CHINGUETTI - TERRESTRIAL AGE AND PRE-ATMOSPHERIC RADIUS., K.C. Welten[1], P.A. Bland[2], M. W. Caffee[3], J. Masarik[1], S.S. Russell[2], A.J.T. Jull[5], I. Denyer[6], J. Lloyd[7] and M.M. Grady[2], [1]Space Sciences Laboratory, University of California, Berkeley, CA 94720-7450, USA; [2]Department of Mineralogy, Natural History Museum, Cromwell Road, London SW7 5BD; [3]CAMS, Lawrence Livermore National Laboratory, Livermore, CA 94551, USA; [4]NSF Arizona AMS Facility, Physics Building, University of Arizona, Tucson, AZ 85721; [5]5 Statham Grove, Stoke Newington, London N16 9DP; [6]Flat 2, 60 Brixton Road, London SW9 6BS.

Introduction: Chinguetti is a 4.5 kg mesosiderite found in the Adra region of Mauretania, some 45 km from the oasis town of Chinguetti, in 1916. It was several years before the sample was identified as a meteorite, however, when it was, and the description of the find was released in 1924, it generated considerable excitement. Gaston Ripert, the French officer who found the meteorite, maintained that it was a representative sample of a much larger mass. His description, as transcribed by Lacroix [1], states: "It was lying on top of an enormous metallic mass measuring about 100m on one side and about 40m in height, which stands up in the middle of the dunes...". Ripert's position as a French officer, and his comparative lack of interest in the find (after turning it over to M.H. Hubert, a freind and a Doctor of Science in Dakar, he made no effort to follow up on any progress made in its analysis, and in fact never claimed that it was a meteorite) convinced many that his story was true. Numerous expeditions have attempted to find the larger mass, most notably those of Theodore Monod (e.g. [2]). Several explanations have been offered to explain their lack of success: the find location being somewhat uncertain, possibly dunes had partially or completely covered the mass; Ripert may have mistaken desert varnished sandstone for a large metallic mass, and just happened by chance on the smaller sample; or, for his own reasons, he simply lied. In order to throw a little more light on this problem, we chose to analyse a portion of the recovered sample for cosmogenic radionuclides, to determine its terrestrial age, and its pre-atmospheric radius.

Experimental procedures: We analyzed a chip taken about 5 cm from the fusion crust. We first separated the metal and stone fraction and treated the metal fraction with 0.2N HCl and concentrated HF to remove attached troilite and silicates, respectively. After adding carrier, containing Be, Al, Cl and Ca, the metal and stone fractions were dissolved in 1.5N HNO3 and concentrated HF/HNO3, respectively. The Be, Al and Cl were separated and ^{10}Be, and ^{36}Cl concentrations were determined using the LLNL-AMS facility [3].

Results and Discussion: The ^{10}Be and ^{36}Cl results are shown in Table 1. The ^{26}Al measurements are still in progress.

Table 1. Cosmogenic radionuclide concentrations in Chinguetti mesosiderite.

	Conc. (dpm/kg)*
^{10}Be(stone)	21.2 ± 0.3
^{10}Be(metal)	3.35 ± 0.05
^{36}Cl(metal)	17.4 ± 0.2

*1σ-errors include all known AMS errors, but not the uncertainties in the AMS standards.

Although the cosmic-ray exposure age of Chinguetti is unknown, the saturation activity level of 10Be in stone phase suggests that the exposure age of the meteorite is more than 5 My. Furthermore, mesosiderites typically have exposure ages 10-300 My [4]. The ^{36}Cl-^{10}Be terrestrial age method [5] yields a terrestrial age <50 ky. Measurements of ^{41}Ca in the metal phase and ^{14}C in stone phase will further constrain the terrestrial age of Chinguetti..

Pre-atmospheric size. The low concentrations of ^{36}Cl and ^{10}Be in the metal phase compared to the saturation activities of those nuclides in typical size of meteorites suggest that Chinguetti experienced moderate shielding conditions. The ^{10}Be(stone)/ ^{10}Be(metal) ratio of 6.3±0.2 is also consistent with moderate shielding conditions [6]. According to Monte-Carlo based calculations for the production rates of ^{10}Be and ^{36}Cl, we can constrain the pre-atmospheric radius to 50-80 cm and the shielding depth to 15-25 cm.

Conclusions: Our analyses suggest that the most likely scenario is that our sample of Chinguetti was irradiated for >10 My at a depth of 15-25 cm in an object of about 50-80 cm in radius, and that it landed on Earth <50 ky ago. These data indicate that Chinguetti has a comparatively recent terrestrial age, at least, too recent to be consistent with Ripert's original description of the main mass having a heavily wind eroded base. More compelling is our estimate of a pre-atmospheric radius of <1m, suggesting that Ripert was either mistaken, or for some reason falsified his description of the find.

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