



# 1<sup>st</sup> Scientific-Technical Conference of the Geological and Mining Institute of Spain- National Center (IGME, CSIC)

July 12-13, 2022  
IGME headquarters in Tres Cantos, Madrid

## PROCEEDINGS

Jorge Jódar Bermúdez  
Teresa Llorens González  
Jorge Colmenar Larena  
Esther Izquierdo Lavall  
Cesar Husillos Rodríguez  
Blanca Martínez García  
Juan López Vinielles  
Ignacio L. Marzan Blas  
Editors

## Remote sensing applied to litho-structural and regolith mapping of the SW of Angola (PLANAGEO Project)

J.C. Gumiel<sup>1,\*</sup>, T. López-Bahut<sup>1</sup>, R. Martín-Banda<sup>2</sup> and L. Quental<sup>3</sup>

<sup>1</sup>IGME, CSIC. Madrid, Spain

<sup>2</sup>IGME, CSIC. Oficina de Proyectos Sevilla, Spain

<sup>3</sup>LNEG. Lisbon, Portugal

\*Corresp. Autor. C/Ríos Rosas 23, 28003 Madrid, Spain. [jc.gumiel@igme.es](mailto:jc.gumiel@igme.es)

### Abstract

IGEO (Geological Institute of Angola) has developed the so-called “PLAN NACIONAL DE GEOLOGIA DE ANGOLA” (PLANAGEO). Within this ambitious project, one of the basic subprograms was focused on the remote sensing survey of the country. The main objective of the study is the use of satellite Earth Observation data in order to support preliminary geological and regolith mapping. This allows us to obtain a first approximation to cartography 1:250.000. Litho-structural and regolith maps are elaborated over eight blocks, covering one-third of the country area and including different geological contexts.

For this purpose, multispectral scenes acquired by the Operational Land Imager (OLI) sensor of the Landsat 8 satellite were used. The scenes were selected during the dry season (which in the case of Angola corresponds to the southern winter) and with the lowest percentage of clouds as far as possible. The Landsat 8 images are geometrically corrected (Level 1 T- Land Correction). Image’s pre-processing was carried out including: i) radiometric correction (conversion of original digital levels to physical parameters as radiance and top-of-atmosphere reflectance) and ii) atmospheric correction to reduce atmospheric and illumination effects on satellite image data to retrieve surface reflectance. Image processing techniques were applied to support the litho-structural and regolith interpretation.

The Litho-structural Interpretation Map differentiates types of lineaments and categorizes lithologies from photo-interpretation of Landsat 8 images and their derived products. The methodology used for the elaboration of this map is based on: i) data collection and analysis of the ancillary information, and ii) its integration into a GIS includes all the products obtained during the processing of Landsat 8 images, the digital model of elevations (MDE) and the data obtained in the airborne geophysical campaign (magnetic and gamma-ray radiometric data).

The Regolith Interpretation Map provides information on the nature and distribution of regolith deposits and the main geomorphological units. The methodology to characterise and map the different regolith units is based on: the integration of geomorphological and lithological features; the soil and climate characteristics; and the information from gamma-ray radiometry (in the form of U-K-Th ternary image) with Landsat 8 images processed by applying DPCA (Directed analysis of principal components) technique.

The result is a thematic series of litho-structural and regolith maps distributed into 1:250.000 sheets for the different studied blocks in the SW of Angola.