# Updated IASI Products Processing System at the NOAA/NESDIS


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### NOAA/NESDIS Office of Satellite and Product Operations (OSPO)



Under the International Joint Polar-Orbiting Operational Satellite System (IJPS) program agreement with the European Organization for the Exploitation Meteorological Satellites (EUMETSAT), the National Oceanic and Atmospheric Administration (NOAA) National Environmental Satellite Data and Information Service (NESDIS) generates the Infrared Atmospheric Sounding Interferometer (IASI) data products. IASI is a hyperspectral infrared sounder residing on the European Space Agency's (ESA) Metop series of polar orbiting satellites and has 8461 spectral channels, aligned in three bands between 3.62 and 15.5 micron-meter, with a spectral resolution of 0.5 cm-1. IASI is a multi-purpose sounding instrument designed for the next generation infrared sounder having element of operational sounding system which provides global measurements with high vertical resolution and accuracy of temperature, water vapor, trace-gases such as ozone, nitrous oxide, carbon dioxide, and methane, as well as surface temperature, surface emissivity, and cloud characteristics. The IASI Product Processing System (PPS) at the Environmental Satellite Processing Center (ESPC), the Office of Satellite and Product Operations (OSPO) generates the IASI data products including the radiances, temperature and humidity profiles, trace gases, and the cloud cleared radiances (CCR) on a global scale which are made available to the operational user community. The EUMETSAT generates the Level 1C data, which are ingested in a pipeline mode via General File Transmission (GFT) protocol, and applied to spectral and spatial sub-setting to generate Level 1C Thinned (L1CT) radiance. Recently the IASI instrument has been estimating the Volcanic Ash and generating the Volcanic Ash/Dust and SO2 alerts. This paper will discuss these products and alerts (http://satepsanone.nesdis.noaa.gov/pub/IASI/alerts/ASH_BTD/index.html).

In an effort to ensure consistent levels of service and quality assurance for these suites of products, the ESPC/OSPO has been preparing for processing the next generation of the IASI instrument onboard Metop-1 data. The Metop-1 was launched on 17 September 2012 (http://www.eumetsat.int/Home/Main/Satellites/index.htm). The IASI PPS will implement and execute the new, innovative tools to better monitor performance and quality of the operational IASI products. The incorporation of these tools in the ESPC/OSPO will facilitate the diagnosis and resolution of problems when detected in the operational environment.


# IASI

**http://www.osdpd.noaa.gov/IASI/html/index.html**

**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**

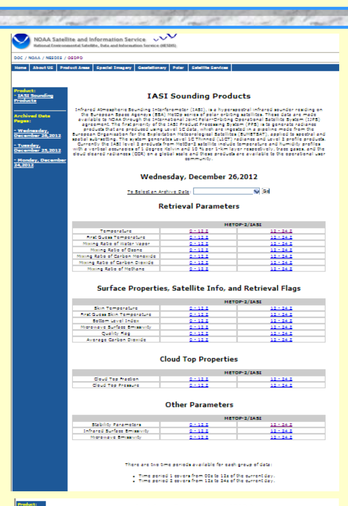
**- 100 levels**
- **retrieved temperatures**
- **First Guess Temperature**
- **Mixing Ratio of Water**
- **Mixing Ratio of Ozone**
- **Mixing Ratio of Carbon Monoxide**
- **Mixing Ratio of Carbon Dioxide**
- **Mixing Ratio of Methane**

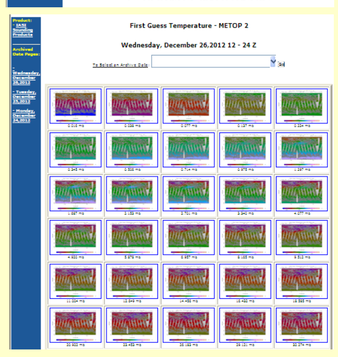
**Surface Properties, Satellite Info, and Retrieval Flags**
- **Skin Temperature**
- **First Guess Skim Temperature**
- **Bottom Level Index**
- **Microwave Surface Emissivity**
- **Quality Flag**
- **Average Carbon Dioxide**

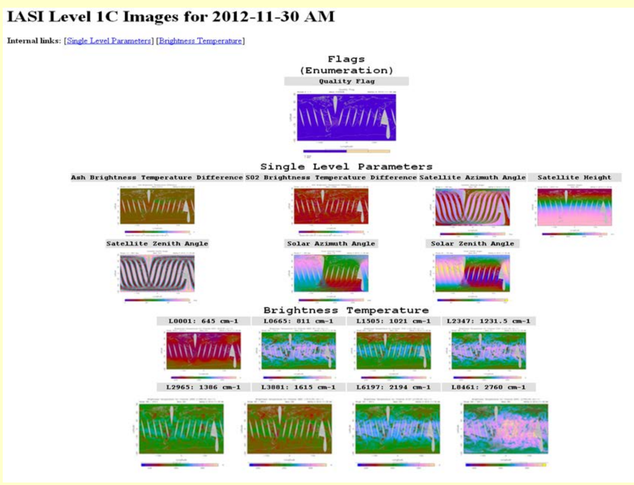
**Cloud Top Properties**
- **Cloud top Fraction - 2 Images displayed over two levels**
- **Cloud Top Pressure - 2 Images displayed over two levels**

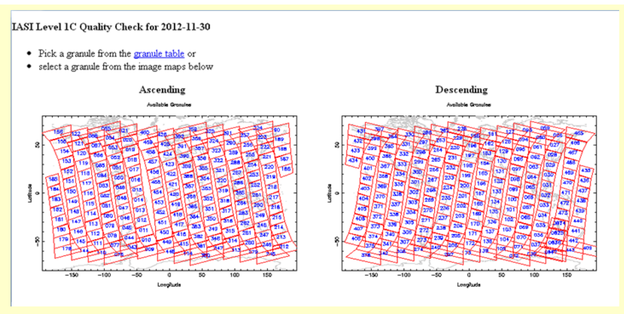
**STABILITY Parameters**
- **Stability Parameters - 10 Stability Parameters**
- **Infrared Surface Emissivity - 50 Infrared Parameters**
- **Microwave Emissivity - 7 Microwave Parameters**

**SO2 Anomaly**
**Ash Brightness Temperature Differences.**



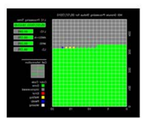



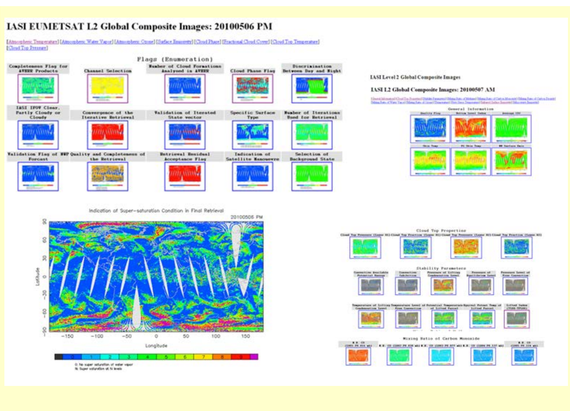

## Products Quality Monitoring Cont.....

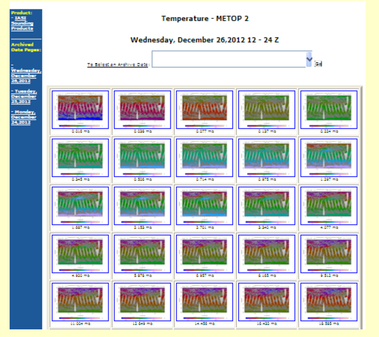
IASI

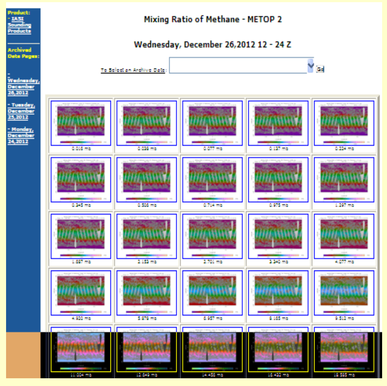


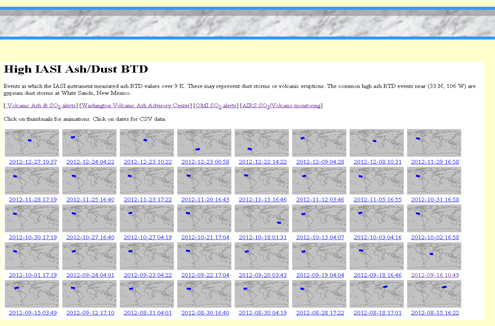
| Parameter Name | Min. Value | Max. Value | Unit |
|---|---|---|---|
| Mixing Ratio of Methane | 0 | 1930 | PPB |
| Mixing Ratio of Carbon Monoxide | 0 | 1750 | PPB |
| Mixing Ratio of Carbon Dioxide | 370 | 400 | PPM |
| Effective Pressure | 0 | 1100 | MB |
| Fast Guess Temperature | 190 | 330 | K |
| Mixing Ratio of Water Vapor | 0 | 0.02 | G/O |
| Mixing Ratio of Nitric Acid | 0 | 8 | PPB |
| Ice Liquid Flag | 0 | 1 | |
| Mixing Ratio of Liquid Water | 0 | 5e-05 | G/O |
| Mixing Ratio of Nitrous Oxide | 0 | 380 | PPB |
| Mixing Ratio of Ozone | 0 | 11000 | PPB |
| Mixing Ratio of Sulfur Dioxide | 0 | 0.3 | PPB |
| Temperature | 190 | 310 | K |

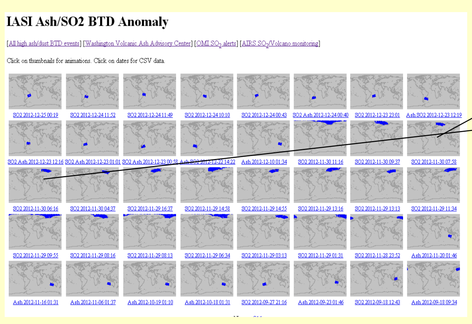
| Parameter Name | Min. Value | Max. Value | Unit |
|---|---|---|---|
| Ascending/Descending Mode | 0 | 1 | |
| Bottom Level Index | 1 | 100 | |
| Day | 1 | 31 | |
| Fast Guess Skin Temperature | 190 | 330 | K |
| Hour | 0 | 23 | |
| Land Fraction | 0 | 1 | |
| Latitude | -90 | 90 | Degree |
| Longitude | -180 | 180 | Degree |
| Microwave Surface Class | 0 | 10 | |
| Microwave Surface Emissivity | 0 | 1 | |
| Average Carbon Dioxide | 0 | 1000 | PPM |
| Minute | 0 | 59 | |
| Month | 1 | 12 | |
| Number of MW Spectral Points | 1 | 16 | |
| Quality Flag | 0 | 10 | |
| Satellite Height | 0 | 1000 | KM |
| Second | 0 | 59 | |
| Skin Temperature | 190 | 330 | K |
| Solar Zenith Angle | 0 | 180 | Degree |
| Surface Pressure | 0 | 1000 | MB |
| Surface Height | 0 | 10000 | M |
| View Angle | -48.333 | 48.333 | Degree |
| Year | 0 | 1 | |
| Number of Cloud Emission Hinge Points | 1 | 100 | |
| Number of Cloud Layers | 1 | 16 | |
| Number of Surface Emission Hinge Points | 1 | 100 | |

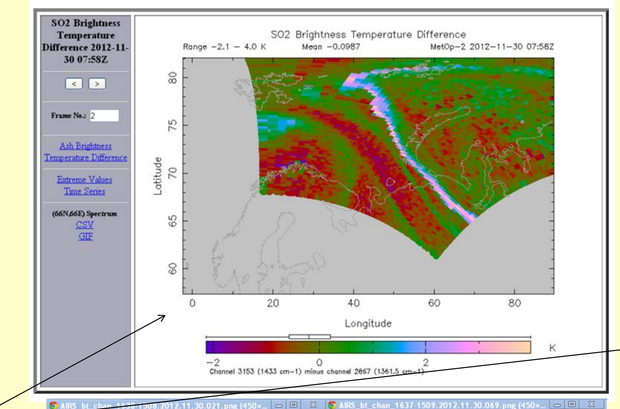


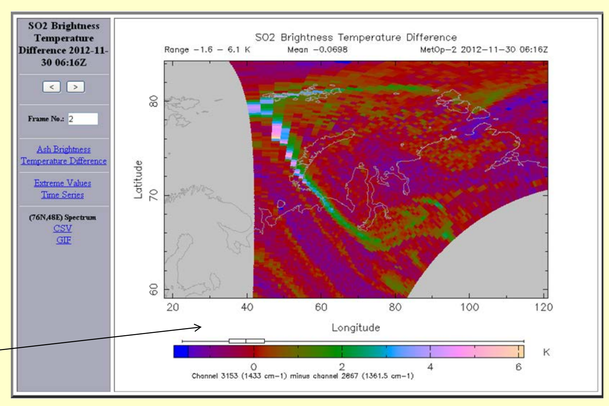



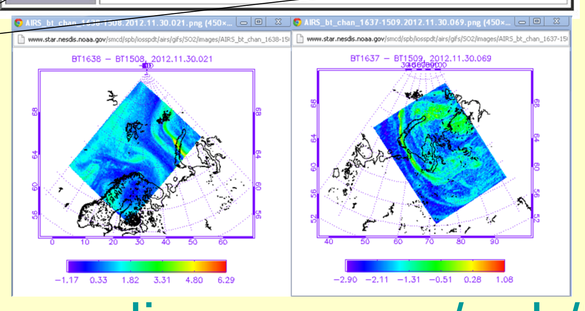



"SO2 Anomaly (4 in [0.00, 0.23]) at (66N,66E) 07:58Z" "2012-11-30 07:58Z granule 160" "See http://satepsanone.nesdis.noaa.gov/pub/IASI/alerts/Ash_SO2_Anomaly/index.html.

Ash BTD is the brightness temperature difference for channel 2347 (1231.5 cm-1) minus channel 2093 (1168 cm-1). SO2 BTD is the brightness temperature difference for channel 3153 (1433 cm-1) minus that of channel 2867 (1361.5 cm-1). Anomaly values equal the ordinary BTD values minus a threshold set to exceed all or almost all recent observations in the local geographic area during periods of low volcanic activity. High ash BTD values may be triggered by dust storms.

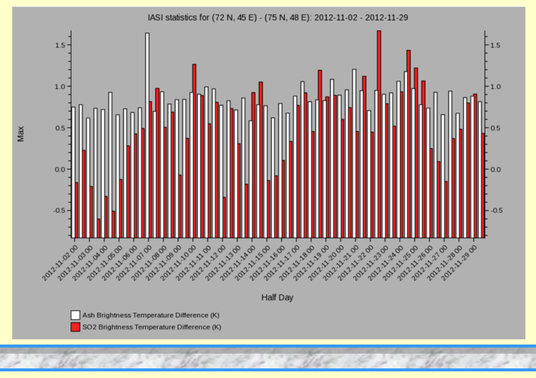
| Latitude (N), | Longitude (E), | "Ash Brightness Temperature Difference", | "SO2 Brightness Temperature Difference", | "Ash Brightness Temp. Diff. Anomaly", | "SO2 Brightness Temp. Diff. Anomaly", | "Brightness Temperature for Channel 2347 (1231.50 cm-1)", | "Brightness Temperature for Channel 2093 (1168.00 cm-1)", | "Brightness Temperature for Channel 3153 (1433.00 cm-1)", | "Brightness Temperature for Channel 2867 (1361.50 cm-1)" |
|---|---|---|---|---|---|---|---|---|---|
| 66.39, | 65.87, | 0.40, | 3.80, | -2.92, | 0.23, | 255.12, | 254.72, | 238.46, | 234.66 |
| 65.37, | 69.13, | 0.62, | 3.67, | -3.10, | 0.20, | 252.14, | 251.51, | 237.37, | 233.70 |
| 76.33, | 45.60, | 0.74, | 3.97, | -3.03, | 0.11, | 257.21, | 256.47, | 244.13, | 240.15 |
| 67.94, | 61.50, | 0.48, | 3.59, | -2.91, | 0.02, | 258.24, | 257.76, | 240.80, | 237.21 |

SO2 Anomaly (17 in [0.0, 2.3]) at (76N,48E) 06:16Z

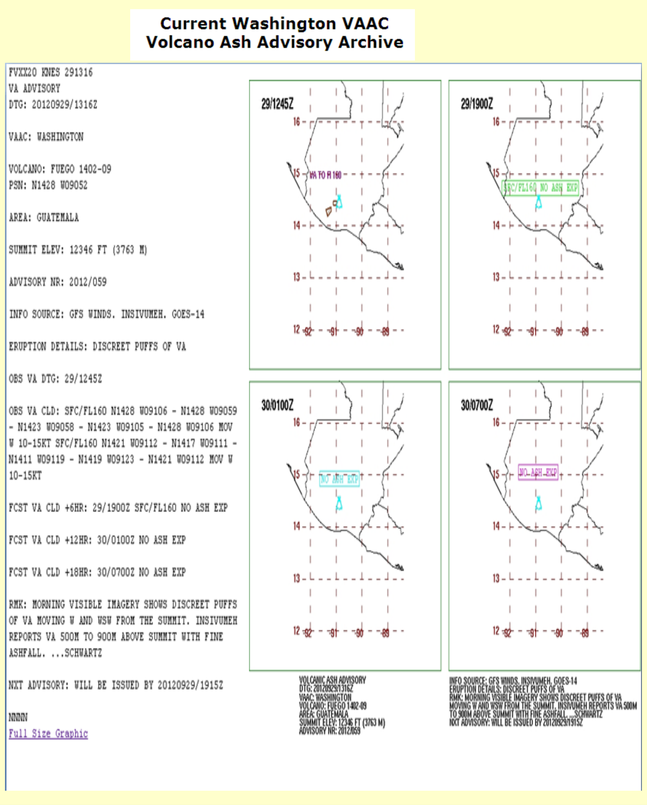
2012-11-30 06:16Z granule 126

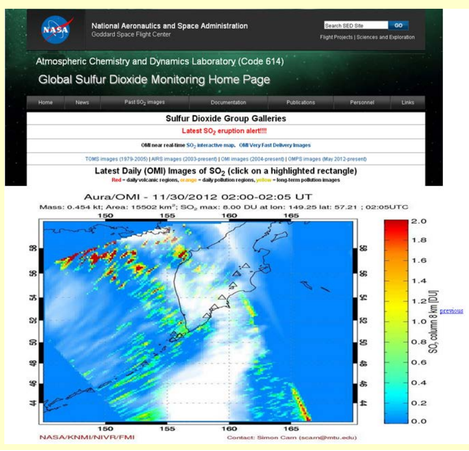
See

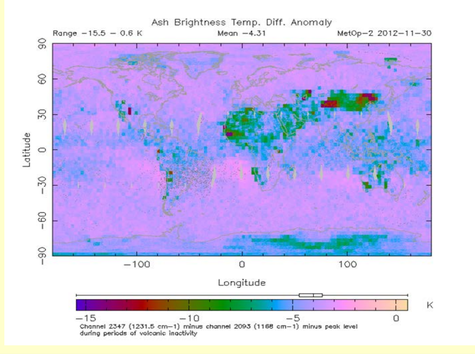
| Latitude (N) | Longitude (E) | "Ash Brightness Temperature Difference" | "SO2 Brightness Temperature Difference" | "Ash Brightness Temp. Diff. Anomaly" | "SO2 Brightness Temp. Diff. Anomaly" | "Brightness Temperature for Channel 2347 (1231.50 cm-1)" | "Brightness Temperature for Channel 2093 (1168.00 cm-1)" | "Brightness Temperature for Channel 3153 (1433.00 cm-1)" | "Brightness Temperature for Channel 2867 (1361.50 cm-1)" |
|---|---|---|---|---|---|---|---|---|---|
| 76.11 | 48.21 | 0.41 | 6.12 | -3.11 | 2.27 | 255.41 | 255 | 241.13 | 235.01 |
| 74.17 | 51.56 | 0.96 | 5.08 | -2.94 | 1.34 | 263.4 | 262.44 | 241.59 | 236.5 |
| 76.33 | 48.26 | 1.01 | 5.14 | -2.5 | 1.29 | 255.74 | 254.73 | 241.42 | 236.28 |
| 74.4 | 51.67 | 0.56 | 4.8 | -3.34 | 1.05 | 262.63 | 262.07 | 242.16 | 237.36 |
| 76.58 | 48.33 | 0.89 | 4.82 | -2.62 | 0.96 | 255.98 | 255.09 | 241.13 | 236.32 |
| 77.25 | 48.51 | 1.08 | 4.78 | -2.44 | 0.93 | 256.9 | 255.82 | 241.17 | 236.39 |
| 75.62 | 49.72 | 0.72 | 4.66 | -2.79 | 0.81 | 255.8 | 255.07 | 241.87 | 237.21 |
| 76.79 | 48.38 | 0.94 | 4.65 | -2.58 | 0.79 | 256.22 | 255.28 | 240.92 | 236.28 |
| 73.43 | 52.44 | 0.79 | 4.47 | -3.11 | 0.73 | 266.49 | 265.7 | 241.09 | 236.62 |
| 72.44 | 53.78 | 0.7 | 4.47 | -3.2 | 0.72 | 254.06 | 253.36 | 240.29 | 235.82 |
| 71.93 | 54.47 | 0.76 | 4.33 | -3.05 | 0.63 | 253.2 | 252.44 | 240.03 | 235.71 |
| 77.04 | 48.45 | 0.76 | 4.45 | -2.75 | 0.6 | 256.58 | 255.82 | 241.63 | 237.17 |
| 73.2 | 52.32 | 0.86 | 4.07 | -3.04 | 0.33 | 272.59 | 271.73 | 240.5 | 236.43 |
| 71.39 | 55.68 | 0.91 | 4.02 | -2.91 | 0.33 | 257.05 | 256.14 | 240.38 | 236.35 |
| 79.35 | 42.37 | 0.5 | 4.24 | -3.06 | 0.21 | 256.95 | 256.44 | 239.17 | 234.93 |
| 77.5 | 48.58 | 0.86 | 4.02 | -2.66 | 0.16 | 257.38 | 256.52 | 240.67 | 236.65 |
| 73.66 | 52.56 | 0.06 | 3.83 | -3.84 | 0.08 | 260.15 | 260.09 | 241.63 | 237.8 |




http://satepsanone.nesdis.noaa.gov/pub/IASI/alerts/Ash_SO2_Anomaly/index.html

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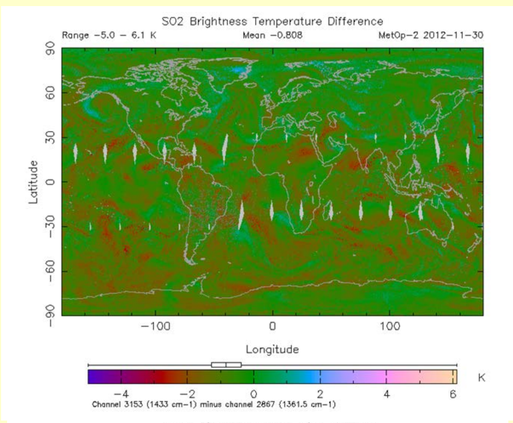


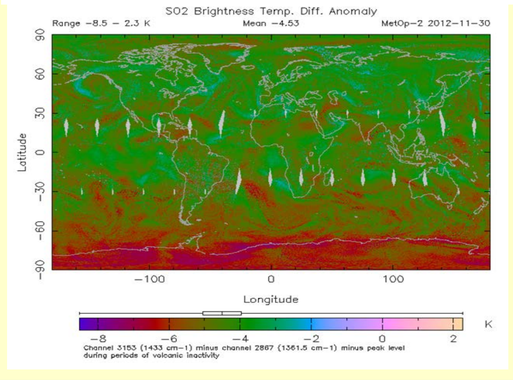


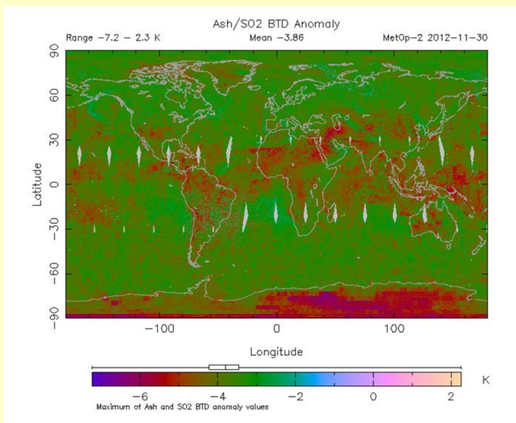


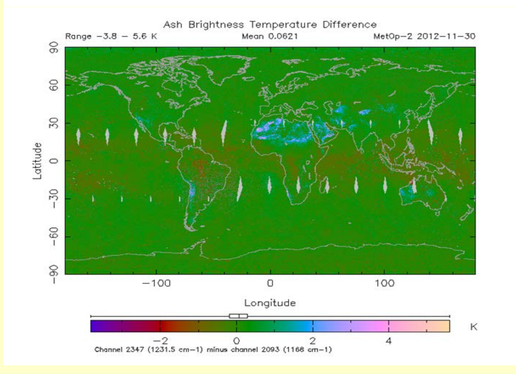


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