Changes in chemistry and stable isotopes in the fossil ice of Torca de La Grajera (Burgos, N Spain)

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The ice accumulation investigated refers to layered ice formed in Torca de La Grajera pothole from a number of snow precipitation events. The hole is a natural open space -185 m depth, directly connected to the surface, in which over time the snow has become ice. It is a nice example of ice preserved in mid-latitudes and is potentially useful for paleoclimate reconstructions. Samples of ice were collected in 2015 and 2016. Age estimates based in Pb isotopes suggest that ice accumulated in the last 200 years [1]. Nowadays, the ice is suffering accelerated melting due to high temperatures and rainfall precipitation. Samples were partially melted for complete chemical (ion chromatography) and isotopic (CRDS) characterization minimizing the exposition to air.

Preliminary profiles of chloride (Cl^-), δ^2H and $\delta^{18}O$ in the ice samples were obtained. The composition indicates that the ice accumulation can be divided into two sections. The average values of lower section (0-8 m) are: Cl^-=0.011 mmol/L, $\delta^{18}O$=-6.1 ‰$_{SMOW}$ and δ^2H=-44‰$_{SMOW}$ and the average values of the upper section (8-14 m) are: Cl^-=0.025 mmol/L, $\delta^{18}O$=-8.5‰$_{SMOW}$ and δ^2H=-55‰$_{SMOW}$. In both sections the profiles of Cl-, δ^2H and $\delta^{18}O$ have similar shape and show the same general trend: the lighter the δ^2H and $\delta^{18}O$ values, the more chloride in the ice, which excludes the evaporation effect and indicates that temperature conditions at the moment of the recharge were different. These findings, with other data are serving to undertake interpretation and modelling in terms of sources of precipitation and climatic conditions prevailing at the time of deposition.

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