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Cosmic ray signatures in Paleo-detectors to investigate the past activity of our Galaxy

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Interactions between secondary cosmic rays and nuclei in natural minerals can leave tracks in the lattice due to nuclear recoils. These defects can be preserved up to the Gyr timescale, making these so-called "Paleo-detectors" useful "time machines" for the study of the history of astrophysical messengers such as cosmic rays, neutrinos or even dark matter. These "Paleo-detectors" feature huge accumulated exposure times even for small masses of material, making them long-term flux integrators of all radiation along the evolution of our planet. We present the case study of the Messinian salinity crisis, a period of draining of the Mediterranean Sea which is interestingly coincident with the estimated age of the Fermi Bubbles, around 5.5 Myr ago, when our Galaxy might have been active. Greatly increased cosmic ray acceleration near the Galactic Center could have left traces in the evaporites, mainly Halite, created with the evaporation of the sea and exposed directly to secondary cosmic rays. These mineral structures were then covered during the sudden reflooding of the Mediterranean basin 5.3 Myr ago; the cosmic ray flux information remained frozen due to the shielding of the massive body of water, possibly retaining information on the flux of particles at ground in that epoch.

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