IMAPP - International MODIS and AIRS Processing Package
Current Status & Future Prospects

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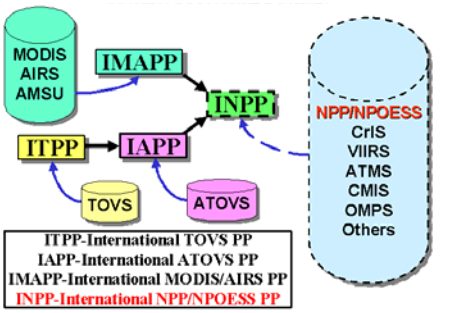
1. Evolution & Features of CIMSS/SSEC Processing Packages

	ITPP	IAPP	IMAPP	INPP
Instrument /Data Type	HIRS/2 MSU AVHRR	HIRS/2 AMSU AVHRR	MODIS AIRS AMSU HSB AMSR-E	CrIS VIIRS ATMS CMIS Others
Example Products	T/Q Sounding Cloud Height SST	T/Q Sounding Cloud Height SST	T/Q Sounding Cloud Mask Cloud Phase Cloud Height SST & Others	Value Added Regional Unique High-Res. Products
Spacecraft	TIROS-N to NOAA 14	NOAA 15-17	EOS Terra & Aqua	NPP
Operation Period	1983-Current	1998 - current	2001 – Current	2006 & beyond

The evolution of international polar orbiting weather satellite processing packages at CIMSS



http://cimss.ssec.wisc.edu/opsats/polar/iapp/IAPP.html
http://cimss.ssec.wisc.edu/~gumley/IMAPP/

2. IMAPP Functions

The goals of the IMAPP project include:

i. To release a freely available package for processing MODIS and AIRS/AMSU/HSB data,

ii. To promote and support the worldwide use of EOS data, and to involve the international community in EOS validation efforts.

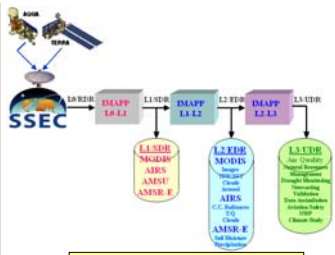
The IMAPP requirements are:

- **IMAPP must be portable to a wide range of UNIX/PC platforms.**

1. **The number of required toolkits must be kept to a minimum.**
2. **Ancillary data sets must be easily accessible.**
3. **Software must be able to process overpasses of any size.**
4. **Downlinked spacecraft ephemeris and attitude data may be used for real-time geolocation.**
5. **Distributed products must be similar to those produced at the Goddard Space Flight Center (GSFC) Distributed Active Archive Center (DAAC).**
6. **The code must be efficient.**

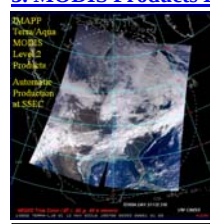
IMAPP may be downloaded at no cost, and is licensed under the terms of the GNU General Public License (GPL). Science algorithms currently under development for release as part of IMAPP include:

- **MODIS SST; Land Surface Reflectance; Snow/Ice Detection; Aerosols, Cloud Optical Properties**
- **AIRS/AMSU/HSB Level 0 to Level 1B; AIRS High-spatial resolution Temperature and Moisture Profiles**
- **MODIS/AIRS Synergistic Cloud Clearing**

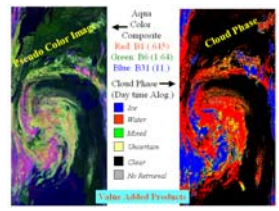


IMAPP End-to-End Diagram

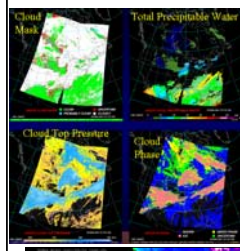
3. MODIS Products Development & Applications

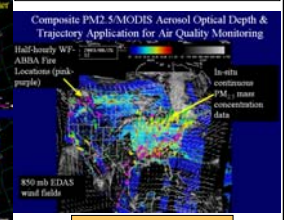


IMAPP MODIS True Color Image

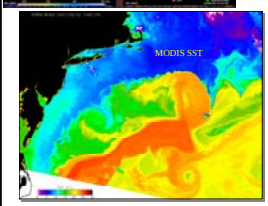


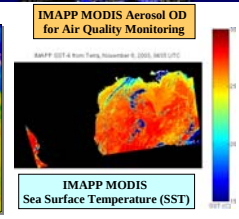
IMAPP MODIS Cloud (Mask, Phase, Top Pres.) & Atmospheric (TPW) Products





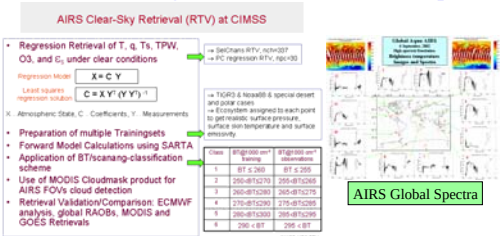
IMAPP MODIS Aerosol OD for Air Quality Monitoring





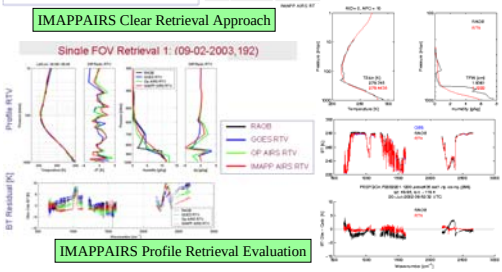
IMAPP MODIS Sea Surface Temperature (SST)

4. AIRS Data/Algorithm Evaluation/Development

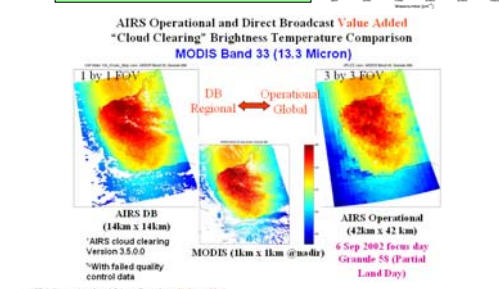


AIRS Global Spectra

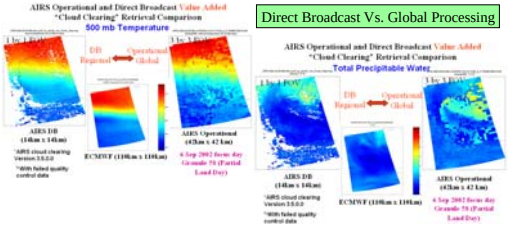
IMAPPAIRS Clear Retrieval Approach



IMAPPAIRS Profile Retrieval Evaluation

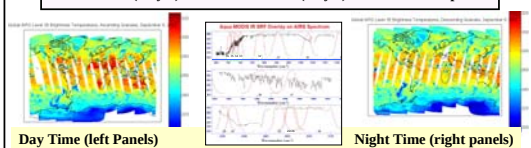


Direct Broadcast Vs. Global Processing

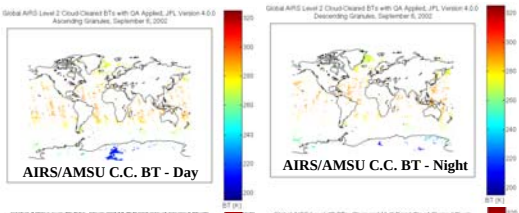


5. MODIS/AIRS Synergistic Cloud Detection/Clearing

AIRS/AMSU (3 by 3) Vs. AIRS/MODIS (1 by 2) C.C. Yield Comparison

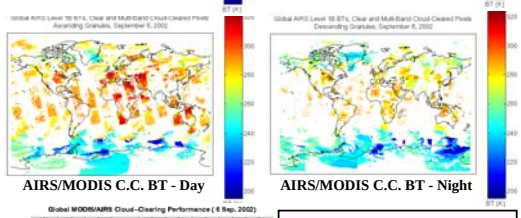


Day Time (left Panels) Night Time (right panels)
AIRS Window Channel Brightness Temp (K) Images



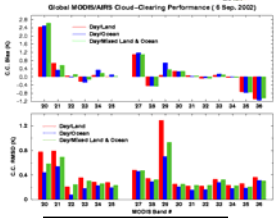
AIRS/AMSU C.C. BT - Day

AIRS/AMSU C.C. BT - Night



AIRS/MODIS C.C. BT - Day

AIRS/MODIS C.C. BT - Night



AIRS/MODIS Cloud-Clearing Approach

MODIS/AIRS Synergistic Multi-Channel N* Cloud Clearing
General Principal

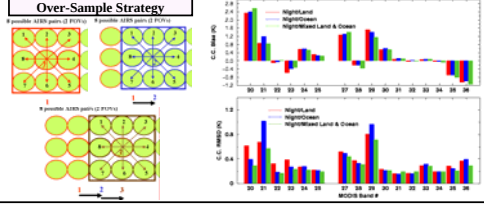
$$J(N^*) = \sum_i \frac{1}{\sigma_i^2}[(R_{ui}^{up} - f_i(R_c^{up})]^2$$

$$J(N^*) = \sum_i \frac{1}{\sigma_i^2}[(R_{ui}^{up} - f_i(\frac{R_1^{up} - R_2^{up}N^*}{1-N^*})]^2$$

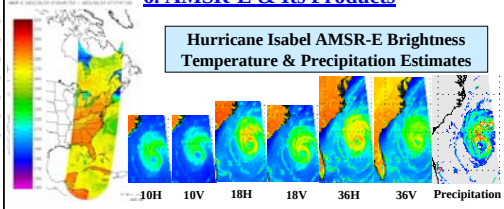
$$\frac{\partial J(N^*)}{N^*} = 0$$

$$N^* = \frac{\sum_i \frac{1}{\sigma_i^2}[f_i(R_1^c) - R_{ui}^{up}][f_i(R_1^c) - f_i(R_2^c)]}{\sum_i \frac{1}{\sigma_i^2}[f_i(R_2^c) - R_{ui}^{up}][f_i(R_1^c) - f_i(R_2^c)]}$$

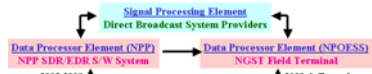
AIRS/MODIS Cloud-Clearing Over-Sample Strategy



6. AMSR-E & Its Products



7. IMAPP to INPP – Role of INPP in NPP/NPOESS



To Provide Value Added Services of

1. Support DOD/Civil N.A. Regional Users
2. Value Added Mission Application Products Generation
3. Regional Optimized/Unique Products Generation
4. Specialty/Synergistic Products Generation
5. Continuous Calibration/Validation & Evaluation Support
6. NPP SDR/EDR & NPOESS Field Terminal P/P Support
7. Engage Global DB Community in NPP/NPOESS Mission

8. Summary of IMAPP Status & Prospects

IMAPP Training Workshops
- 1st Workshop: 6-9 June 2004 Nanjing Institute of Meteorology, China
- 2nd Workshop: 19-21 May 2005 Peking University, China
- 3rd Workshop: To Be Determined

Kudos from Australian Commonwealth Scientific & Industrial Research Organisations

IMAPP is a key enabling technology in a number of natural resource and environmental management and research systems. It enables the development and support of near real time applications with processing customised for local conditions:

- Wildfire monitoring and management – "Sentinel Hotspots" (CSIRO Land & Water, http://www.sentinel.csiro.au)
- Marine monitoring – algal blooms, oceanography (CSIRO Marine Research http://www.marine.csiro.au/media/0releases/27oct04.html)
- Pasture management – "Pastures from Space" (CSIRO Livestock Industries, http://www.pasturesfromspace.csiro.au)

Goal of IMAPP & Its Successor:

- Support IMAPP Global Users
- Support Regional Near Real-Time Applications
- Improve/Expand Algorithms
- Release Updated/New S/W
- Conduct Algorithm/Product Developments
- Conduct Products Validation
- Provide Training, Research, & Visiting Scientist Opportunity
- Preparation for NPP/NPOESS Direct Broadcast Data Processing

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