ANALYSIS OF GENESIS SOLAR WIND SAMPLES .

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The Genesis Discovery mission (1) returned solar matter in the form of the solar wind with the goal of obtaining precise solar isotopic abundances (for the first time) and greatly improved elemental abundances. Measurements of the light noble gases demonstrate that isotopes are fractionated in the solar wind relative to the solar photosphere (2). The inefficient Coulmb drag theory (3), which reprduces the noble gas regime differences predicts large, about 60 permil, fractionation between the Sun and the solar wind in $^{18}O/^{16}O$. Measurement of the solar wind C and Mg isotopic compositions will provide additional tests and refinement of theories. Measurement of the solar wind O and N isotopes show that these are very different from any inner solar system materials. The solar O isotopic composition is consistent with photochemical self-shielding. For unknown reasons, the solar N isotopic composition is much lighter than essentially all other known solar system materials except the atmosphere of Jupiter which Genesis shows to have solar N isotopic compostiion. Although lunar regolith noble gases are derived from the solar wind, most of the N and C in these samples comes from neither the moon nor the Sun. Genesis provides a precise measurement of the isotopic differences of Ar between the solar wind and the terrestrial atmosphere. The Genesis isotopic compositions of Kr and Xe agree with data from lunar ilmenite separates, showing that lunar processes have not affected the ilmenite data and that solar wind composition has not changed on 100 Ma time scales.. Relative to Genesis solar wind, ArKrXe in Q (the chondrite noble gas carrier) and the terrestrial atmosphere show relatively large light isotope depletions. Spacecraft instrument data show that solar wind abundances of elements with first ionization potential (FIP) greater than about 9 eV are depleted relative to those below 9eV, which appear unfractionated. This pattern can be tested at a higher level of precision with Genesis data. Fe and Mg have similar FIP and the Genesis Fe/Mg agrees with both the photospheric and CI chondrite ratios. The Genesis re-entry capsule crash has significantly slowed the pace of sample analysis, but the solar wind is safely trapped below the surfaces of those samples that were not destroyed. Removing surface contamination is a major hurdle, but there is no fundamental reason at present which would prevent achievment of all Genesis science goals.

References: (1) Burnett D.S. 2013 *Meteoritics and Planetary Sciences, in press.* (2) Heber V.S. et al. 2012 *The Astrophysical Journal* **759,** 121-135. (3) Bochsler P. 2000 *Reviews of Geophysics* **38**: 247–266.