THE CONSTANCY OF THE GALACTIC COSMIC RAYS: THE CONTRIBUTION OF COSMOGENIC NOBLE GASES AND RADIONUCLIDES IN IRON METEORITES.

T. Smith[1], I. Leya[1], S. Merchel[2], G. Rugel[2], S. Pavetich[2,3], and A. Scharf[2], [1]University of Bern, Space Research and Planetary Sciences, Bern, Switzerland. E-mail: thomas.smith@space.unibe.ch, [2]Helmholtz-Zentrum Dresden-Rossendorf (HZDR), Dresden, Germany. [3]Present address: Department of Nuclear Physics, The Australian National University, Canberra, Australia.

Introduction: The temporal constancy of galactic cosmic rays (GCRs) over the last few billion years is an important and long-standing question in meteorite research. Over the years, meteorites have been intensely studied to answer this question [1]. While travelling in space, meteoroids are exposed to GCRs and the nuclear interactions produce (among others) stable (noble gases) and radioactive cosmogenic nuclides. Being interested in the long-term variation of the GCRs, we study iron meteorites because they typically have cosmic ray exposure (CRE) ages in the range of a few million years (Ma) and – for some – even up to 2Ga [2]. It has been demonstrated previously that periodic GCR flux variations can induce peaks in CRE age histograms, which is due to the fact that during periods of high fluency the "apparent" time seems to run faster and *vice-versa*. Therefore, setting up a consistent exposure age histogram and then searching for periodic peaks would make it possible to study GCR flux variations.

Experimental methods: We measured the isotopic concentrations of He, Ne, and Ar by noble gas mass spectrometry at the University of Bern following procedures described earlier [3,4]. Analyses of the cosmogenic radionuclides ^{10}Be, ^{26}Al, ^{36}Cl, and ^{41}Ca have been performed at the DREsden Accelerator Mass Spectrometry facility (DREAMS, [5]) using chemical separation procedures described in [6].

Results: In total 55 iron meteorite samples, predominantly of class IIIAB, have been selected and investigated for their cosmogenic nuclide contents. The CRE ages have been calculated using the ^{36}Cl-^{36}Ar dating scheme [1]. However, doing so we had to correct ^{36}Cl for radioactive decay on Earth, i.e., we had to determine the terrestrial age for each studied meteorite. To avoid problems with ^{10}Be and ^{26}Al production from inhomogeneously distributed sulfur- and phosphorous-bearing minerals, we use the ^{41}Ca-^{36}Cl system to determine terrestrial ages instead of e.g. ^{10}Be-^{36}Cl system. Doing so we use updated Monte-Carlo calculations, e.g., [3], instead of the classical semiempirical approaches [7]. Up to now, noble gases have been measured in 35 samples and radionuclides in 48 samples. The calculated CRE ages range between ~5 and ~700 Ma, which is in the range expected for iron meteorites [2,8]. So far, no features can be observed in the CRE ages histogram. Additional noble gas and radionuclide measurements are ongoing, which will increase the statistics and will help to study possible long-term variations in the GCR intensities over the last few billion years.

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