

Meteosat-8 database @ ITC



Introduction

MSG-1 was launched on the 28th of August 2002. On January 29 2004, the satellite commenced routine operations and was renamed Meteosat-8. The advanced SEVIRI radiometer aboard the MSG series will enable the Earth to be scanned in 12 spectral channels from visible to thermal infrared (including water vapour, ozone and carbon dioxide channels) at 15 minutes intervals. Meteosat-8 data is received via the EUMETSAT Multicast Distribution System (EUMETCast). The EUMETCast system has been established to provide an alternative reception system after the failure of one of the on board power amplifiers of MSG-1.

Data reception and archiving

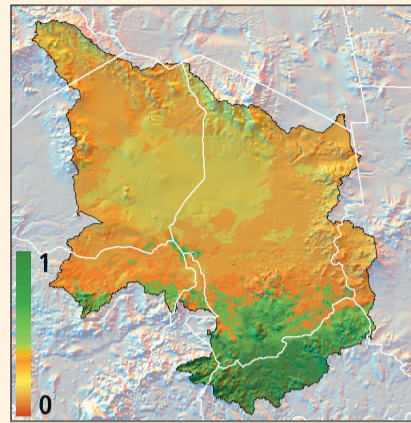
From its geostationary orbit at 0° N, 3.4° W, Meteosat-8 continuously scans the Earth surface and transmits the data to the EUMETSAT Primary Ground Station in Germany (Darmstadt). The received data is pre-processed and rectified into a so called Level 1.5 data-format; furthermore the data is compressed and split in small data-packages. These packages are sent to the uplink station in Usingen (Germany) and are subsequently transmitted to the Hotbird-6 satellite. At ITC, using a satellite dish directed towards the Hotbird-6 satellite, the DVB (digital video broadcasting) signal can be received. The DVB-PCI card in the computer demodulates and decodes the continuous DVB data-stream. Meteosat-8 transmits the data in a Low Rate Image Transmission (LRIT) and High Rate Image Transmission (HRIT) mode. After central ground processing at EUMETSAT, images in full resolution are transmitted in HRIT mode, within five minutes of observation. EUMETCast provides a continuous stream of data from different platforms ranging from Meteosat 5, 7 and 8 to NOAA and GMS allowing near global coverage (at three hours intervals). At ITC all EUMETCast data is received but only the high rate information transmission (HRIT) data is archived. This data set is about 85 % of the total data stream. ITC is receiving the images under license from the Royal Dutch Meteorological Institute (KNMI) as METEOSAT's national point of contact. For education-research institutes no additional costs for data receiving applies as the data is requested for educational and open research usage.

Database development

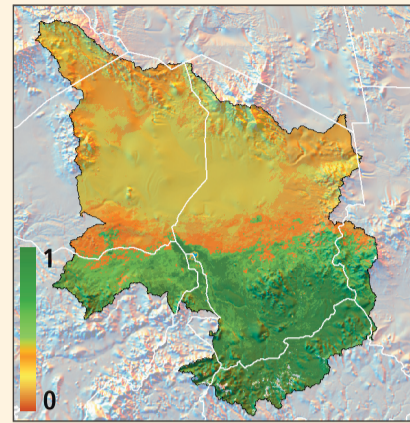
After an initial test period at ITC combined with some software development a Meteosat data archive is under construction. Currently every 15 minutes the high resolution and 11 low resolution channels are received. The high resolution channel consists of 24 segments stored as separate files, the low resolution channels consist of 8 segments. All segments are stored in their original lossless wavelet compressed file format. This results in the smallest demand for storage space, coupled with no further user interference (fully automated, only a provisional system check once a day). In total 14000 files, equivalent to 7.5 Gigabyte, are stored per day. A software tool has been developed to move the relevant data, based on the acquisition date and time, to specific folders. It also creates entries in a log file if data is missing and optionally it can send warning emails if large problems, like system failures may occur. The data is stored on high capacity disks of 1 Terabyte to provide easy access and retrieval. These disks are connected to a system that shares the disks online over a network.

Data base quality: Monthly maximum NDVI of Chad Basin, Africa

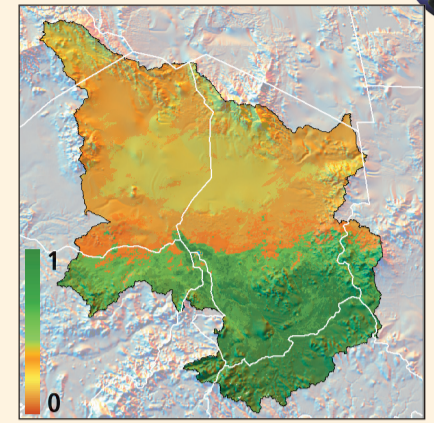
Meteosat-8 images are received and stored with low cost off-the-shelf hardware, consisting of two computers and TB-USB disks, a satellite dish and a receiver card. In order to validate the quality of the data archive a 713 x 728 pixel selection of one year of data has been retrieved and processed. A daily 12.00 hr. UTC NDVI was computed, corrected for cloud cover (using a simple cloud temperature threshold), aggregated using the maximum NDVI value within a specific month, from July 2004 till June 2005. Given the online availability of the whole archive the time series could



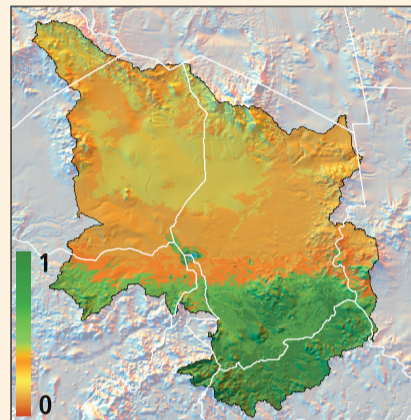
Maximum NDVI July 2004



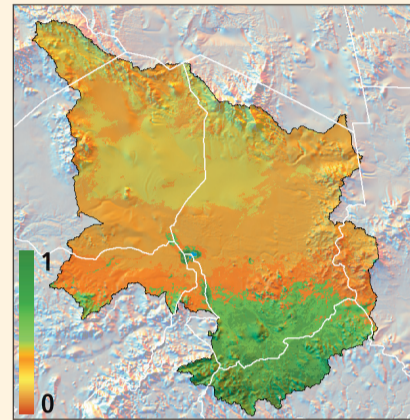
Maximum NDVI August 2004



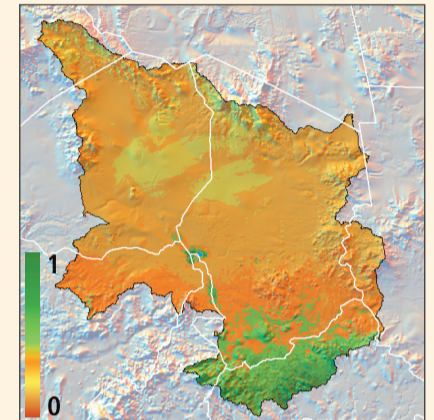
Maximum NDVI September 2004



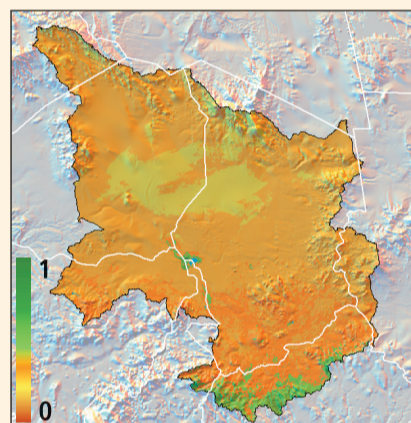
Maximum NDVI October 2004



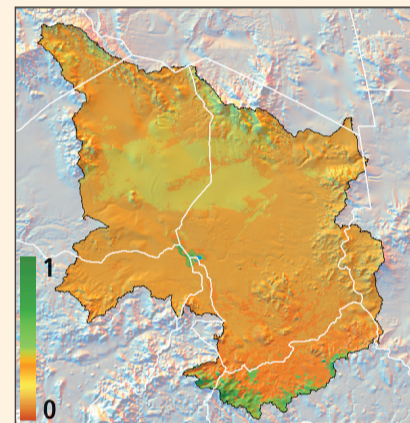
Maximum NDVI November 2004



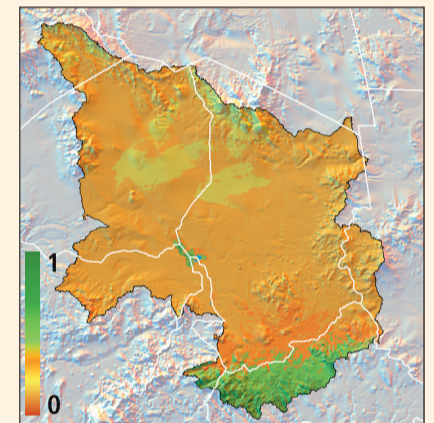
Maximum NDVI December 2004



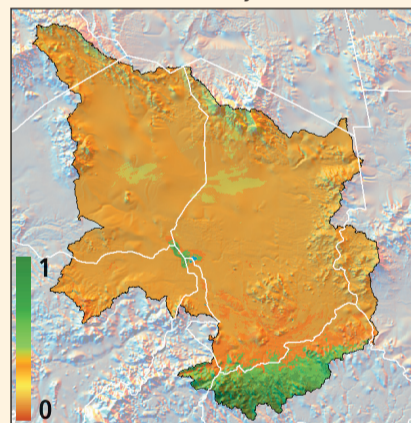
Maximum NDVI January 2005



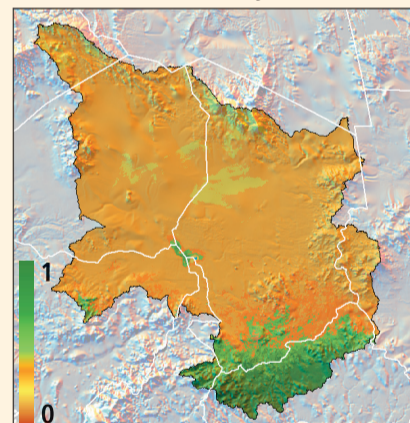
Maximum NDVI February 2005



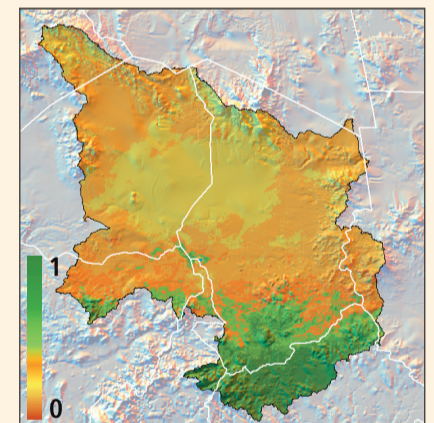
Maximum NDVI March 2005



Maximum NDVI April 2005



Maximum NDVI May 2005



Maximum NDVI June 2005

be quickly assembled using the MSG Data Retriever developed at ITC. With regard to the completeness of the existing data archive, only for a few days data availability problems occurred. Over 95 percent of the data used to construct the time series could be retrieved and imported without problems. The calculated maximum monthly NDVI time series is shown in the figures given.

Conclusions

The current low cost system of data reception and archiving performs very well. Having online access to the whole archive

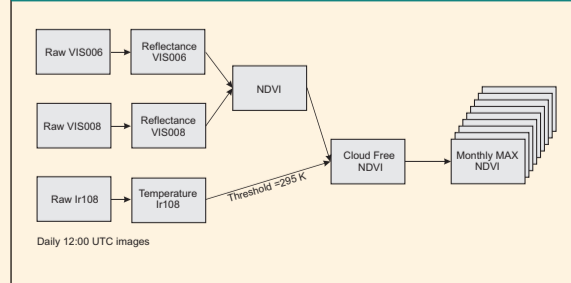
is very efficient in terms of time series construction. A few data gaps occurred but these can easily be replaced by taking images recorded just prior or after the 12.00 hr UTC target image. Given the huge amount of data involved the archiving system is currently the most expensive part. At ITC the complete geographical coverage comprising of all spectral bands of Meteosat-8 is stored. Organizations with a focus on a dedicated geographical area need far less storage capacity if their area of interest is stored only. Continuously the archive is expanded making it more valuable for future research.

For more information:

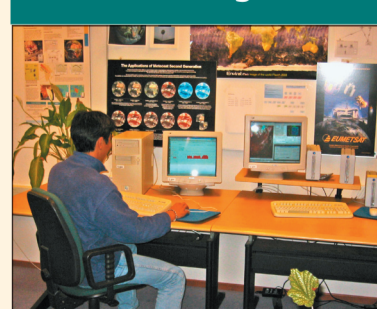
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<http://intranet.itc.nl/support/it/support/Documents/Expertise and Knowledge/Earth Observation Systems/Meteosat Second Generation.htm>

NDVI processing chain



MSG receiving station



ITC