EXPOSURE AND TERRESTRIAL AGE OF THE TWANNBERG METEORITE BASED ON COSMOGENIC NOBLE GASES AND RADIONUCLIDES.

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Introduction: The 15.9 kg main mass of the Twannberg meteorite has been found in 1984 in the Canton of Bern, Switzerland. Five additional masses were found until 2007 [1]. Since then, nearly 100 new finds brought the known mass to ~37 kg. The Twannberg meteorite belongs to the small IIG group (6 members), which is characterized by a low concentration of nickel and large inclusions of schreibersite.

Here we study the cosmic ray exposure (CRE) history of 17 individuals of Twannberg using cosmogenic radionuclides and noble gases. We are especially interested in the terrestrial age of Twannberg to better understand its relation with the associated glacial sediments.

Experimental Methods: Noble gas isotopes (He, Ne, and Ar) are analyzed by noble gas mass spectrometry at the University of Bern following procedure described earlier [2,3]. Analyses of the cosmogenic radionuclides (^{10}Be, ^{26}Al, ^{36}Cl, and ^{41}Ca) are performed at the DREsden Accelerator Mass Spectrometry facility (DREAMS, [4]) adapted from procedures described in [5].

Results: So far, 17 samples have been analyzed for the noble gas; 6 of them have also been investigated for their cosmogenic radionuclide contents. We observed a wide range of noble gas and radionuclide concentrations (more than one order of magnitude). The noble gas and radionuclide concentration correlate, indicating the reliability of the analysis despite low concentrations. Combining the data with model calculations indicate a preatmospheric radius in range of 1 to 10 meters. Considering an average density of about 8g/cm^3 and assuming a spherical object, the Twannberg preatmospheric mass was greater than at least 33 tons.

The CRE age has been determined using the ^{36}Cl-^{36}Ar method [6]. The average CRE age is 243±64 Ma, which is in the range of typical CRE ages for iron meteorites [7] and which is in good agreement with the adopted age of 230±50 Ma found previously [1]. The average terrestrial age based on the ^{36}Cl/^{10}Be-^{10}Be systematics is 88±38 ka, indicating that the meteorite fell during the last glaciation, the Würm event (~110-15 ka), but before the maximum glaciation at 24 ka. We expect ^{41}Ca measurements soon, which will help to further pin down the terrestrial age of the Twannberg meteorite and bring the fall into context of glacial events, as suggested by geological indicators [1].

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