PREATMOSPHERIC SIZE AND TERRESTRIAL AGE OF THE TWANNBERG METEORITE (IIG).

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Introduction: The main mass of the Twannberg meteorite (15.9 kg) has been found 1984 in the Canton of Bern, Switzerland. The Twannberg meteorite belongs to the IIG group, which comprises so far only six members and which is characterized by large amounts of schreibersite $(Fe,Ni)_3P$ and a low nickel content of 5% only [1]. Twannberg is so far the largest meteorite found in Switzerland. Recent research campaigns have increased the amount of recovered material yielding to a total mass of ~70 kg in ~550 individual pieces.

In this study, we analyzed 17 individual samples and calculated their cosmic ray exposure (CRE) age using cosmogenic noble gases and radionuclides. We applied updated Monte-Carlo model calculations to determine (i) the preatmospheric size, (ii) the cosmic ray exposure age, and (ii), especially, the terrestrial age of Twannberg to better understand its relation to the last glaciation event in Europe [1].

Experimental methods: The isotopic concentrations for He, Ne, and Ar have been measured by noble gas mass spectrometry at the University of Bern following procedures described earlier [2,3]. Analyses of the cosmogenic radionuclides (i.e., ^{10}Be, ^{26}Al, ^{36}Cl, and ^{41}Ca) have been performed at the DREsden Accelerator Mass Spectrometry facility (DREAMS, [4]) using procedures described in [5].

Results: In total, 17 samples have been analyzed for noble gas concentrations; seven of them have also been investigated for their cosmogenic radionuclide contents. We observe a wide range of noble gas and radionuclide concentrations of more than one order of magnitude among the different samples. The noble gas and radionuclide concentrations linearly correlate, demonstrating the reliability of the analysis despite low concentrations. Combining the data with improved model calculations indicate a preatmospheric radius of up to 10 m. Considering an average density of about 8 g/cm^3 and assuming a spherical object, the preatmospheric mass of Twannberg was most likely larger than 33000 tons.

The CRE age for Twannberg, which has been determined using the ^{36}Cl-^{36}Ar method [6], is 236±50 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]. More importantly, the mean terrestrial age based on ^{41}Ca-^{36}Cl systematics and updated Monte-Carlo calculations is 165±58 ka. The age therefore indicates that Twannberg most likely fell during the second last glaciation (~185-130 ka), or even during one of the two last (~130-115 ka) or (~225-185 ka) interglacials. Research campaigns in the field are still ongoing and we hope for a further recoveries of Twannberg material.

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