COSMOGENIC NUCLIDES IN IRON METEORITES: CHALLENGING CANYON DIABLO. S. Merchel[1,2], T. Faestermann[3], U. Herpers[1], K. Knie[3], G. Korschinek[3], I. Leya[4], M. E. Lipschutz[5] and R. Michel[6], [1]Universität zu Köln, D-50674 Köln, Germany, [2]Bundesanstalt für Materialforschung und –prüfung, D-12205 Berlin, Germany, [3]Fakultät für Physik, TU München, D-85748 Garching, Germany, [4]ETH Zürich, CH-8092 Zürich, Switzerland, [5]Purdue University, West Lafayette IN 47907-1393, USA, [6]Universität Hannover, D-30167 Hannover, Germany.

Introduction: A big advantage of discussing cosmogenic long-lived radionuclides in iron meteorites is that, in general, cosmic ray exposure ages are long enough to ensure that all measured radionuclide activities were in saturation and, therefore, correspond to production rates. This is also valid for Canyon Diablo samples which experienced irradiations in space between 122 and 1030 Ma, calculated from noble gas concentrations [1]. But for meteorites with complex exposure histories, as Canyon Diablo, the typically used shielding parameters, $^{3}He/^{21}Ne$ and $^{4}He/^{21}Ne$, are not reliable because they represent an average of values produced under different shielding conditions and for that reason the resulting exposure ages should be discussed with the utmost caution. However, radionuclides reflect only the most recent irradiation conditions and are, therefore, the best tool to reveal information about shielding conditions of the investigated samples during this stage. Unfortunately, recent studies [2,3] demonstrated the great influence of inhomogeneous distributed trace elements, as sulfur and phosphorus, on the production rates of lighter radionuclides, e.g. ^{26}Al, ^{36}Cl, in iron meteorite samples. Such an inhomogeneity should, of course, result in additional errors regarding lighter stable nuclides, e.g. ^{21}Ne, ^{36}Ar, too. Taking all this into account, only the measurement and discussion of heavier radionuclides ^{53}Mn, ^{59}Ni, and ^{60}Fe, which are sorely produced from iron and/or nickel, allows us to get reliable shielding parameters.

This study should be one step into the direction of self-criticism regarding the reliability of cosmogenic nuclides. For this purpose, we determined ^{53}Mn activities in a suite of well-characterized Canyon Diablo samples [1,4] and compared all known cosmogenic nuclide data with the most advanced theoretical model calculations [5] for production rates by galactic cosmic ray particles of these nuclides focusing on possible sources of errors.

Experimental: The investigated 8 samples are from a suite of 56 Canyon Diablo fragments recovered from known locations around the crater. Stable and lighter radioactive cosmogenic nuclides were already published [1,4]. Details about the radiochemical separation from manganese out of the samples and the following ^{53}Mn-AMS measurements can be found elsewhere [6,7].

Results and discussion: The measured $^{53}Mn/^{55}Mn$ ratios and the corresponding ^{53}Mn production rates are summarized in Table 1.

Table 1: Manganese-53 AMS results of Canyon Diablo

Sample[#]	$^{53}Mn/^{55}Mn$ [E-9]	^{53}Mn production rate[*] [atoms/(min kg)]
II	0.65 ± 0.16	51 ± 13
III	2.60 ± 0.39	125 ± 19
11	1.31 ± 0.13	55.7 ± 5.6
20	1.50 ± 0.23	66.0 ± 9.9
24	4.10 ± 0.41	177 ± 18
26	1.07 ± 0.16	51.1 ± 7.7
27	0.69 ± 0.10	31.5 ± 4.7
38	2.31 ± 0.35	94 ± 14

[#]sample numbers used by [1]; II and III refer to the Canyon Diablo 2 and 3 meteorites, respectively

*corrected for terrestrial age of 49 ka [8]

The comparison with preliminary model calculations indicates the problems already discussed in the introduction part. Final theoretical data based on latest thin- and thick-target cross section measurements will be presented at the conference.

References: [1] Heymann D. et al. (1966) *J.Geophys.Res., 71,* 619-641. [2] Leya I. et al. (1997) *Meteoritics & Planet. Sci., 32,* A78. [3] Leya I. and Michel R. (1998) *LPS XXIX,* #1172. [4] Michlovich E. S. et al. (1994) *J.Geophys.Res., 90,* 23187-23194. [5] Leya I. et al. (2000) *Meteoritics & Planet. Sci., 35,* 287-381. [6] Merchel S. and Herpers U. (1999) *Radiochim. Acta, 84,* 215-219. [7] Knie K. et al. (2000) *NIMB, 172,* 806-811. [8] Sutton S. R. (1985) *J.Geophys.Res., 90,* 3690-3700.

Acknowledgment: This work was partially funded by the DFG. We gratefully acknowledge particle spectra data by J. Masarik.