

Near Real Time website for IASI observations of atmospheric anomalies

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Introduction

Near Real Time (NRT) observations of atmospheric disturbances, especially volcanic ash and SO₂, are becoming increasingly important, especially with the increasing volumes of air travel around the globe. NRT data can be used to rapidly alert Volcanic Ash Advisory Centres (VAACs) to a new eruption or volcanic plume, so as to warn aircraft in the region, and also to monitor the progression of wildfires and desert dust storms.

To facilitate this, a website is being developed to display data from the IASI satellite instruments in NRT – within 3 hours of measurement. Fast algorithms have been developed that flag the presence of atmospheric anomalies, such as volcanic products, dust and the bi-products produced during biomass burning. An archive of previous events will also be available on the website.

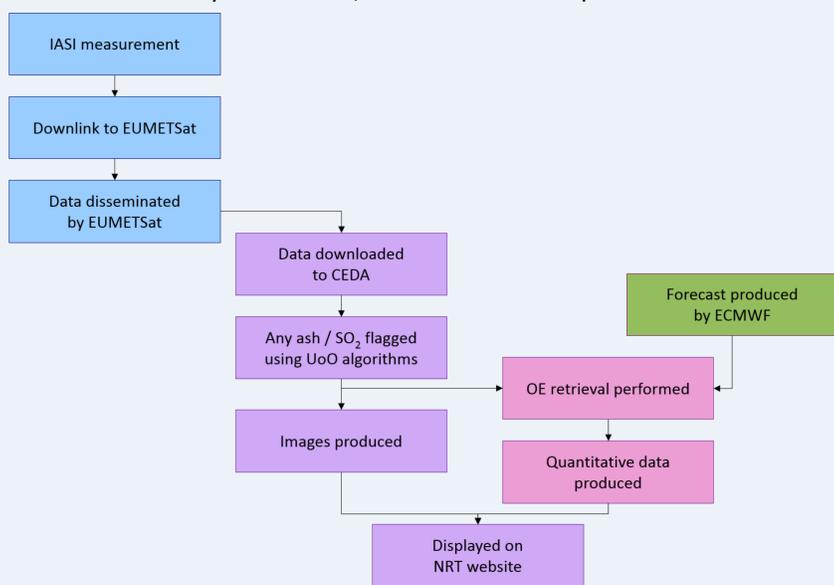


IASI

The first Infrared Atmospheric Sounder Instrument (IASI) was launched on ESA's MetOp-A in 2006, followed by a second instrument on MetOp-B in 2012. The instruments are hyperspectral Fourier transform spectrometers, observing in the infrared, between 645 – 2760 cm⁻¹ (3.62-15.5 μm).

Data Processing

The IASI data are transmitted by EUMETSAT and received at the Centre for Environmental Data Archival (CEDA), at the Rutherford Appleton Laboratories (RAL), Oxfordshire. The data are processed on the CEMS/JASMIN system at CEDA, using algorithms developed in the Earth Observation Data Group (EODG) at Oxford University. The analysis is initially performed to flag the presence of atmospheric anomalies. If an anomaly is detected, the full retrieval is performed.



Data analysis chart, from satellite observation to display

Flagging Routine

The flagging routine uses a linear retrieval technique, allowing for very fast analysis of the data and so is used initially in the NRT analysis. If a pixel is flagged as having ash or SO₂ present in this analysis, the full retrieval is performed.

Full retrieval data

The full retrieval of the IASI data varies depending on the species being retrieved, however they all use an optimal estimation method. For volcanic ash, the cloud's optical depth, altitude and surface temperature and the ash effective radius are all retrieved, along with an associated error matrix. The SO₂ retrieval returns the SO₂ column amount and the altitude, vertical spread and surface temperature of the cloud, again with associated errors. For more details, see Poster B289 (EGU2014-11947, Carboni et al.).

Future Work

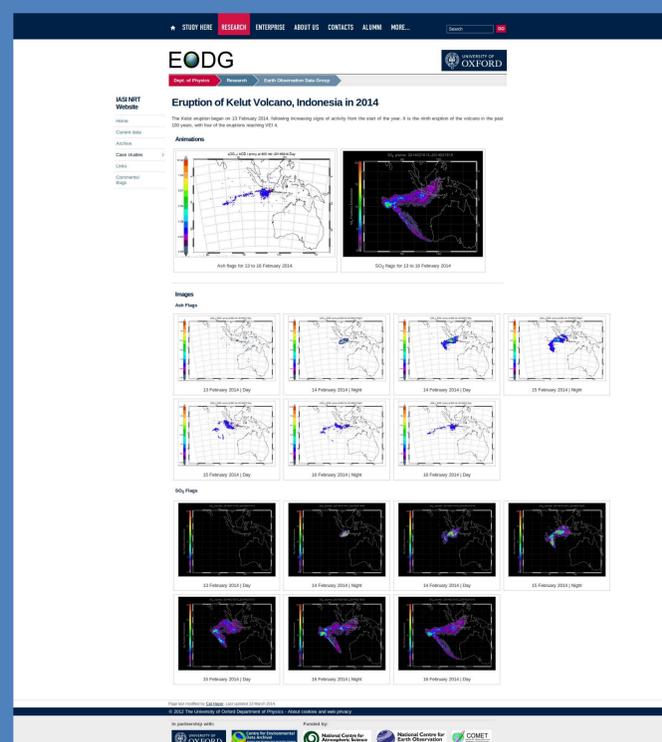
Beta testing of the website is planned to begin within the next month, with the site going live over the summer. Once the flagging routines are working in NRT, the full OE retrieval for SO₂ will be implemented.

Website architecture

The website will be hosted at RAL and administered by EODG. The data will be separated into current and archived data. Global and regional data will be available in both forms. The regional data will focus on different areas which often experience atmospheric anomalies, such as regions with active volcanoes and regions prone to dust storms or wildfires.



The website home page as on 9 May 2010 during the Eyjafjallajökull eruption. Image is displaying the SO₂ flag. North and south polar projections will also be included on this page.



Case study page for the recent eruption of Kelut volcano, Indonesia, in March 2014. Both SO₂ and ash flags are displayed.