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M. Labiadh, M. Briki, N. Ben Khatra

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Space-based tools for surveillance of natural resources

Thematic mapping

by Moez LABIADH, Mourad BRIKI & Nabil BEN KHATRA

Context

The contribution that satellite data have made to monitoring natural resources cannot be challenged: the multitude of applications based on space-based remote sensing along with the reliability of such software confirms this contribution.

Concerning the monitoring of natural surfaces (ground and vegetation), remote satellite sensing permits drawing up inventories area by area and characterising the state of the resources, estimating and foreseeing the variations in the occupation and use of the soils, as well as assessing and quantifying the production of strategic plant cover (cereals, grazing land, forest...).

The importance in the decision-making process of the information derived from satellite data no longer needs demonstrating, especially in relation to the management of natural resources in arid areas threatened by ongoing degradation. Effectively, the use of such information permits the accurate description of the state of the natural resources and the monitoring of their evolution and exploitation. In fact, this information constitutes the basic material making it possible to design and implement a strategy for the sustainable management of the regions' natural resources, thus contributing to the struggle against their deterioration.

Given that space-based remote sensing offers an efficient tool for gathering data and producing crucial up-to-date, accurate information, taking the greatest advantage of space detection has become absolutely essential for enhancing our understanding of our environment. The capacity to set up the "chain production" of information based on satel-

1 - LCCS: Land Cover Classification System

2 - Project for the "Reinforcement of resilience by innovation, communication and knowledge".

3 - Project for the "Improvement of the resilience of the populations in the Sahel in the face of environmental mutation".

lite data works in favour of the implementation of those various multilateral agreements on the environment whose objectives involve the very long term.

Indeed, for the management of natural resources, there can be no avoiding data either from cartography or space detection. The data from satellites needs to be better exploited: the cost of mapping resources on the basis of remote space sensing is cheaper than with classical methods and, moreover, the time required for carrying out the work is shorter. The value of such advantages is multiplied when the object or phenomenon to be monitored involves a vast area.

on a vast scale using the data acquired in (quasi-)real time by the GEONETcast reception station. This work has resulted in geographic maps on the following themes: precipitation, aridity, drought, evapotranspiration, plant cover (indices of vegetation), biomass and carbon fixing and the water resource.

Online tools have also been developed to facilitate the analysis and interpretation of the time-line series.

Management and diffusion of the information from space

The OSS has developed a group of tools to facilitate the diffusion and sharing of the maps made within the framework of its projects and programmes. It is made up principally of:

– *SIG and geographic databases*

These are a collection of data from space that have been gathered, treated, organised and stocked in SIG form. These tools permit the visualisation and analysis of an ensemble of parameters that are directly or indirectly related to the themes of the project in question. To enable the remote-sensored information to be accessed at different levels, "mobileSIGs" have been developed and implemented in digital form (USB sticks).

– *Geoportal and Internet geographical services*

These online tools are aimed at very large-scale diffusion of the geographical data. The BRICKS² geoportal facilitates the centralisation of information collected or created within the framework of the project and provides rapid access to users to explore, visualise and download the maps and related products.

– *Atlases*

The OSS has created a series of theme-based atlases with the objective of sharing at a national level the maps of land use/cover made within the framework of the REPSA-HEL³ project. Besides the maps, each atlas includes a section on the state and dynamics of the environment of the country concerned.

Mapping the ground cover

The method of mapping the occupation of the land developed by the Observatory of the Sahara and the Sahel (OSS) is based on the free LANDSAT-8 (30 m) high-resolution digital imaging software acquired in 2015.

The approach used aims to optimise the time and the costs involved in handling the data while maintaining the overall quality of the final products. The mapping process is made up of two main stages:

– the automatic classification of the images,

– the visual interpretation of the results in order to reconstitute the previously-identified classes of soil use in accordance with the norms of the FAO/LCCS¹.

Validation was carried out via a collaborative phase with the participation of national institutions and experts.

No fewer than twenty-two maps of land use and cover were made at 1/200,000 for the countries of West, North and East Africa. The map at the regional level was developed in 2017.

Monitoring bio-physical variables by remote sensing

Using the time-line series of data from the Earth Observatory to draw up maps showing the basic parameters for climate and ecology: starting with this framework, the OSS has ensured the monitoring of these parameters

Moez LABIADH
Consultant,
remote sensing
labiadh.moez@
oss.org.tn

Mourad BRIKI
Head of
environmental
monitoring
mourad.briki@
oss.org.tn

Nabil BEN KHATRA
Coordinator,
environment
programme
nabil.benkhatra@
oss.org.tn

Observatory of the
Sahara and the Sahel
www.oss-online.org