MS 10: Posters III

Time: Thursday 16:30–19:00 Location: Empore Lichthof

MS 10.1 Thu 16:30 Empore Lichthof

Supernova-produced ^{60}Fe in Earth's microfossil record — •Peter Ludwig[1], Shawn Bishop[1], Ramon Egli[2], Valentyna Chernenko[1], Boyana Deneva[1], Thomas Faestermann[1], Leticia Fimiani[1], José Manuel Gómez-Guzmán[1], Karin Hain[1], Gunther Korschinek[1], Marianne Hanzlik[3], Silke Merchel[4], and Georg Rugel[4] — [1]Physik Department TUM, Garching — [2]ZAMG, Wien — [3]Chemie Department TUM, Garching — [4]HZDR, Dresden

It is possible for a nearby supernova (SN) explosion to deposit a fraction of its ejecta on Earth. Due to the lack of significant anthropogenic and cosmogenic background, ^{60}Fe ($T_{1/2}$ = 2.6 Ma) is perfectly suited to serve as a radioactive tracer of recent SN events. The ratio of ^{60}Fe/Fe was measured in over 100 samples extracted from two sediment cores from the Eastern Equatorial Pacific. The AMS samples were produced using a carefully tuned chemical leaching technique that specifically targets fine-grained iron-oxides, such as magnetofossils. Magnetofossils are the remains of magnetosome chains, built up by magnetotactic bacteria, which are abundantly present in our sediment, as shown by magnetic analysis and electron microscopy. The AMS samples were measured at the GAMS setup at the Maier-Leibnitz-Laboratory in Garching, where the use of a gas-filled magnet for isobaric suppression provides a sensitivity of ^{60}Fe/Fe $\approx 5 \cdot 10^{-17}$. Our results reveal a ^{60}Fe signature over a time-range of about 1.7-2.7 Ma, which is attributed to the deposition of SN debris.

MS 10.2 Thu 16:30 Empore Lichthof

Iodine-129 and iodine-129 in natural waters from Fuhrberger Feld catchment near Hannover, Germany — •Alfatih Osman[1], Stefan Bister[1], Abdelouahed Daraoui[1], Alex Hoelzer[1], Beate Riebe[1], Clemens Walther[1], Christof Vockenhuber[2], and Hans-Arno Synal[2] — [1]Institute for Radioecology and Radiation Protection (IRS), Leibniz University of Hannover, Germany — [2]Laboratory of Ion Beam Physics, ETH Zurich, Switzerland

Environmental input of anthropogenic iodine-129 has been increased due to various nuclear applications. Such releases lead to a diffuse pollution of large scale reservoirs. In the framework of the TransAqua project, funded by BMBF, we are aiming at assessing the sensitivity of the drinking water reservoir in Fuhrberger Feld catchment near Hannover with regard to introduction and accumulation of iodine-129. For that purpose, surface- and groundwaters were analyzed for I-127 and I-129 using ICP-MS and AMS. I-129/I-127 isotopic ratios in all samples are significantly higher than the pre-nuclear isotopic ratio (1.5*10-12). Concentrations of I-129 of the investigated waters were compared to other environmental compartments in the same region (Lower Saxony). The investigated groundwater revealed comparable I-129 concentration and I-129/I-127 isotopic ratio as in surface waters from the same area, but higher values in contrast to other aquifers in the same region. This means that the water reservoir in Fuhrberger Feld has already been slightly affected by atmospheric input of anthropogenic I-129, which is most likely originating from the European reprocessing plants.

MS 10.3 Thu 16:30 Empore Lichthof

Actinide AMS at DREAMS — •Nasrin B. Khojasteh[1], Silke Merchel[1], Stefan Pavetich[1,2], Georg Rugel[1], Andreas Scharf[1], and René Ziegenrücker[1] — [1]HZDR, Dresden, Germany — [2]ANU, Canberra, Australia

Radionuclides such as ^{236}U and ^{239}Pu were introduced into the environment by atmospheric nuclear weapon tests, reactor accidents (Chernobyl, Fukushima), releases from nuclear reprocessing facilities (Sellafield, La Hague), radioactive waste disposal, and accidents with nuclear devices (Palomares, Thule) [1]. Accelerator Mass Spectrometry (AMS) is the most sensitive method to measure these actinides.

The DREsden AMS (DREAMS) facility is located at a 6 MV accelerator, which is shared with ion beam analytics and implantation users, preventing major modifications of the accelerator and magnetic analyzers. DREAMS was originally designed for ^{10}Be, ^{26}Al, ^{36}Cl, ^{41}Ca, and ^{129}I [2,3]. To modify the system for actinide AMS, a Time-of-Flight (TOF) beamline at the high-energy side has been installed and performance tests are on-going. Ion beam and detector simulations are carried out to design a moveable ionization chamber. Especially, the detector window and anode dimensions have to be optimized. This ionization chamber will act as an energy detector of the system and its installation is planned as closely as possible to the stop detector of the TOF beamline for highest detection efficiency. [1] Srncik et al., J. Environ. Radioact. 132 (2014) 108. [2] Akhmadaliev et al., Nucl. Instr. Meth. B. 294 (2013) 5. [3] Rugel et al., Nucl. Instr. Meth. B. in review.

MS 10.4 Thu 16:30 Empore Lichthof

AMS measurements of ^{10}Be, ^{26}Al and ^{41}Ca at DREAMS — •Andreas Scharf[1], Shavkat Akhmadaliev[1], Maurice Arnold[2], Pascal Bohleber[3], Ingo Leya[4], Silke Merchel[1], Georg Rugel[1], Thomas Smith[4], René Ziegenrücker[1], and Lars Zipf[3] — [1]HZDR, Dresden, Germany — [2]CEREGE, Aix-en-Provence, France — [3]Universität Heidelberg, Germany — [4]University of Bern, Switzerland

DREAMS, the DREsden AMS-facility, is performing routine accelerator mass spectrometry for the isotopes ^{10}Be, ^{26}Al, ^{36}Cl, ^{41}Ca and ^{129}I. Sample ratios of ^{10}Be/^{9}Be as low as 8 x 10^{-15} (background-corrected) have been measured and an exposure age of about 330 years of a boulder of 3000 t in Nepal could be determined [1]. We could demonstrate that a by-product of ice core drilling, so-called drilling chips, are also suitable for ^{10}Be analysis of ice cores, instead of using valuable ice core samples. A set of several in-house ^{26}Al and ^{41}Ca standards has been made traceable to primary standards by cross-calibration [2]. Numerous ^{26}Al and ^{41}Ca concentrations of meteorites could be determined, but for marine sediments there is still a need for a low-level (10^{-13}) ^{26}Al standard. ICP-MS measurements have shown that the steel pins used to fix the CaF_2 sample material in the cathodes have high K-concentrations of (44.6 ± 2.2) μg/g. By replacing the steel pins with copper pins the ^{41}K background during ^{41}Ca measurements could be lowered by a factor of three.

Ref. : [1] W. Schwanghart et al., Science (2015), DOI:10.1126/ science.aac9865. [2] G. Rugel et al., Nucl. Instr. Meth.B (2015), in review.

MS 10.5 Thu 16:30 Empore Lichthof

^{36}Cl and ^{129}I at ASTER and DREAMS — •Georg Rugel[1], Aster Team[2], Régis Braucher[2], Silke Merchel[1], Stefan Pavetich[1,3], Andreas Scharf[1], and René Ziegenrücker[1] — [1]HZDR, Dresden, Germany — [2]CEREGE, Aix-en-Provence, France — [3]ANU, Canberra, Australia

At ASTER (Accélérateur pour les Sciences de la Terre, Environnement, Risques) and DREAMS (DREsden Accelerator Mass Spectrometry) sophisticated ion sources are used for ^{36}Cl and ^{129}I. Both facilities have dedicated ^{36}Cl chemistry labs. At DREAMS it is also used for storage and pressing of AgCl in sample holders (SHs). Most ^{36}Cl-AMS labs, reduce the isobar ^{36}S from the SH by a labor-intensive AgBr-backing. Though, at ASTER and DREAMS only ultrapure Ni and Cu is used, respectively. To find out the pros and cons of the two materials, we have (a) exposed AgCl pressed in Ni and Cu to air (in the dark). After 2 h only, cauliflower-type $NiCl_2$ (analysed by EDX) has been formed from AgCl and Ni preventing any later AMS, whereas AgCl in Cu after 3 days looks unweathered and is still measurable. (b) compared S-decline in AgCl pressed in Ni and Cu (ASTER SHs). After ∼5 min S decreases by a factor of ∼5 for both reaching the same low S-rate after 20 min. However, S is higher at 5-20 min in Cu showing that Cu is contaminated at the surface. High S is not seen at all at DREAMS for DREAMS Cu SHs. Thus, chemical etching and controlled storage of Cu SHs might be a cheaper and better alternative for ^{36}Cl-AMS. For ^{129}I AMS a sophisticated tuning strategy is minimising sputtering of any iodine containing material at DREAMS.