ATSR Rush Fire Service

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Introduction

At the request of the user community as well for public information, a fast delivery Service dedicated to fire monitoring application has been set up at ESRIN. The night time acquisitions of ATSR-2 instrument on board ERS-2 are processed in order to visualise and localise the hot spots. The hot spot localisation, the map and the quick look are made available to the users through a web interface.

ATSR instrument

The Along track Scanning radiometer (ATSR) developed by a consortium of laboratories led by the Rutherford Appleton laboratory has been flying on board the ERS satellites since 1991. ATSR-2 has four visible and near infra red channels centred at 0.55, 0.65, 0.87 micrometers, together with mid-infrared channels centred at 3.7, 11, 12 micrometers. ATSR is an instrument with a conical scan producing a double view (forward: 55 degrees and nadir view). The spatial resolution is 1km.
The 512 km swath allows the observation of the same point about every three days (figure 1.).

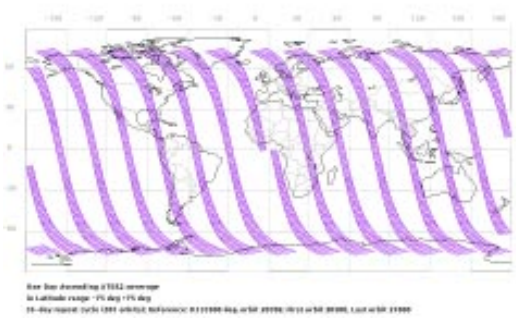

Figure 1

The instrument is equipped with a precise on board calibration system and with a Stirling Cycle Cooler which keep the detector's temperature low and stable. The high radiometric sensitivity and the good signal-to-noise ratio (NEDT ~ 0,05K) enable the detection of fine ground structure.

ATSR data

Night time data are processed by the SADIST software up to Level 1B (GBT) consisting of 512 x 512 m frame rectified in along track/across track coordinates and gridded into 1km cells. The geolocalisation accuracy is less than 1km.

ATSR Rush Fire Service set-up

The ERS-2 low bit rate data are dumped at Kiruna, Maspalomas, Gatineau and Prince Albert. The raw data are then transcribed on exabyte. The exabyte are dispatched to ESRIN where the processing takes place. From the GBT products the hot spots are extracted. A map, a quicklook and an ASCII file with the latitude/longitude and time of the fire are automatically put on the web where they are kept for one month.

Hot Spot Detection

During the night, in the absence of reflected solar energy, the irradiance at 3.7 micrometers coming from the earth's surface at 500K is about 2 orders greater than from the earth's surface at 300K (see figure 2.).

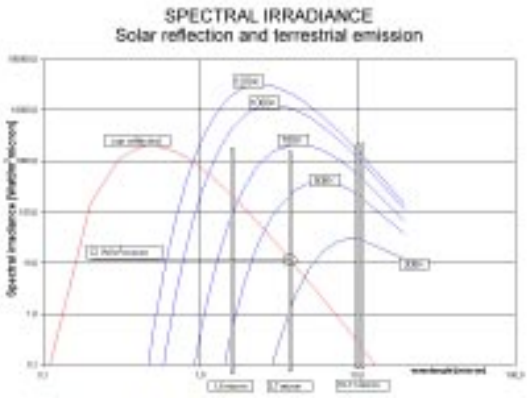

Figure 2

A fire, even less than 1km x 1km will provide a sensitive signal in the 3.7 channel.
Because ATSR was initially design to provide SST, the 3.7 channel saturates at 312 K. A hot spot will be identified each time the temperature reaches this threshold.

Quick-look processing

A RGB colour composite is made from the nadir view images using the 3.7 in the red, the 11 micrometers channel in the blue and an 11 and 3.7 average in the green. Pixel saturation flag in the 3.7 channel is used to identify the hot spot. The hot spot are displayed in red on the quick look.
As the temperature increases, the BT in the 3.7 channel increases quicker than the one in the 11 channel, giving a creamy yellow colour on the quick-look. For the low temperature, the contribution of the 11 and 3.7 channels is equivalent giving a dark grey colour. Coastlines have been overlaid on the images to enhance the land/sea contours. The high quality of the ATSR radiometry product and the precise orbit offer high confidence in the detection and localisation of the hot spots. Some fires can be missed but few false alarms will be detected.

Product Availability

At users request, today four areas are under monitoring:
- South and Central America
- Europe
- West Africa
- India

Europe and India are covered by Kiruna station, West Africa is covered by Kiruna and Maspalomas, South America is covered by Gatineau. The products are available between 3 days to 2 weeks after the acquisition.The area monitored by this service can evolve at the user request and according to the processing chain capacity.

Web Interface

The fire products consisting in the quick-look, map, ASCII files (see figure 3.) are accessible through the web. The access is done by area and per day. After one month the product is removed.

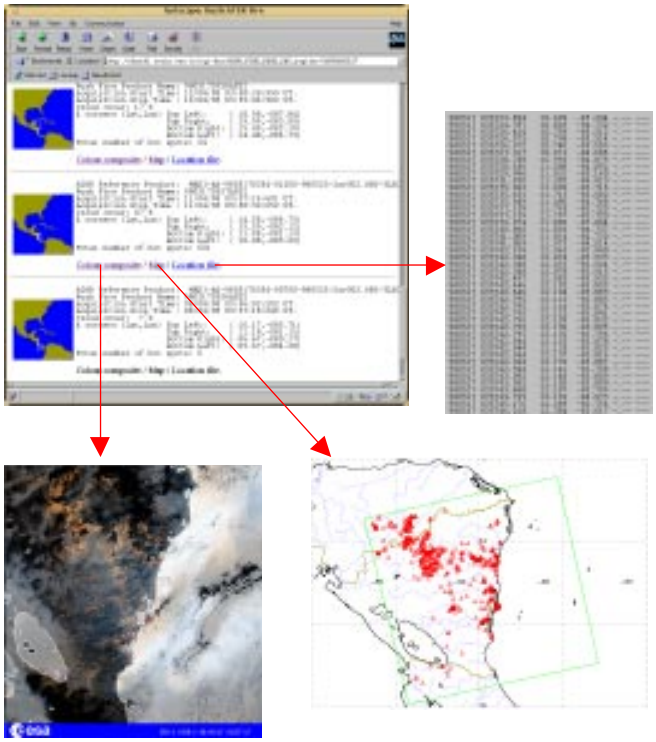

Figure 3

Server historic

Rush Fire Server started in April 1998. Since that date we covered:
- Europe: June-September 1998, February 1999 onward.

- Indonesia: April-June 1998, September-December 1998.
- South America: April-May 1998, September-December 1998, February 1999 onward.
- Central America: may-June 1998, September-December 1998, February 1999 onward.
- Russia: October-November 1998.
- West Africa: February 1999 onward.
- India: February 1999 onward.

Conclusion

The fire detection is important for land use, forestry, atmospheric chemistry, global climate, fire management studies. The fire products from satellites data have been identified by IGBP as an important input for global change analysis. The only solution for a rapid and efficient survey of biomass burning is the use of permanent operational satellites.

The Rush Fire Service developed at ESRIN demonstrates the good ability of ATSR to provide in a quick time the position of the active fires. However, one should take into account the limitation of this service due to the cloud coverage, atmospheric effect, revisiting period; some fires are missed but very few alarms are detected. In some occasions the ATSR fire products have been cross checked with others sources giving good results.

The good feedback received from this initiative demonstrates the importance and the need for a fast delivery service of ready-to-use products to end users.

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1997 World ATSR Fire Product:

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