INTRODUCTION.

The Guadalquivir Basin (GB) in southern Spain is an ENE-WSW elongated foreland basin developed during the Neogene and Quaternary between the external units of the Betic Cordillera and the Iberian Massif. It is located at a strategic position for studying the role of tectonic and climatic processes in the functioning of the connection between the Mediterranean Sea and the Atlantic Ocean, which has played an important role on the Earth’s climate since the late Neogene. Geochemical and mineralogical data are very scarce (Pozo et al., 2011), so new data are necessary to clearly explain and constrain new environmental data.

MATERIALS AND METHODS.

In this study 60 fine-grained samples, Pliocene to Holocene in age, corresponding to 10 boreholes of the lower Guadalquivir basin have been analysed at the IGME laboratory by means of XRF analysis (major and traces). Bulk and <2 micron mineralogy as determined by X-Ray diffraction. In addition, a petrographical study on 70 coarser-grained samples and a statistical analysis integrating all data have also been made in order to compare and discriminate the compositional characteristics of different units.

Composition of oxides and trace elements over the 63 samples analysed was determined by analysis FRX + atomic absorption (sodium), data management software used was ProGraph. For statistical analysis of the composition of the 53 samples analysed was used STATGRAPHICS Centurion XVII software.

P Petrography.

Below: correlation values of major oxides and compositional data for GB, very close, with no significant differences between three of the units of the studied boreholes. As shown, average values for the different units are very close, with no significant differences between fine-grained sediments of Marismas, Lebrija and Doñana formations. Only Sr values for Marismas Fm can be considered higher and these high values can be possibly related to the presence of organic matter.

Table on the right shows maximum, minimum, and average it values for all the samples grouped in three of the units of the studied boreholes. As shown, average values for the different units are very close, with no significant differences between fine-grained sediments of Marismas, Lebrija and Doñana formations. Only Sr values for Marismas Fm can be considered higher and these high values can be possibly related to the presence of organic matter.

Below: correlation values of major oxides and traces for Marismas, Lebrija and Huellas Formations.

- Ca-Fe high positive and Sr-Si high negative values are consistent with variations in bioclastic contents and carbonate or silicilastic abundance in the samples.

- Si-K-Al Fe-Al indicates also fine-grained detrital components vs. bioclastic content in the samples.

- La/Co-Rei-AI indicates also that REE elements are related to clay minerals.

- Zr/Al high positive values can be explained as a sorting process.

Different values have been found in Huellas Fm regarding Lebrija and Huellas formations, for Ca-Co-Ni-Zn metals vs major oxides and MgO-trace metals, that can be interpreted as presence of other metal carriers (oxides or sulphides not detected by XRF) and, for MgO, differences in the content and composition of clay minerals / carbonates (both Mg-carbonated bearing minerals).

This is a preliminary work in the framework of the Guadalquivir project that deals with the tectonic and climatic evolution of GB. The aim of this study is to define the general geochemical features of the upper Neogene units of the Lower GB and to look for the best proxies to study the environmental changes along the sequence and changes on source areas.

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MINERALOGY AND CLAY MINERALOGY

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RESULTS OF BULK MINERALOGY.

Table of the right shows maximum, minimum, and average it values for all the samples grouped in three of the units of the studied boreholes. As shown, average values for the different units are very close, with no significant differences between fine-grained sediments of Marismas, Lebrija and Doñana formations. Only Sr values for Marismas Fm can be considered higher and these high values can be possibly related to the presence of organic matter.

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Clay mineralogy is made of abundant smectite, interstratified illite/smectite, illite, kaolinite and sporadic palygorskite and chlorite. Significant differences have been found in the smectite crystallinity and illite/smectite interlayering along different cores mainly in SL, VP y VF in Huellas Formation that can be related to environmental changes in source area.

In addition to the clay minerals as determined by XRD, plagioclase has been identified on coarse-grained samples as granules and pellets. Textural features and optical properties on coarse grained can indicate that some of the clay mineralogy of Marismas Fm can be related to the alteration of previous Fe-Mg rich silicates.

This study gives a general view of main compositional features of the upper units of the Lower Guadalquivir basin. Main compositional variations seems to be related to sorting, and silicilastic vs bioclastic components, being the main silicilastic components very close in nature.

Nevertheless, these preliminary results show that clay minerals seems to be a promising proxy of environmental and source areas changes to be used on this area.

REFERENCES.


This abstract is a contribution to Guadalquivir project: CGL-2012-39875