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Measuring solar neutrinos over Gigayear timescales with Paleo Detectors

Measuring the solar neutrino flux over gigayear timescales could provide a new window to inform the Solar Standard Model as well as studies of the Earth's long-term climate. We demonstrate the feasibility of measuring the time-evolution of the ^{8}B solar neutrino flux over gigayear timescales using paleo detectors, naturally occurring minerals which record neutrino-induced recoil tracks over geological times. We explore suitable minerals and identify track lengths of 15-30 nm to be a practical window to detect the ^{8}B solar neutrino flux. A collection of ultra-radiopure minerals of different ages, each some 0.1 kg by mass, can be used to probe the rise of the ^{8}B solar neutrino flux over the recent gigayear of the Sun's evolution. We also show that models of the solar abundance problem can be distinguished based on the time-integrated tracks induced by the ^{8}B solar neutrino flux.

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