2 Atmosphere Software - Required after Terra Safe Hold**
  ➢ Collection 6 Cloud Mask, Destriping

- **MODIS Aviation Hazard Software Additions**
  ➢ Fog and Low Cloud Visibility (MVFR, IFR, LIFR Designations)
  ➢ Daytime Aerosol Visibility

- **BRDF Software Package Update**
  ➢ Working with NASA Algorithm Developer Crystal Schaaf

- **IMAPP Applications Workshops**
  Guam, 2017

- **Currently no funding beyond May 2017**
  Looking for ways to continue support for Aqua and Terra IMAPP through lifetime of satellites (forecast through 2020).