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60Fe and 244Pu in deep-sea archives - a link to nearby supernova activity and r-process sites

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% % Nuclear Physics in Astrophysics 8 template for abstract % % Format: LaTeX2e. % % Rename this file to name.tex, where 'name' is the family name % of the first author, and edit it to produce your abstract. % \documentstyle[11pt]{article} % % PAGE LAYOUT: % \textheight=9.9in \textwidth=6.3in \voffset -0.85in \hoffset -0.35in \topmargin 0.305in \oddsidemargin +0.35in \evensidemargin -0.35in %\renewcommand{\rmdefault}{ptm} % to use Times font $\label{eq:long} \label{eq:long} \label{eq:lo$ $\log\left(\frac{1 \#2}{1 \#2}\right)$ \begin{document} {\small \it Nuclear Physics in Astrophysics 8, NPA8: 18-23 June 2017, Catania, Italy} \vspace{12pt} \thispagestyle{empty} \begin{center} %%% %%% Title goes here. %%% \TITLE₁⁶⁰Fe and ²⁴⁴Pu in deep-sea archives - a link to nearby supernova activity and r-process sites }\\[3mm] %%% %%% Authors and affiliations are next. The presenter should be %%% underlined as shown below. %%% \AUTHORS{A. Wallner¹, N. Kinoshita², J. Feige³, M. Froehlich¹, M. Hotchkis⁴, L.K. Fifield¹, R. Golser⁵, M. Honda⁶, U. Linnemann⁷, H. Matsuzaki⁸, S. Merchel⁹, M. Paul¹⁰, G. Rugel⁹, D. Schumann¹⁰, S.G. Tims¹, P. Steier⁵, T. Yamagata¹², S.R. Winkler⁵}. %%% {\small \it

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%%% %%% Abstract proper starts here.

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The Interstellar Medium (ISM) is continuously fed with new nucleosynthetic products. The solar system moves through the ISM and collects dust particles. Therefore, direct detection of freshly produced radionuclides on Earth, i.e. before decaying, provide insight into recent and nearby nucleosynthetic activities [1,2]. Indeed, a pioneering work at TU Munich [3,4], which applied the ultra-sensitive single atom counting technique of accelerator mass spectrometry (AMS) to an ocean crust-sample, showed an enhanced ⁶⁰Fe signal possibly of extraterrestrial origin.

Within an international collaboration [5-7] we have continued to search for ISM radionuclides incorporated in terrestrial archives. We have analyzed several deep-sea sediments, crusts and nodules for extraterrestrial ⁶⁰Fe ($t_{1/2}$ =2.6 Myr), ²⁶Al ($t_{1/2}$ =0.7 Myr) and ²⁴⁴Pu ($t_{1/2}$ =81 Myr) [5-8] which are complemented by independent work at TU Munich [9-11]. All the data demonstrate a clear global ⁶⁰Fe influx that is interpreted as exposure of Earth to recent (\leq {10} Myr) supernova explosions. Furthermore, the low concentrations measured for ²⁴⁴Pu suggest an unexpectedly low abundance of interstellar ²⁴⁴Pu [5]. This finding signals a rarity of actinide r–process nucleosynthesis which is incompatible with the rate and expected yield of standard core collapse supernovae as the predominant actinide-producing sites.

In this talk I will also present additional new results for ⁶⁰Fe and ²⁴⁴Pu measured with unprecedented sensitivity. These data provide new insights into their concomitant influx and their ISM concentrations over a time period of the last 11 million years.

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Primary author:Prof. WALLNER, Anton (The Australian National University)Presenter:Prof. WALLNER, Anton (The Australian National University)Session Classification:Explosive nucleosynthesis observations

Track Classification: Explosive scenarios in astrophysics: observations, theory, and experiments