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Do minerals know about cosmic rays?

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The measurement of the flux of cosmic rays in the past could give some important information about the sources of cosmic rays, the evolution of the neighbourhood of the Solar System in the Galaxy, and the Galaxy itself. It could also inform our understanding of key events in the Earth's history such as mass extinctions.
The paleo-detector technique consists of looking for damages inside of long-aged minerals left in the form of tracks by astroparticles passing. It has been proposed to take advantage of the extremely long mineral exposure to look for weakly interacting particles such as dark matter constituent particles and neutrinos. On the other hand, here we propose to use the paleo-detectors technique to obtain information on the history of cosmic rays detecting the tracks left by past flux of secondary cosmic rays.
Cosmic rays can be shielded, thus selecting minerals with a known and specific geological history, we can measure the flux at a specific moment in time. An example is the Messinian Salinity Crisis, when, after the desiccation of the Mediterranean Sea at the end of the Messinian Age, evaporites formed and were exposed directly to secondary cosmic rays. After a period of time of ~ 300 kyr the Mediterranean Sea was filled again by water and the evaporites were shielded by a km-deep overburden of water, retaining information of the cosmic ray flux of that period. In this work, we study the sensitivity of these evaporites to the cosmic ray flux and to a potential flux variation given by the explosion of a nearby supernova.

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