Meteosat-8 @ CGIS-NUR, Rwanda

Introduction

In March-April 2006 a low-cost Meteosat Second Generation ground receiving station was installed at the Centre for GIS at the National University of Rwanda (CGIS-NUR) in Butare. The system-configuration developed ensures a low-cost alternative to build a METEOSAT time series archive coupled with free- or shareware processing tools for applications relevant for environmental, hydrological and meteorological organizations in Africa dealing with geo-spatial temporal data analysis, like the CGIS-NUR.

System overview

The system utilizes a C-band LNB, a 2.4 diameter parabolic dish, a receiving computer with a Broadlogic-DVB PCI card connected to a processing computer. Additional disk space for data storage of the continuous data stream received is provided through two USB-Terabyte disks which can be expanded when more storage requirements are needed at a later stage. Additional software used, developed at ITC, is firstly a MSG File-Manager, performing the data transfer between the receiving station and the data processing and archiving system in an orderly manner. The data is stored in their raw compressed format as they are received and no further user interference is therefore required. To preserve disk capacity a software program allows selected segments to be deleted only storing e.g. the 4 central MSG-low resolution segments and the corresponding 12 HRV segments, reducing the data storage volume and still covering most of the African continent.

Secondly for data import a software tool called the MSG Data Retriever is developed which facilitates the import of the raw compressed (time series) data into common used image processing software package formats. The data is geometrically and radiometrically calibrated during the import procedure and can be transformed into their original 10 bit radiometric resolution, compressed to 8 bit, transformed into radiances, temperature (in Kelvin) or reflectance, based on the channels selected. Thirdly, in order to process the images additional tools are developed and are integrated in the ILWIS software package (shareware) capable to handle and analyse time series data together with scripts which allow nearly full automated processing to retrieve a number of products relevant for meteorological, environmental and hydrological applications.

Additional programes for data processing are provided as Java applets, e.g. to compute solar zenith/azimuth angles for a given date and time which might be needed for dedicated analysis. Annotated animations can be generated with generic Windows tools. Other routines can be developed according to specific user needs using the extensive map and times series calculator in ILWIS and eventually be automated using the Script language capabilities.

For more information:

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Meteosat @ CGIS-NUR

The system-configuration described here provides a low cost alternative to the "non-traditional meteorological" user community in Africa, applying the Meteosat data to a multitude of important environmental science related applications. The MSG SEVIRI sensor capabilities and current favorable data distribution policy - license agreement of EUMETSAT, for Research and Education Institutes like the CGIS-NUR, has recently opened the way for new initiatives. With an operational system to receive, handle, store and analyse multi temporal Meteosat images, CGIS-NUR is in a good position to offer this enhanced capability for further (inter) national research and capacity building and can actively collaborate and contribute to international networks as the data received cover the whole African continent. With time an archive is constructed consisting of images recording the dynamics and the state of the environment every 15 minutes. This archive can be utilized for further CGIS-NUR Research and Development to obtain a better insight in the changing conditions of the environment and to provide national authorities as well as international bodies (e.g Nile Basin Initiative) with information and expertise to assist them in their policy making process.

For calibration and validation of the processed images several instruments have been installed at the CGIS-NUR premises. The information collected is logged at 30 minutes interval (e.g. radiance, temperature, wind direction and wind speed, rainfall). Also a water level recorder is installed. After calibration and validation the transformed high temporal satellite image observations can be used for regionalization and up-scaling of the meteorological station's spot measurements, eventually in conjunction with other satellite based sensor observations (e.g. TRMM or the altimeter used for lake level determination onboard Envisat).

Conclusion

The challenge for the period ahead is to utilize this capability for Education, Research en eventually produce various (dynamic) Meteosat derived (regular) products required by e.g. environmental organizations to assist them in reaching their (Millennium) development objectives. CGIS-NUR is now readily equipped to take up this challenge and to further develop their capacity through active (inter) national collaboration.







C-Band parabolic dish

Meteosat-8, first image received at CGIS-NUR using the EUMETSAT-EUMETCast data distribution service / 04-04-2006, 09:15 UTC / Channels VIS006, VIS008, IR 016 using a natural colour transformation





observation station installed at CGIS-NUR, measuring rainfall, radi-

ance, temperature, windspeed, humidity. Data are currently logged at 30 minutes interval



System setup at CGIS-NUR



Cloud Masking and animation creation

Overall EUMETCast system configuaration

Linking spot measurements from the meteotower with Meteosat-8 Top of Atmosphere Channel IR_108 observations



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