

Mapping CAMP formation in the northern flank of Tindouf basin by integrating remote sensing and geochemistry data

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The Central Atlantic Magmatic Province (CAMP) is one of the Large Igneous Provinces (LIPs) in the world. It coincides with the breakup of Pangea and first opening stages of the central Atlantic Ocean. The CAMP consists of mafic rocks, often in a form of sills, dikes and lava flows which spread across four continents (Africa, North America, South America and Europe). The Algerian CAMP appears in the southwestern Paleozoic basins (Bechar, Tindouf, Hank and Taoudeni) where the magma is intruded within the Paleozoic sedimentary series in the form of giant sills and long dikes. The CAMP formations in western Africa are classically subdivided into four stratigraphic units (Lower, Intermediate, Upper and Recurrent). However, only the upper and recurrent units were recognized by previous works in the Tindouf basin. These two units are geochemically and petrographically well studied. But, their spatial distribution and emplacement mode are still unknown.

This study aims to map CAMP units in the northern flank of Tindouf basin by integrating geochemical and remote sensing data. In a first step, a basic remote sensing techniques such as color composites and ratioing have been applied to Landsat 8 images to locate the different CAMP outcrops in the study area. Then, a field mission was performed to validate the preliminary results and collect samples for geochemical and petrographic analysis. The field and laboratory observations show the existence of three different units: upper, recurrent and chimneys units. The analysis of the combined geochemical results and reflectance values shows a strong concordance between the mineralogical composition and the spectral response of samples. Therefore, we can see that the reflectance variation on CAMP units is widely controlled by iron, magnesium and calcium oxides. According to previous results, advanced image processing techniques have been applied on Landsat 8 and Sentinel 2A images. The three units were located and mapped with 10 meters accuracy. Furthermore, the analysis of the spatial distribution of these units, linked to the formation type (sill, dike or chimney) and to the stratigraphic hosted level (Devonian or carboniferous), may give us keys to understand the emplacement mechanism and ore potentialities.

Keywords: CAMP; Tindouf Basin; remote sensing; volcanic sulfides; dolerite

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