



The NOAA/NESDIS/STAR IASI Near Real-Time Product Processing and Distribution System

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Outline

- Background
- IASI Processing System
- Monitoring and Validation
- Next Steps
- Summary



Background

- IJPS -- Initial Joint Polar-Orbiting Operational Satellite System
 - » Mission: It is a cooperative effort between NOAA and EUMETSAT to provide and improve the operational meteorological and environmental forecasting and global climate monitoring services worldwide.
- IJPS started with NOAA N, covers the MetOp series, and continues with NPP and the NPOESS series.



MetOp-A Instruments

- IASI: IR Fourier Transform Spectrometer
 - » Spectral Coverage: 8461 channels (3.4 -15.5 μm) in 3 bands
 - » Spatial Resolution: 12 km at nadir (120 FOVs/scan)
- AMSU-A: Microwave sounder (synchronized to IASI scans)
 - » Spectral coverage: 15 channels (15-90 GHz).
 - » Spatial resolution: 48 km at nadir (30 FOVs/scan).
- MHS: Microwave sounder (synchronized to IASI scans)
 - » Spectral Coverage: 5 channel (89 – 190 GHz)
 - » Spatial Resolution: 15km at nadir (90 FOVs/scan)
- AVHRR: Visible and near infrared imager
 - » Spectral Coverage: 5 channels (0.58-12.5 μm)
 - » Spatial Resolution: 1km at nadir (2048 FOV/scan)



IASI Products to Distribute

- IASI Level 1C Radiance
 - » Full resolution
 - » Spatially and Spectrally Subset
 - » Principal Component Analysis
 - » Reconstructed Radiances
 - » Gridded Datasets
- EUMETSAT IASI Level 2 Products
 - » Full Resolution
- NOAA Unique IASI Level 2 Products
 - » Cloud Cleared Radiances
 - » Trace Gas Products
 - » Gridded Datasets



Customers

- NCEP (National Center for Environmental Prediction, NOAA)
- GMAO (Global Modeling and Assimilation Office, NASA)
- NRL (Naval Research Lab)
- FNMOC (Fleet Numerical Meteorology and Oceanography Center)
- AFWA (Air Force Weather Agency)
- CLASS (Comprehensive Large Array-data Stewardship System)



System Development



AIRS Processing System

- Instruments
 - » AIRS
 - » AMSU
 - » HSB
- Products
 - » Spatially and Spectrally Subset L1B Radiances
 - » Spatially and Spectrally Subset Reconstructed Radiances
 - » Level 2 cloud cleared radiances
 - » Temperature and Water vapor profiles
 - » Trace gas profiles
- Products are distributed to the global NWP community.

AIRS/IASI/CrIS Comparison



- AIRS Granules contain 6 minutes of data
- 240 Granules per day
- 35 GB per day
 - » 9 FOV
 - » 2378 channels
- IASI Granules contain \approx 3 minutes of data
- 480 Granules per day
- 30 GB per day
 - » 4 FOV
 - » 8461 channels
- CrIS Granules contain \approx 6 minutes of data
- \approx 240 Granules per day
- 30 GB per day
 - » 9 FOV
 - » 1305 channels

- IASI system design was based on that developed for AIRS
- The same design is being used to develop the CrIS/ATMS system for NPP/NPOESS

Development of IASI Products at NOAA: Pre-Launch



- Began IASI development in August 2004
- Started simulating IASI data in February 2005
- Worked with Simon Elliott of EUMETSAT on reviewing the IASI BUFR format during the spring of 2005.
- Started distributing simulated IASI L1C BUFR files on the AIRS data server to the global NWP centers in October 2005.
- Started producing IASI profiles and cloud cleared radiance products in NetCDF format in August 2006

Development of IASI Products at NOAA: Post Launch



- Started generating products from the actual EUMETSAT pre-operational IASI data in February 2007
- Began distribution of EUMETSAT PFS to NCDC/CLASS in March 2007
- Began transition to operations in June 2007
- Conducted the System Readiness Review in August 2007
- System was run on the test machine during the final transition phase in September 2007
- IASI L1C thinned and reconstructed radiance products became operationally available in October 30, 2007

Current Status of IASI Products at NOAA



- Products will be made operationally available in three phases
 - » IASI L1C thinned and reconstructed radiance products (phase 1)
 - » IASI NOAA Unique products (phase 2)
 - » AVHRR collocated to IASI footprints (phase 3)
- The product processing system will run at NOAA/OSDPD distributing all products through the NOAA/ESPC Data Distribution Server (DDS)
- Phase 1 is already operational (October 30, 2007)
- Phase 2, IASI NOAA-Unique profiles and cloud cleared products, will be operationally available in March of 2008
- Phase 3, IASI/AVHRR products, will made available in March 2010



System Information

- IBM P570+ with 16 2.2 GHz CPUs, 2 GB/CPU, 3 TB SAN storage, running AIX 5.3
- Three separate machines for development, test, and production (Operated within NOAA/NSOF)
- All data handling and algorithms are written in C++ and Fortran 90
- All high-level system management is written in Perl and K-shell



System Information

- System limits the number of consumptive processes
- Up to 16 granules may be processed at once
- 12 minutes to produce all L1C subsets and principal components per granule
- 9 minutes for the retrieval to generate profile and reconstructed radiance products



IASI L1C Archive Products

Instrument	File Type	Contents	Format
IASI	EUMETSAT PFS IASI L1C	IASI Radiance	EUMETSAT Binary
IASI	IASI granule metadata file	IASI metadata (FGDC-RSE)	xml

Instrument or Source	Data type	Time period	Product type	Resolution	Format
IASI	Radiances	Daily	Global grids	3*3	Gridded Binary
IASI	Metadata	Daily	Global grid metadata	3*3	xml



IASI L1C Products

Instrument	Spectral Subset	Data Type	Spatial Subset	Format
IASI	616 channels	IASI Radiance	Warmest FOV from every FOR	BUFR NetCDF
IASI	616 channels	IASI Radiance	First FOV from every FOR	BUFR NetCDF
IASI	616 channels	IASI Radiance	All 4 FOVs from every FOR	BUFR NetCDF
IASI	616 channels	IASI Reconstructed Radiance (1 band)	1 FOV from every FOR	BUFR NetCDF
IASI	616 channels	IASI Reconstructed Radiance (3 bands)	1 FOV from every FOR	BUFR NetCDF
IASI	616 channels	IASI Reconstructed Radiance (1 band)	4 FOVs from every FOR	BUFR NetCDF
IASI	616 channels	IASI Reconstructed Radiance (3 bands)	4 FOVs from every FOR	BUFR NetCDF
IASI	8461 channels	IASI Radiance	4 FOVs from every FOR	NetCDF
IASI	8461 channels	IASI Radiance	4 FOVs from 2 scans/granule	NetCDF

FOV = Field of View; FOR = Field of Regard. The light green refers to internal files.

IASI Level 2 NOAA Unique Products



Instrument	Channels	Data Type	IASI FORs	IASI FOV #	Format
IASI	616	CCR from retrieval	All FORs (660/granule)	1	BUFR NetCDF
IASI	100 levels	L2 (T, H ₂ O, CO ₂ , O ₃ , CH ₄ , CO, HNO ₃ , N ₂ O)	All FORs (660/granule)	NA	BUFR NetCDF
IASI (using AVHRR)	616	RAD	All FORs (660/granule)	1 (clearest)	BUFR NetCDF
AVHRR (on IASI FOVs)	5	RAD (clear and cloudy)	All FORs (660/granule)	1,2,3,4	BUFR NetCDF
IASI (using AVHRR)	616	CCR	All FORs (660/granule)	1	BUFR NetCDF

PCS - Principal Components; RAD - Radiance; RR - Reconstructed Radiance; CCR – Cloud cleared radiance; FOR - Field of Regard; * 616 channel set determined through a NOAA/ECMWF collaborative effort.



System Output

Instrument or Source	Data type	Time period	Product type	Resolution	Format
IASI	Radiances	Daily	Global grids	3*3	Gridded Binary
IASI	Radiances	Daily	Global grids	0.5*2	Gridded Binary
IASI	RR/PCS	Daily	Global grids	3*3	Gridded Binary
IASI	RR/PCS	Daily	Global grids	0.5*2	Gridded Binary
IASI GFS	Radiances/Forecast	Daily	Global grids	0.5*2	Gridded Binary
IASI GDAS	Radiances/Forecast	Daily	Global grids	0.5*2	Gridded Binary
IASI	Radiances	Daily	Global binary	N/A	Binary
IASI	Radiance locations (input for matchups)	Daily	Global binary	N/A	Binary
IASI	Radiances	Daily	Matchups (Radiosondes)	N/A	Binary and NetCDF
IASI	Radiances	Daily	Thinned data	2 scans/granule	Binary



Validation and Monitoring



Validation

- Global Grids enable quick reprocessing of long term representative data.
- Matchups enable daily comparisons between Level 2 products and radiosondes.
- Online system allows us to have a quick view of the daily products.

STAR IASI Web Page


<http://www.orbit2.nesdis.noaa.gov/smcd/spb/iosspdt/iosspdt.php>



File Edit View Go Bookmarks Tools Window Help

Back Forward Reload Stop <http://www.orbit2.nesdis.noaa.gov/smcd/spb/iosspdt/iosspdt.php> Search Print

Home Bookmarks

 National Environmental Satellite, Data, and Information Service (NESDIS)

Welcome to NOAA.

HOME AIRS MODIS IASI CrIS AMSU

Home | Documentations | Acronyms | Links | Group Members

IASI HOME

- Global Radiance
- PCS
- Channel Monitoring
- Near Real Time (demo)
- NOAA Unique Products
- System Updates
- Spectral Ranges

NESDIS NRT IASI

The Infrared Atmospheric Sounding Interferometer (IASI) is a Fourier Transform Spectrometer based upon a Michelson Interferometer (8461 channels)

- Spectral range: 645 - 2760cm⁻¹
- NEDT information
- Constant sample spectral interval: 0.25cm⁻¹, 8461 channels
- Apodized spectral resolution: 0.5cm⁻¹
- Scan Type: Step and Dwell
- Scan Rate: 8s
- IFOV 3.33 degree
- IFOC size at Nadir: 12km
- Sampling at Nadir: 25km
- Pixel/Scan: 120
- Swath: +-48.3 degree; +-1026km
- Data Rate: 1.5 Mbps

Imaging channel within the IASI field of regard (64 x 64 pixels)

- Enables characterization of cloudiness inside the spectrometer field of view

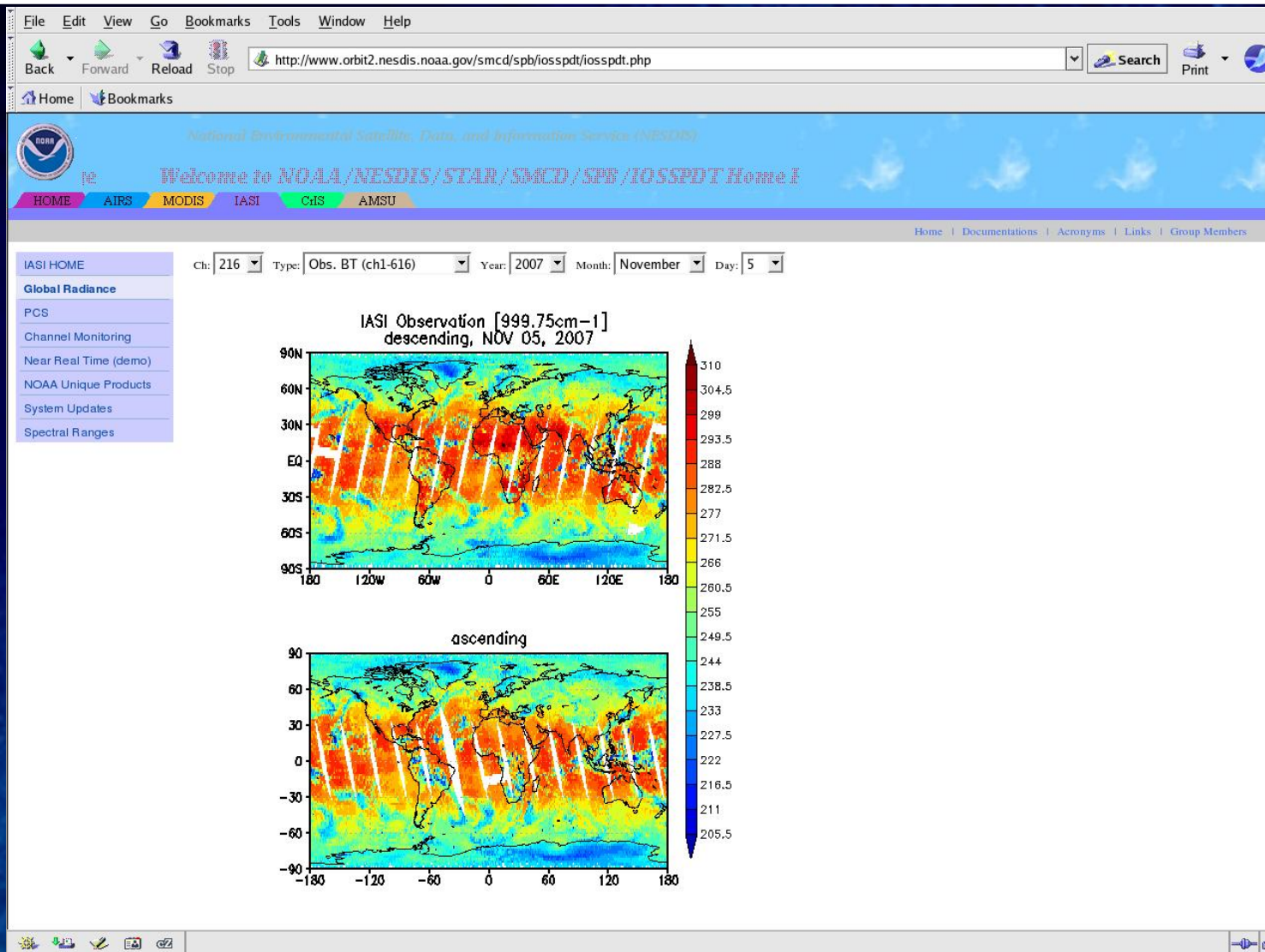
IASI will provide temperature and humidity profiles with a vertical accuracies of 1 Kelvin and 10% per 1-km layer, respectively

A near realtime system has been running at NOAA/NESDIS/SMCD/SPB/IOSSPDT since November 2005. To get more information about the data, please [email us](#)

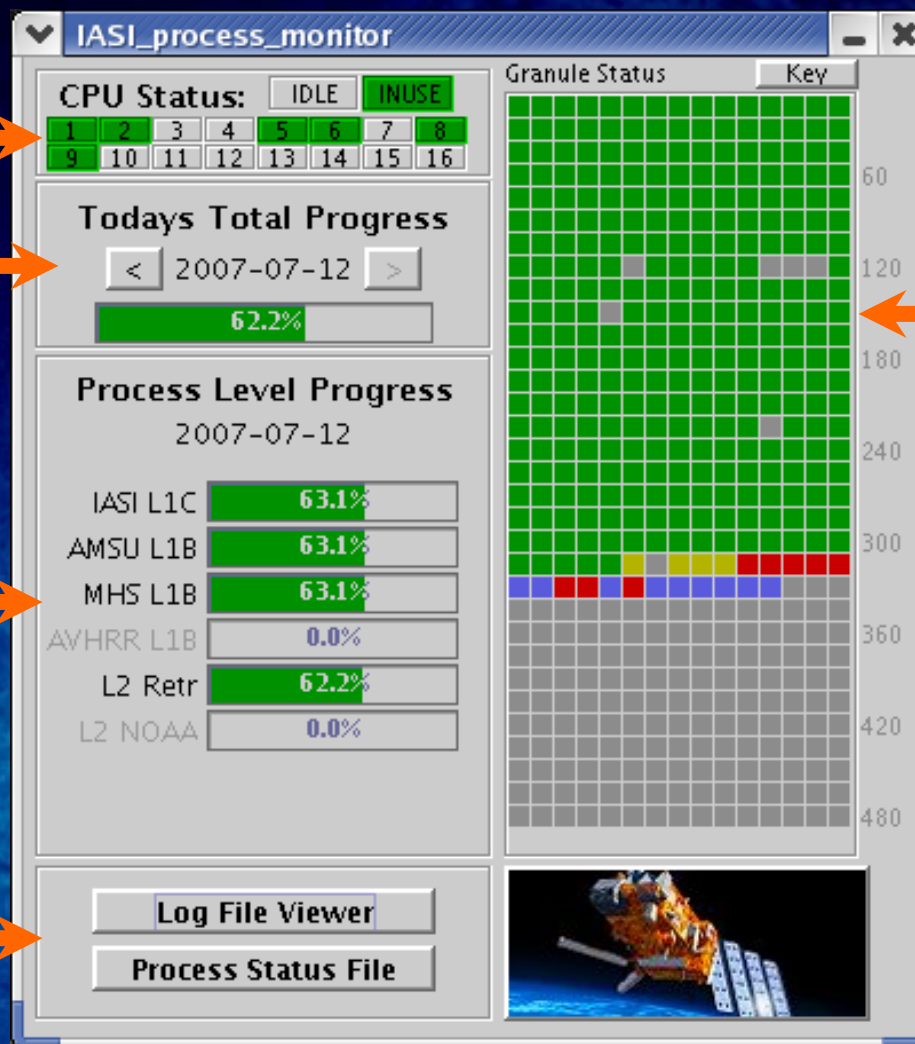
Please refer comments or questions to the [webmaster](#). This page was last modified on: 11/08/2007 13:59:22

Windows taskbar: Internet Explorer, File Explorer, Runesoft, etc.

Example of Images on STAR IASI Web Page



IASI Process Monitor Main Display



Indicates which of the 16 available CPU's are in use

Indicates the day's total progress. Arrow buttons allow display of previous day's status

Indicates the day's progress of each processing level.

Buttons to open up the log file and the status file viewing windows.

Indicates the status of each granule:

- not processed
- waiting to start
- one process level complete
- all process levels complete
- error in a process level
- missing data



Next Steps

Future Development of IASI Products at NOAA



- Integrate the use of the IASI calibrated image in the ILS sub-pixel correction algorithm
- Implement handling of grib2 formats in retrieval preprocessing and in the forecast global grid products
- Test latest updates to the retrieval algorithm
- Finalize NOAA-Unique Level 2 products archive agreements with NCDC/CLASS
- Finish implementation of the AVHRR/IASI physical collocation algorithm
- Develop IASI/AVHRR BUFR tables



CrIS/ATMS

- Simulated CrIS and ATMS data
- Meeting in late November with Simon Elliott (EUMETSAT) and NCEP to discuss the BUFR table for CrIS
- The simulated CrIS data will be available in March 2008



Summary

- Have been running the AIRS near real-time processing system for five years
- Developed and built the IASI processing system:
 - » Based upon AIRS experience
 - » Working with EUMETSAT
 - » Transitioned Level 1C Subsetting and Distribution System (phase 1) to operations
 - » NOAA Unique Level 2 System (phase 2) will transition to operations in March 2008
 - » AVHRR collocated to IASI footprints (phase 3) will be transition to operations in March 2010
- CrIS/ATMS development has already begun