Coronal Mass Ejecta in depth profiling on NASA's Genesis mission.

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The energy distribution of solar wind (SW) is an indicator of solar activity. Energy distribution correlates with the implantation profiles of SW particles in solid materials that are directly irradiated by the SW. Solar wind He is one of the best candidates to measure the implantation profile because He is the second most abundant element of SW and almost free from terrestrial contamination. But measuring the implantation profile of SW He is difficult because conventional depth-profiling methods have extremely low He ionization yields or they require extremely large sample volumes. Recently, we performed an initial measurement of the SW He implantation profile in a sample from the NASA *Genesis* SW sample return mission [1]. The profile was composed of low-speed and high-speed SW He. Profiles of coronal mass ejection (CME) flows were below the detection limit of the measurements at that time. Here we report depth-profiling showing CME flows collected by *Genesis*.

Depth profiles were measured on a diamond-like-carbon (DLC) film on a Si substrate (DOS60939) from *Genesis* bulk collectors [2]. A secondary neutral mass spectrometer named LIMAS at Hokkaido Univ. [3] was used for measurements. The vacuum of sample chamber was improved to 10^{-9} Pa. As a result, the background level of ^{4}He signal is down to 10^{17} cm^{-3}. A tail profile deeper than 100 nm is clear at concentrations less than 10^{18} cm^{-3}. The tail corresponds to implanted ^{4}He with velocities faster than 1000 km s^{-1} showing CME origin. Using ACE/SWICS data [4], the CME tail has been identified as corresponding to the Halloween solar storms of 2003.

References: [1] Bajo et al. 2015 *Geochem. J.* 49, 559–566. [2] Burnett 2013 *Meteorit. Planet. Sci.* 48, 2351–2370. [3] Tonotani et al. 2016 *Surf. Interf. Anal.* 48, 1122–1126. [4] Reisenfeld et al. 2013 *Space Sci. Rev.* 175, 125-164.