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Paleo-detectors for cosmic rays

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The paleo-detector technique proposes to use long-age minerals, which have been exposed to an enormous flux of particles, as astroparticle detectors. Some of these particles should have interacted with mineral nuclei, generating linear defects in the crystalline structure in the form of tracks. The paleo-detectors have been proposed to detect dark matter and neutrinos, using minerals found well deep in the ground, shielded by the cosmic rays. These studies take advantage of the enormous exposure, even to these rare events, that can be acquired through age with a small amount of material. We propose to use the paleo-detectors as cosmic rays detectors. Since the cosmic rays can be shielded, we can find optimal exposure windows during which the minerals were exposed to the flux and then shielded. We take as example the dessication of the Mediterranean Sea during the Messinian (~ 6 Myr ago). After the dessication, several evaporites were formed, exposed to the flux of cosmic rays (for ~ 300 kyr) and then submerged again. The large amounts of tracks expected is enough to measure the variation of 1% of the flux, making this technique optimal to identify a potential transient events happened during the exposure window.

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