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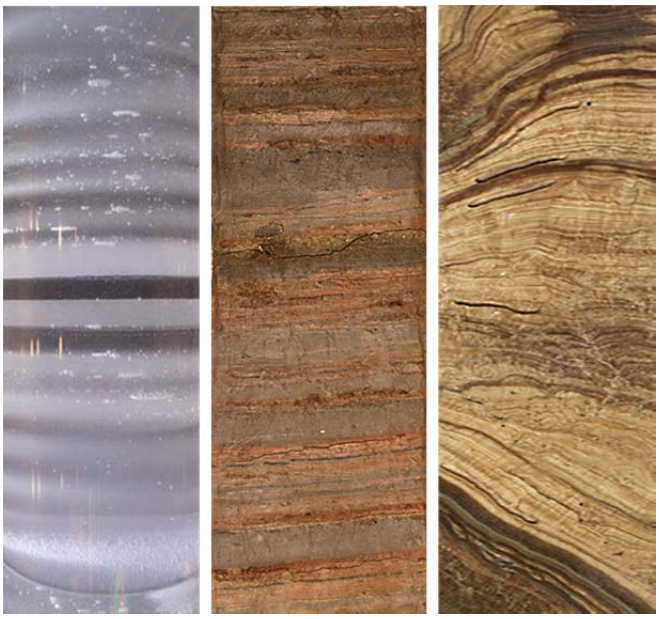

Abstract Volume and Programme

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The imprint of global climate cycles in the Fuentillejo maar-lake record during the last 50 ka cal BP (central Spain)

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ABSTRACT

We have analysed the geochemical (element analysis), mineralogical and sedimentary facies to characterize the sedimentary record in Fuentillejo maar-lake in the central Spanish volcanic field of Campo de Calatrava and thus be able to reconstruct the cyclicity of the sedimentary and paleoclimatic processes involved. The upper 20 m of core FUENT-1 show variations in clastic input and water chemistry in the lake throughout the last 50 ka cal BP. Being a closed system, the water level in this maar-lake depends primarily on the balance between precipitation and evaporation. The system is consequently very sensitive to changes in the regional hydrological balance and these changes should be reflected by the geochemical proxy parameters TiO_2, an indicator of major detrital input related to arid and cold climates, and CaO, an indicator of carbonate precipitation favored by warm, dry environmental conditions. In this case, analysis of the geochemical component was found to be the best way to identify a cyclic pattern in the lacustrine sedimentary sequence because the first 20 m of the record are not laminated. Normalized geochemical TiO_2 and CaO records were used to carry out a spectral analysis that revealed the millennial cyclicity present in the sequence with major periodicities of 15.1 ka; 10 ka; 5.4 ka; 3.4 ka; 2.3 ka; 1.8 ka; 1.5 ka; 910, 863 and 606 yr. All these peaks also appear in the power spectrum of the Vostok record (10, 8.2, 4.9, 3.4, 2.1, 1.9 and 1.1 ka) and NGRIP record (3.3 ka, 1.6 ka and 952 yr), which have been analysed using the same method as for the FUENT-1 series and the same time-window. These cycles correspond closely with the harmonics of Milankovitch´s climatic precession cycle of 23 ka. Only the time period between 12 and 50 ka (MIS 2 and 3) was analysed, giving cycles of 8.6 ka, 4.9 ka and 3.2 ka, which exceed a confidence level of 95%. The 1.5 ka cycle is also quite significant, especially in the CaO series, indicating warm, arid events in the Fuentillejo sequence, which modulated its water balance and may be related to the cyclicity of the Dansgaard-Oeschger (DO) events. Geochemical spectral analyses have revealed the effect of the millennial-scale cycles and the superimposed signal produced by modulating local climatic factors. Thus, Fuentillejo hydrology is controlled by changes in the atmospheric and oceanic systems that operated in the North Atlantic region at millennial scale during the last 50 ka cal BP.

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