

NOAA/NESDIS SOUNDING DATA PRODUCTS FROM THE NEXT GENERATION OF SATELLITES

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<http://www.ospo.noaa.gov/Products/atmosphere/soundings/index.html>



Vertical and horizontal distributions of atmospheric temperature, water vapor, clouds, and chemical composition are essential climate observations. High spectral resolution infrared sounding has made significant improvements in retrievals from the Cross-track Infrared Sounder (CrIS) and the Advanced Technology Microwave Sounder (ATMS) instruments on board the Suomi-National Polar-orbiting Partnership (SNPP) and the Infrared Atmospheric Sounding Interferometer (IASI), residing on the European Space Agency's (ESA) MetOp series of polar orbiting satellites. In a series of advanced operational sounders CrIS in conjunction with ATMS provides more accurate, detailed atmospheric temperature and moisture observations for weather and climate applications. Higher (spatial, temporal and spectral) resolution and more accurate sounding data from CrIS and ATMS support continuing advances in data assimilation systems and NWP models to improve short- to medium-range weather forecasts. Currently the IASI level 2 products from Metop satellites include temperature and humidity profiles, trace gases such as ozone, nitrous oxide, carbon dioxide, and methane, and the cloud cleared radiances (CCR) on a global scale and these products are available to the operational user community. In an effort to ensure consistent levels of service and quality assurance for the CrIS/ATMS data the NOAA Unique CrIS/ATMS Product System (NUCAPS) data products, the Office of Satellite and Product Operations (OSPO) has implemented and executing new, innovative tools to better monitor performance and quality of the operational sounder and imager products that are being generated. The incorporation of these tools in the OSPO operation has facilitated the diagnosis and resolution of problems when detected in the operational environment. This poster presentation will include several of these tools developed and deployed for the sounding products monitoring and data quality assurance which lead to improve the maintenance and sustainment of the Environmental Satellites Processing Center (ESPC) processing systems. The presentation will include the discussion on the ESPC system architecture involving sounding data processing and distribution for CrIS, IASI, and GOES sounding products. Discussion will also include the improvements made for data quality measurements, granule processing and distribution, and user timeliness requirements envisioned from the next generation of JPSS and GOES-R satellites. There have been significant changes in the operational system due to system upgrades, algorithm updates, and value added data products and services.

NOAA Unique CrIS ATMS Processing System NUCAPS (SNPP)

NUCAPS - Temperature and humidity profiles at 15 US standard atmospheric levels with vertical accuracies of 1 degree Kelvin and 10 % per 1-km layer respectively, water vapor mixing ratio, Ozone mixing ratio, mixing ratio of CO, CO₂, CH₄, trace gases, and the cloud cleared radiances (CCR) on a global scale.

IASI (Metop-1, and Metop-2)

IASI - Temperature and humidity profiles with vertical accuracies of 1 degree Kelvin and 10 % per 1-km layer respectively, water vapor mixing ratio, Ozone mixing ratio, mixing ratio of CO, CO₂, CH₄, trace gases, and the cloud cleared radiances (CCR) on a global scale.

GOES Sounders (GOES-East and West)

GOES - The products include standard imagery which is an image product of the raw sounder data and derived level 2 products (Clear-sky Radiances, Layer & Total Precipitable Water, Cloud-top retrievals (pressure, temperature, cloud amount), Surface Skin Temperature, Temperature and Moisture Profiles, Atmospheric Stability Indices, water Vapor Winds and Total Ozone.

<http://www.ospo.noaa.gov/Products/atmosphere/soundings/nucaps/index.html>

NUCAPS

NUCAPS Sounding Products

SNPP Global Gridded 0.5 deg lat x 2 deg lon Images

Address: [Select a Date] [Go]

Tuesday, April 14, 2015

Parameter Name	Min	Max
Temperature	333.2	333.2
Mixing Ratio of Water Vapor (H2O)	333.2	333.2
Mixing Ratio of Carbon Dioxide (CO2)	333.2	333.2
Mixing Ratio of Methane (CH4)	333.2	333.2
Mixing Ratio of Nitrous Oxide (N2O)	333.2	333.2
Mixing Ratio of Ozone (O3)	333.2	333.2
Mixing Ratio of Carbon Monoxide (CO)	333.2	333.2
Mixing Ratio of Sulfur Dioxide (SO2)	333.2	333.2
Mixing Ratio of Nitric Acid (HNO3)	333.2	333.2
Mixing Ratio of Nitrogen Dioxide (NO2)	333.2	333.2

NUCAPS Sounding Products

The NOAA Unique CrIS/ATMS Processing System (NUCAPS) was developed to generate (1) spectrally and spatially thinned radiances, (2) retrieved products such as profiles of temperature, moisture, trace gases and cloud-cleared radiances, and (3) global validation products such as radiance matchups and gridded radiances and profiles. The thinned radiances products are produced in BUFR format using the NetCDF4 Reformatted Toolkit (NART) and are tailored to specifically Numerical Weather Prediction (NWP) centers. The NUCAPS Environmental Data Records (EDR) products are archived in Comprehensive Large Array-Data Stewardship System (CLASS) for non-real time users and can be acquired from www.nsf.class.noaa.gov.

NUCAPS/SNPP Global Granules Composite Images

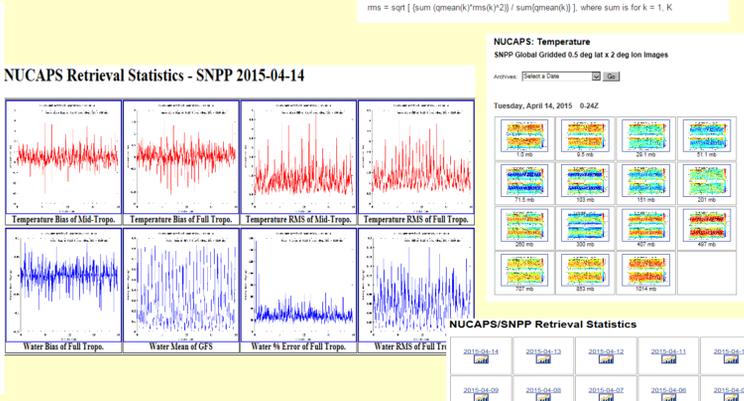
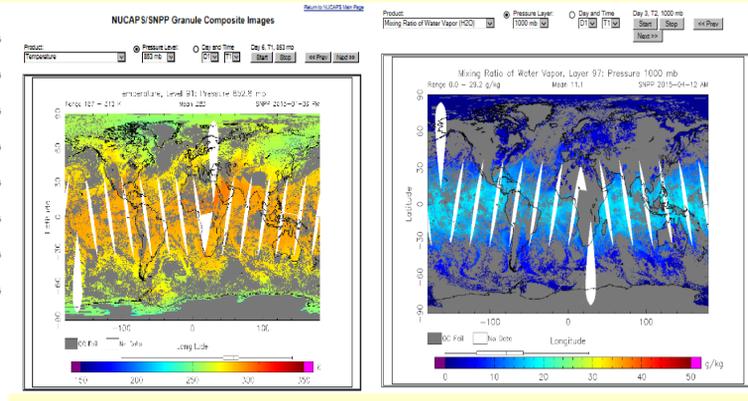
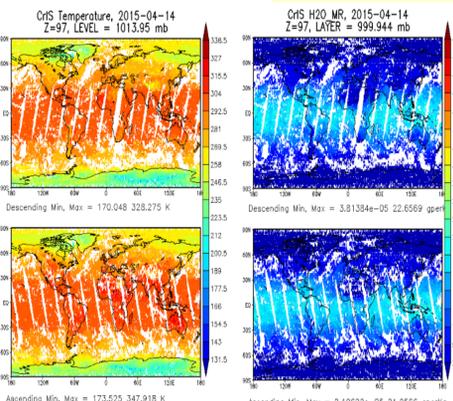
The NUCAPS global granules composite images are produced for the last seven days at the 15 fixed air pressure levels or layers. They are produced by using the NUCAPS retrievals which are derived based on a fixed air pressure variable grid: temperature is derived at the fixed pressure levels (1014 mb, 853 mb, 707 mb, 497 mb, 300 mb, 250 mb, 201 mb, 151 mb, 103 mb, 71.5 mb, 51.1 mb, 29.1 mb, 9.5 mb, 1.0 mb), and mixing ratio variables are derived at the layer pressure using the effective air pressure variable (1000 mb, 840 mb, 695 mb, 487 mb, 399 mb, 293 mb, 254 mb, 196 mb, 147 mb, 99.5 mb, 68.8 mb, 49.3 mb, 27.6 mb, 8.82 mb, 838 mb). Each product is computed separately for each granule, and then the global image is generated by combining the data from individual granules based on the granule geographical location. For each image the granules from the preceding 12 hours of observation are used; each image combines the granules of data measured at both ascending and descending nodes.

NUCAPS/SNPP Global Gridded Products

SNPP Global Gridded 0.5 deg lat x 2 deg lon Images
NUCAPS EDR Global Gridded products include the Temperature (deg K), Water Vapor Mixing Ratio (g/Kg), Liquid Water Mixing Ratio (g/Kg), Ozone Mixing Ratio (ppb), Methane Mixing Ratio (ppb), Carbon Dioxide dry mixing ratio (ppm), Carbon Monoxide Mixing Ratio (ppb), Sulfur Dioxide mixing ratio (ppb), Nitric Acid Mixing Ratio (ppb), and Nitrous Oxide Mixing Ratio (ppb). The retrievals are derived based on a fixed air pressure variable grid: temperature is derived at the fixed pressure level (1014 mb, 853 mb, 707 mb, 497 mb, 300 mb, 250 mb, 201 mb, 151 mb, 103 mb, 71.5 mb, 51.1 mb, 29.1 mb, 9.5 mb, 1.0 mb) and mixing ratio variables are derived at the layer pressure using the effective air pressure variable (1000 mb, 840 mb, 695 mb, 487 mb, 399 mb, 293 mb, 254 mb, 196 mb, 147 mb, 99.5 mb, 68.8 mb, 49.3 mb, 27.6 mb, 8.82 mb, 838 mb).

NUCAPS/SNPP Retrieval Statistics

The NUCAPS retrieval statistics are generated for Temperature (Tp) over two layers: average over mid-troposphere (520-790 mb) and average over full troposphere (200-1100 mb), and Water Vapor Mixing Ratio (WVMR) statistics are generated over full troposphere. The NUCAPS retrieval estimates are compared with GF5 estimates to compute bias and rms error over these layers and are plotted for each granule on the 24-hour scale for the day. To generate the temperature bias and rms error over a large ensemble of K granules one needs to take the bias for a single granule, bias(k), weighted by the number of accepted cases, Nacc(k), such as:
bias = sum (Nacc(k)*bias(k)) / sum(Nacc(k)), where sum is for k = 1, K
rms = sqrt (sum(Nacc(k)*rms(k)^2) / sum(Nacc(k))), where sum is for k = 1, K
To generate the WVMR bias and rms error over a large ensemble of K granules the following formulas are used:
bias = sum(gmean(k)*bias(k)) / sum(gmean(k)), where sum is for k = 1, K
rms = sqrt (sum (gmean(k)*rms(k)^2) / sum(gmean(k))), where sum is for k = 1, K



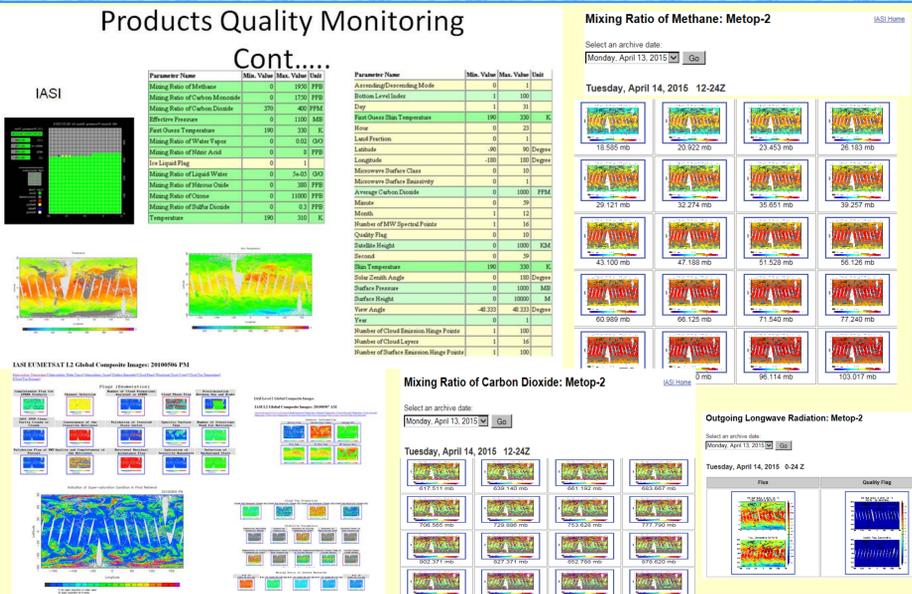
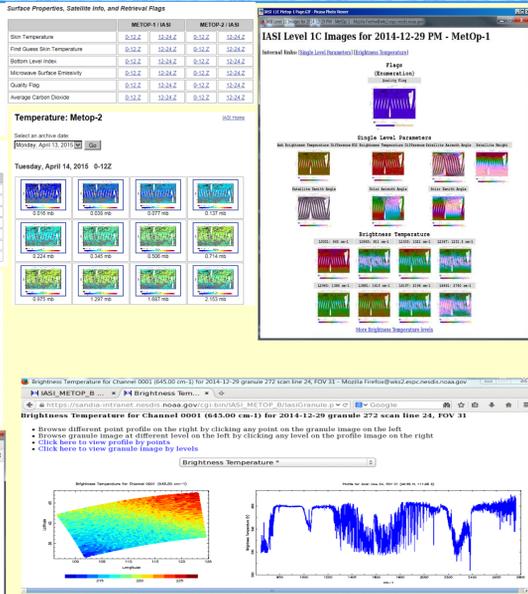
IASI

- Temperature profiles
- Water vapor profiles
- Radiances (thinned, cloud cleared, reconstructed)
- Principal components
- Stability parameters (CAPE, Lifted Index, Convective Inhibition, Pressure of Equilibrium Level, Temperature Level of Free Convection, etc.)
- Cloud products (Cloud Top Pressure, Cloud Top Fraction)
- Trace gases
- Emissivity
- 100 levels retrieved temperatures
- First Guess Temperature
- Mixing Ratio of Water
- Mixing Ratio of Ozone
- Mixing Ratio of Carbon Monoxide
- Mixing Ratio of Carbon Dioxide
- Mixing Ratio of Methane
- Surface Properties, Satellite Info, and Retrieval Flags
- Skin Temperature
- First Guess Skin Temperature
- Bottom Level Index
- Microwave Surface Emissivity
- Quality Flag
- Average Carbon Dioxide
- SO2 Anomaly
- Ash Brightness Temperature Differences.

IASI Sounding Products

IASI Sounding Products (ISPP) is a high-resolution sounding system on board the European Space Agency (ESA) MetOp series of polar orbiting satellites. It provides vertical profiles of temperature, water vapor, and various trace gases. The ISPP products are derived from the IASI Level 1C (L1C) data and are available in BUFR format. The ISPP products are used for weather forecasting and climate research. The ISPP products are available in real-time and are used for operational purposes. The ISPP products are also used for research and development of new sounding instruments. The ISPP products are used to validate the performance of the IASI instrument and to improve the accuracy of the sounding data. The ISPP products are also used to study the variability of the atmosphere and to understand the role of trace gases in climate change. The ISPP products are used to study the impact of human activities on the atmosphere and to assess the risk of climate change. The ISPP products are used to study the impact of natural variability on the atmosphere and to understand the role of natural factors in climate change. The ISPP products are used to study the impact of climate change on the atmosphere and to assess the risk of climate change. The ISPP products are used to study the impact of climate change on the atmosphere and to assess the risk of climate change.

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Mixing Ratio of Nitrogen Dioxide (NO2)	333.2	333.2



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GOES

