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The San Marco Project in Malindi (Kenya)
The Italian contribution to Space Technology for Sustainable Development

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UNISPACE III
Wien Declaration on Space and Human Development (1/2)

Following the UNISPACE III recommendations, in particular those regarding:

- Protecting and managing Earths' resources
- Using space applications for human security and development
- Enhancing education and training opportunities
- Enhancing international cooperation in space science and technology and its applications

Italy pays special attention in implementing applications based on remote sensing data for the sustainable development of Africa

UNISPACE III
Wien Declaration on Space and Human Development (2/2)

Italy and Kenya are co-operation since 1964 in the San Marco Project, with the development of a Space Center in Malindi – Kenya, called "Broglio Space Centre" (BSC)

- During the last months, ASI has been revising and improving the activities carried out at the Centre
- Attention is paid to the Remote Sensing activities, with the intent and aspiration to develop more and more BSC into a Remote Sensing Space Centre serving the Region

This presentation introduces the BSC and its activities

Background (1/4)

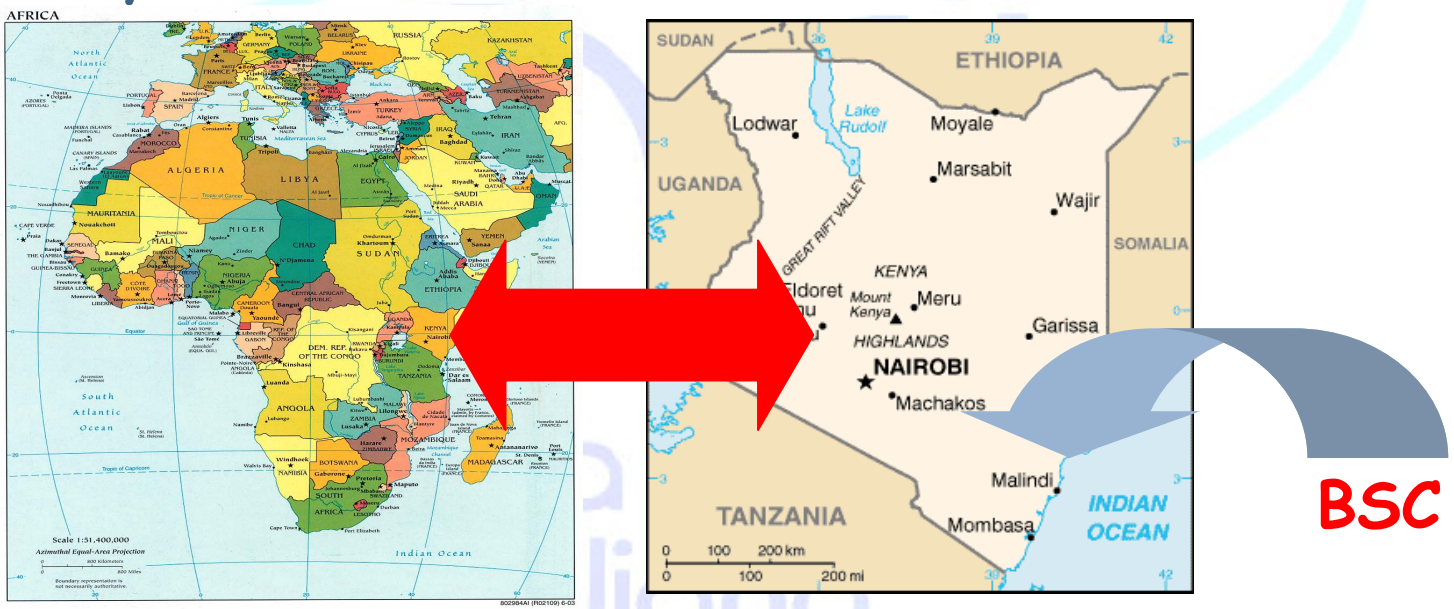
- The facility was established in 1964, managed by the University of Roma "La Sapienza" until 2004. Since then, the management has been transferred to the Italian Space Agency – ASI.

- In 1995 an inter-governmental agreement has renewed the bilateral co-operation between Italy and Kenya concerning the Satellite Tracking and Launching Station at the BSC in Malindi, taking into account the need to promote the exploration and use of outer-space for peaceful purposes.

- Activities at BSC during the past 40 years span from rocket launches to satellite TT&C support and Remote Sensing image acquisition. A Remote Sensing Centre (RSC) is active at BSC to acquire, pre-process, archive and distribute EO satellite data.

Background (2/4)

The BSC is located at 3° South and 40° East, by the sea near Malindi, in Kenya.



The location is ideal to launch and support equatorial satellites and acquire Earth Observation (EO) images over the Central and Eastern Africa region.

Background (3/4)

The San Marco Base is composed by two parts:

Sea Segment

Land Segment

Background (4/4)

The Sea Segment is dedicated to orbital and suborbital launches for scientific payloads and satellites from the off-shore platforms

Number of launches: 27 (9 satellites): 100% success

- LV: Scout; Nike; SuperARCAS; ASTROBeed
- First launch: March 1964 - Nike Apache;
- Last launch: March 1988 – SCOUT SV 206 – San Marco D/L

The Land Segment supports launches and the other BSC activities. On a 35.000 sq m are:

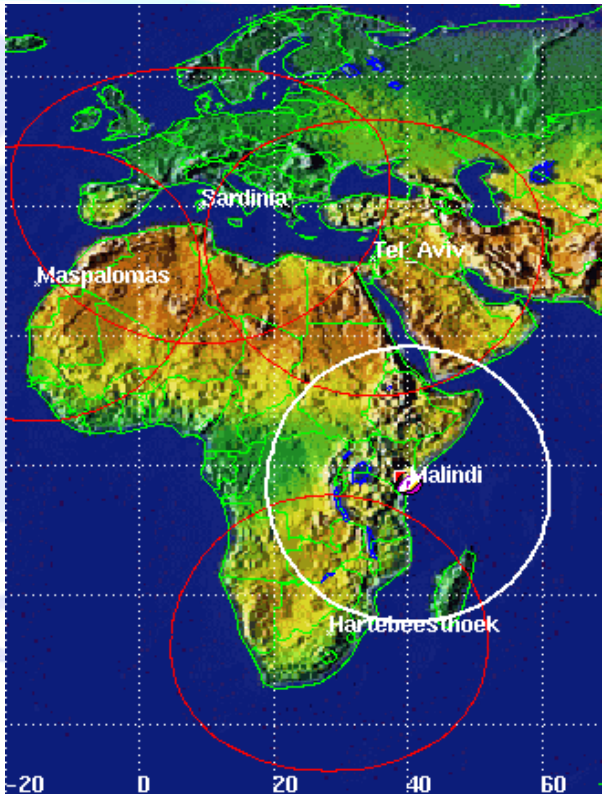
- 3 Ground Stations for Satellite Data Acquisition;
- Remote Sensing Center;
- Meeting and Training Center;
- Logistic Facilities.

Remote Sensing Facilities and activities (1/6)

RS activities at BSC started in 1997 with the acquisition of ERS-1 SAR

The area covered by the acquisition circle has a radius of about 2,000 Km for a typical EO satellite altitude.

This allows the acquisition of satellite images covering all the East and Central African countries including the islands in the Western Indian Ocean region (WIO).



Images regularly acquired at BSC include MODIS/Terra, MODIS/Aqua, SAR/Ers-2, AVHRR/NOAA and SeaWiFS/SeaStar

Remote Sensing Facilities and activities (2/6)

The Remote Sensing Centre at the BSC acquires EO satellite images both in L-band and in X-band. An average of 12 to 15 images per day are acquired from different sensors, processed and archived. The 6.2 m antenna in X-band is used to acquire MODIS/Terra and MODIS/Aqua.

Remote Sensing Facilities and activities (3/6)

The L-band system hosted at BSC Remote Sensing Centre, used to acquire NOAA/AVHRR and SeaStar/SeaWiFS.

Remote Sensing Facilities and activities (4/6)

All data present at the RSC, including satellite imagery, is available for free to the Kenyan research community and other governmental agencies.

Satellite data very valuable to ocean applications is available at the BSC. The Kenya Marine and Fisheries Research Institute (KMFRI) uses data from BSC to predict and map potential fishing zones in the WIO region.

Data from the BSC has also been used by other researchers in assessing desertification hot spots in the Northern frontier districts in Kenya, or in studying and tackling the Lake Victoria water hyacinth issue

Interested researchers from institutions in the region may access this data through partnership with the local research communities, or seek authorization from the Kenya Government

Remote Sensing Facilities and activities (5/6)

Activities at the geophysical station started in 1999 with a regular balloon atmospheric sounding

Balloons, filled with helium, are released in the atmosphere measuring the ozone content, pressure, temperature and humidity during their ascent that usually reaches around 35 Km

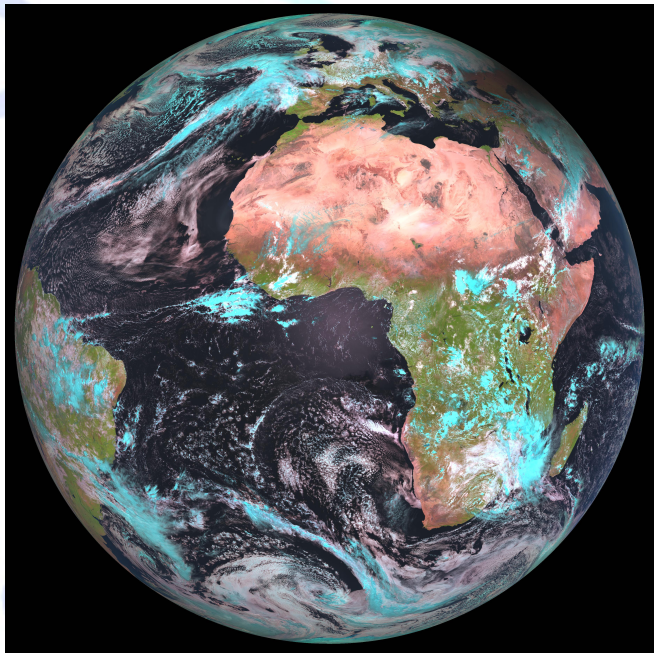
Data acquired locally are compared with those obtained at Kenya Meteorological Department station in Nairobi

BSC is part of the international project SHADOZ (Southern Hemisphere Additional Ozonesondes) that gathers ozone atmospheric data from a network of facilities distributed all around the world

Remote Sensing applications

In the spirit of the Italy-Kenya cooperation, ASI plans to transfer some of the application activities from its Remote Sensing Centre "Centro di Geodesia Spaziale G. Colombo" in Matera (Southern Italy) to BSC

The first applications is the Hot-Spot Detection System (HSDS) based on MSG images, devoted to the early detection of wild fires in the region. The operational activation of this service for the Central and East Africa region at BSC Malindi, is foreseen at the mid year 2007



An example of and RGB composite image obtained with channels 3,2,1 of MSG/SEVIRI.

Another RS application regards the detection of oil spill. Being already operational at the ASI Matera Centre for the Mediterranean Sea, it is based on ERS2/SAR images

Training on Remote Sensing applications

Several courses have so far been organized at the BSC by the University of Roma "La Sapienza" with participants drawn from the local universities, research institutions and Kenya government departments

The involvement of Italian Universities at the BSC guarantees adequate training and study cycles, so that students from the region have a platform and environment to develop their theses, post graduate studies and access to advanced technology and knowledge.

Cooperatios and Partners

Various local and regional institutions have shown interest to cooperate with the BSC satellite receiving station to utilize and add value to the data available. Currently, negotiations are going on with the following institutions

Kenyan

- Department of Resource Survey and Remote Sensing (DRSRS);
- Department of Meteorology at the School of Physical sciences, University of Nairobi (UoN);
- Kenya Marine and Fisheries Research Institute (KMFRI).

Regional and international

- IGAD Climate Prediction and Applications Centre (ICPAC);
- Intergovernmental Oceanographic Commission (IOC/UNESCO);
- Regional Centre for Mapping of Resources for Development (RCMRD).

Developments

BSC has the possibility to further develop in the following areas

Capacity-building and technology transfer

- The continuous involvement of Italian Universities at the BSC will guarantee adequate training and study cycles, so that students from the region have a platform and environment to develop their theses, post graduate studies and access to advanced technology and knowledge
- BSC is open to share its expertise and experience to support courses organized, for example by the European Commission Joint Research Centre and by the European Space Agency

Regional Centre for Space-based information for Disaster Management

- UN Platform for Space-based Information for Disaster Management and Emergency Response (SPIDER);
- implementation of expertise in use of space technology in disaster management;
- access to space-based information relevant to disaster management.

Conclusions

- The Broglio Space Centre offers a unique opportunity to acquire satellite imagery for the Central and East Africa region.
- The presence of the remote sensing facility at the space centre and the various space related activities enhance the opportunities for real-time data availability for various applications.
- Satellite technology is relatively new in the Eastern Africa region and therefore requires capacity building opportunities and end-users training. This can be provided by the involvement of the Italian an European Universities and Centers in Malindi.
- The implementation of a regional remote sensing centre with the mentioned goals is very promising.

Conclusions

Thank you for your kind attention

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