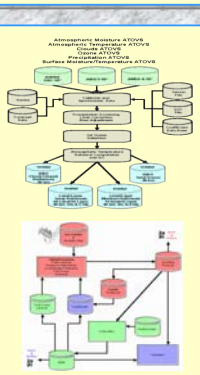
# NOAA/NESDIS UPDATES ON OPERATIONAL SOUNDING DATA PRODUCTS AND SERVICES


**A.K. Sharma**

**NOAA/NESDIS Office of Satellite Data Processing and Distribution – OSDPD**

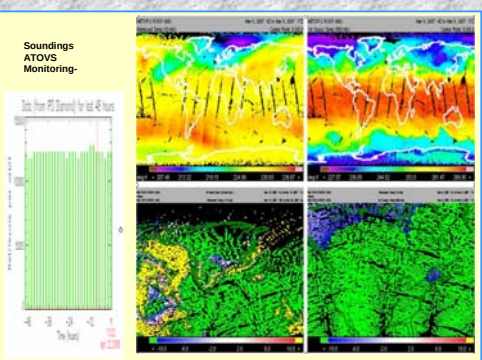

## Introduction

It is a cooperative effort between the National Oceanic and Atmospheric Administration (NOAA) and the European Organization for the Exploitation of Meteorological (EUMETSAT) to provide and improve the operational meteorological and environmental forecasting and global climate monitoring services worldwide. The NOAA National Environmental Satellite, Data, and Information Services (NESDIS) has been a pioneer in producing and distributing atmospheric sounding data products as a part of its operation for operating a fleet of civilian, Polar Orbiting Environmental Satellites (POES) and providing users and researchers a suite of operational atmospheric and environmental data products. Sounding Data Products are being generated from the advance TIROS Operational Vertical Sounder (ATOVS), onboard NOAA polar orbiting satellites (currently operational NOAA-15 and NOAA-18), and Infrared Atmospheric Sounding Interferometer (IASI) onboard Meteorological Operational Satellite (MetOp-1). IASI is a state-of-the-art sounding system developed to support Initial Joint Polar-Orbiting Operational Satellite System at NESDIS for generating operational calibrated and navigated radiances, reconstructed radiances, cloud cleared radiances, principal components, temperature profile, water vapor profile, ozone profile, and trace gases profiles such as methane, carbon dioxide, and carbon monoxide. IASI is a Fourier Transform Spectrometer based upon a Michelson Interferometer (8461 channels), spectral range from 645 to 2760 cm-1, with a constant sample spectral interval at a 0.25 cm, and apodized spectral resolution at a 0.5 cm. It provides enhancements to the NESDIS current operational ATOVS sounding system to generate temperature and moisture profiles with a vertical accuracy of 1 degree Kelvin and 10% per 1-km layer, respectively. Recently, the IASI level -1 products system was successfully transitioned into operation at NESDIS. It was declared operational in October 2007. Level-1 data have been made available to both real-time users and climate users through NESDIS Environment Satellite Processing Center (ESPC) Data Distribution Sever (DDS) and Comprehensive Large Array-data Stewardship System (CLASS). In this presentation, we discuss the transition of IASI from research to operation, its operational implementation procedures, products validation, monitoring and dissemination. This presentation will include the discussion on the ESPC system architecture involving sounding data processing and distribution for ATOVS and IASI, improvements made for data quality measurements, pipeline processing and distribution via DDS, and user timeliness requirements envisioned from the next generation of satellites. There have been significant changes in the operational system due to system upgrades, algorithm updates, and value added data products and services. User requirements for data products and services for sounders like ATOVS and IASI would help us determine the products and services required from the next generation of sounders such as Cross-Track Infrared Sounder/ Advanced Technology Microwave Sounder (Cris/ATMS) as planned for the National Polar-orbiting Operational Environmental Satellite System (NPOESS) program and the future missions of the EUMSAT satellites. Detailed information on the operational products and their applications are also presented.

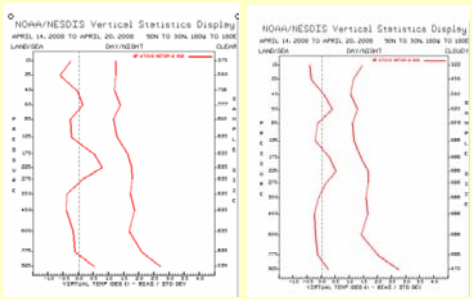


ATOVS

Soundings
ATOVS
Monitoring-

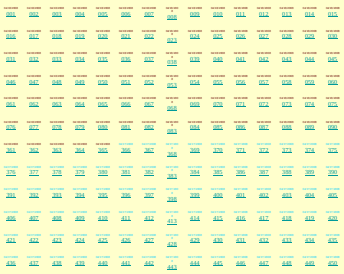


ATOVS Weekly Vertical Statistics



Near Real-Time IASI Data Browse

IASI L1C Monitoring Interface



Data Available

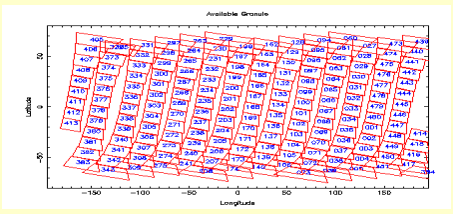
Data Unavailable

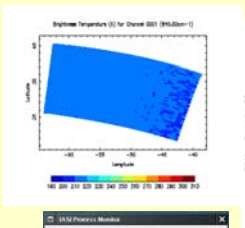
Near Real-Time IASI Data Browse

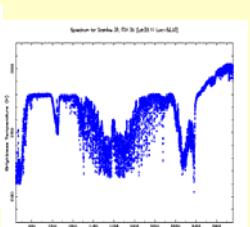
•Granule Data Monitoring (Granule data comes in ~3-minutes)

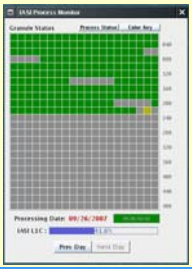
•Click Granule in the Granule Map below to Browse the image or

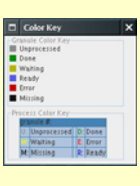
•Click Granule number in the table: [Show Granule Table]



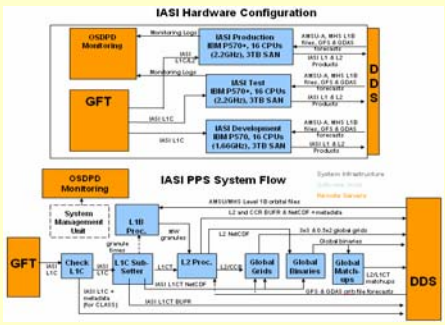




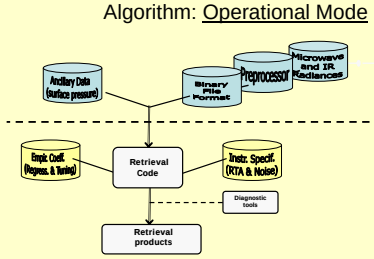




IASI Hardware Configuration



System Diagram of NOAA Retrieval Algorithm: Operational Mode



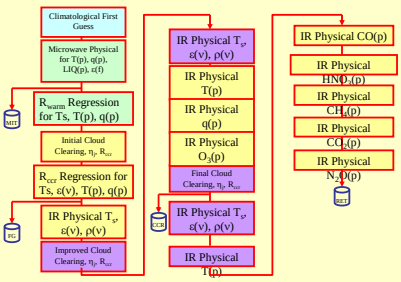
## Sequence of Steps of the Retrieval Algorithm

1) A microwave retrieval module which derives cloud liquid water flags and microwave surface emissivity uncertainty;
2) A fast eigenvector regression retrieval for temperature and moisture that is trained using the ECMWF analysis and IASI cloudy radiances;
3) A cloud clearing module that uses a set of microwave and IR channels to produce the cloud-cleared IR radiance product and reject those cases violating the cloud-clearing requirements;
4) A fast eigenvector regression retrieval for temperature and moisture that is trained using the ECMWF analysis and IASI cloud cleared radiances;
5) The final IR retrieval module, which uses the regression retrieval as an initial solution and produces the final version of the physical retrieval by an iterated regularized least squared minimization.

We start with the temperature retrieval, because temperature is the most linear component of the RTA equation, followed by water vapor, ozone, etc.

All adjustments to the algorithm pertain the first 5 steps. Optimizations of the parameters involved in the following trace gas retrievals are only minor adjustments.

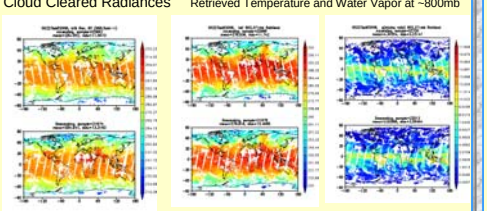
Simplified flow diagram of the NOAA retrieval algorithm



## Global Grids Data

Cloud Cleared Radiances

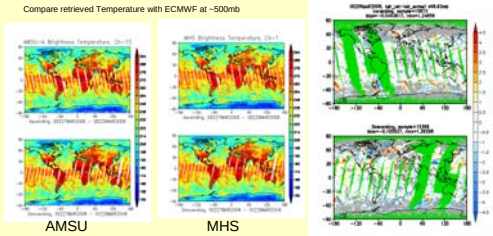
Retrieved Temperature and Water Vapor at ~800mb



The plot is the IASI cloud cleared radiance (CCR) at the channel 965.5cm-1. Browsing the map can check if the CCR range is reasonable.

## Global Grids Data

Compare retrieved Temperature with ECMWF at ~500mb



AMSU

MHS