ELEMENTAL SOLAR WIND FLUENCES OF Fe AND Mg FROM GENESIS SAMPLES. A. J. G. Jurewicz[1] D. S. Burnett[2], Y. G. Guan[1], and D. S. Woolum[2], [1]ASU Center for Meteorite Studies, ASU m/c 1404, Tempe AZ 85287 (Amy.J.Jurewicz@asu.edu), [2]Caltech, Pasadena CA 90025.

Introduction: Elemental abundances, specifically Fe and Mg fluences, are being measured in selected collector fragments. This study is in pursuit of one of the first goals for the analysis of Genesis samples: measuring the magnitudes of fractionation of solar wind elemental abundances relative to the solar photosphere, especially as a function of elemental First Ionization Potential (FIP) and First Ionization Time (FIT).

The relative abundances of elements with FIP below 9 eV *(Fig. 1)* are of particular interest as they appear unfractionated in spacecraft data, but *in situ* measurements are imprecise relative to those expected from analyzing Genesis collectors. In contrast, elements whose FIP is above 9 eV are clearly fractionated. So, Genesis will be studying the fractionation (or lack of fractionation) these low FIP elements.

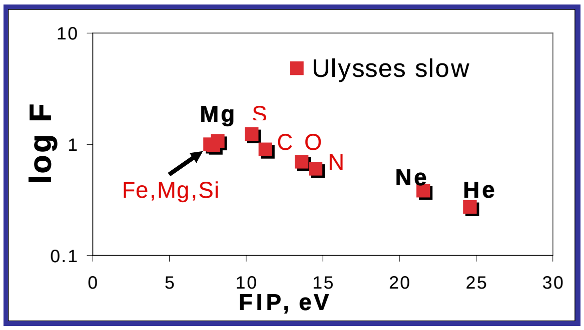

Fig. 1. Select FIP of elements vs. fractionation observed by Ulysses for slow solar wind. Low FIP elements constitute a major fraction of terrestrial planets.

Fe and Mg have FIP ~7.6 – 7.8 *(Fig 1,8)*, and differ by only 0.3 eV. A better test of FIP fractionation would be to measure a larger range of FIPs, so analyzing Na (FIP = 5.139) and Si (FIP = 8.151) fluences have a high priority at present.

Collector /cleaning description: Collectors were primarily silicon and diamond-like carbon collector fragments (prepared at Sandia Labs by T. Friedman). Fragments were generally less than 6mm in their long dimension, and were of "average" to "fair" condition, as this work is part of Genesis cleaning studies *(Fig.2)*.

Analysis was challenging because of surface contamination related to (1) the hard-landing of the sample return capsule upon re-entry, and (2) a photopolymerized silicone film produced in flight. We have determined that the silicone film did not cause significant solar wind attenuation during collecton.

Washing procedures incorporated semi-conductor grade solvents (warm xylene, acetone, alcohol), Micro-90 (particle removal), and ultra-high purity water. Areas for analysis were selected after cleaning *(Fig. 2)*.

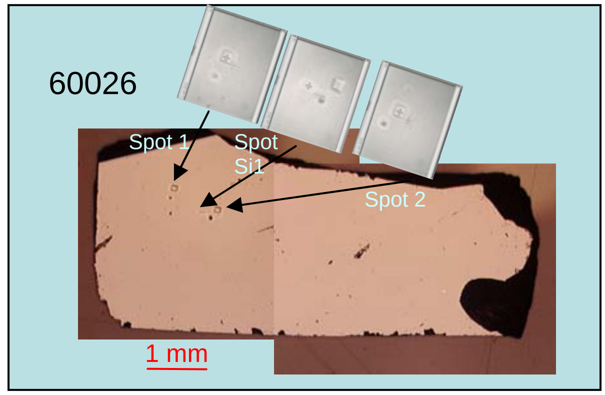

Fig. 2. Genesis Si fragment #60026 after analysis. Inserts point to areas of Mg anayses using SIMS.

Analyses: Analyses to date are of the bulk solar wind collected over 27 months during 2002 through April 2004.

For the analysis of Mg and Fe in selected samples, we have found that secondary ion mass spectrometry (SIMS) has sufficient depth resolution to allow us to easily deconvolve the surface contamination from the underlying solar wind, given an appropriately-selected areas on a sample's cleaned surface *(Fig. 3)*. These areas are no less than 100x100 microns in size, are free

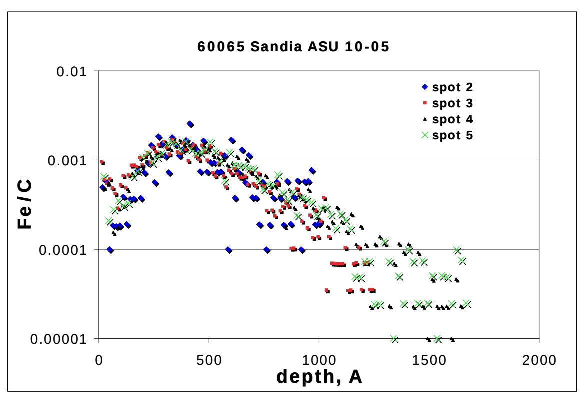

Fig. 3. Fe analyses in diamond-like carbon showing clearly resolvable depth profiles. Mg in silicon was more problematic after a simple wash. Both other cleaning techniques and standardizations on diamond-like carbon are being developed.

of visible particles, and thus have surface contamination which does not appear to significantly affect the SIMS data, except in the most surficial portion of the depth profile. That is, the shapes of the measured SIMS depth profiles are in reasonable agreement with theoretical profiles based on the solar wind He velocity distributions measured by the LANL solar wind monitors on the Genesis spacecraft.

Results: Preliminary results are given as Fe and Mg fluences *(Fig 4, Fig 5)* and comparison of the Fe/Mg ratios measured by Genesis with that of spacecraft and spectroscopic techniques *(Fig. 6)*. There is currently no evidence for fractionation within Fe, Mg (although Genesis can see the known fractionation between low and high FIP elements). Our errors will shrink with further study; if photospheric measurements improve, we will be able to make a case for fractionation (or lack of fractionation) of elements during ejection of the solar wind.

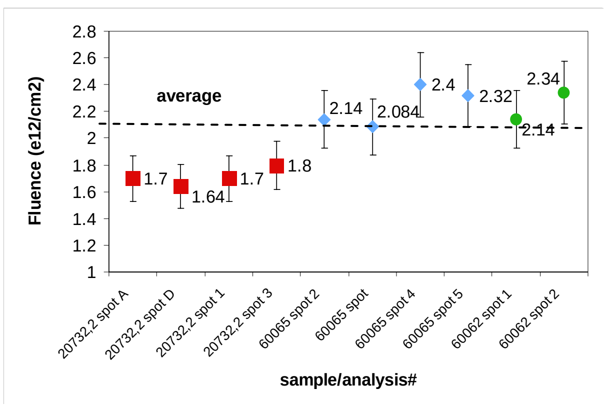

Fig. 4. Fe Fluences from 10 analyses on three samples.

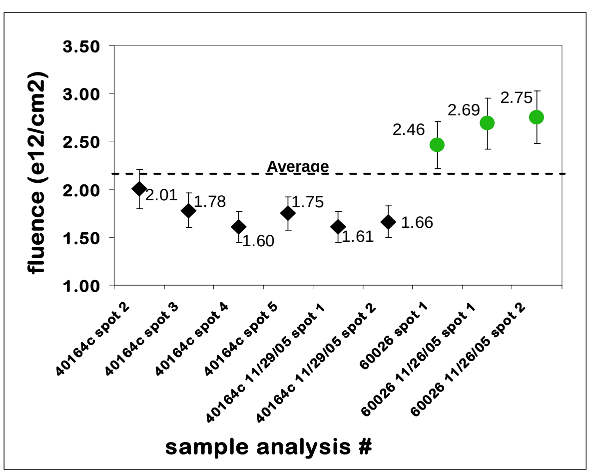

Fig. 5. Mg Fluences from 9 analyses on two samples.

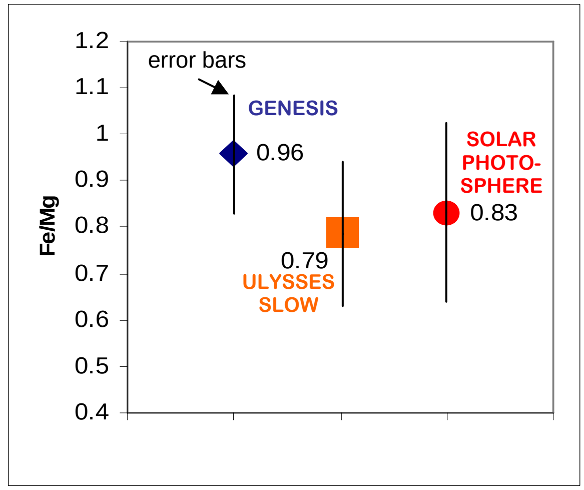

Fig. 6. Comparison of Fe/Mg ratios from Genesis analyses, Ulysses data and spectroscopic techniques.

Discussion: FIP potentials for Mg and Fe are similar, as are potential fractionations *versus* First Ionization Time (FIT). Accordingly we can not determine if FIT rather than FIP is the controlling variable. Other elements we plan to pursue (e.g. Na) will not have these ambiguities *(Fig 7, Fig. 8)*.

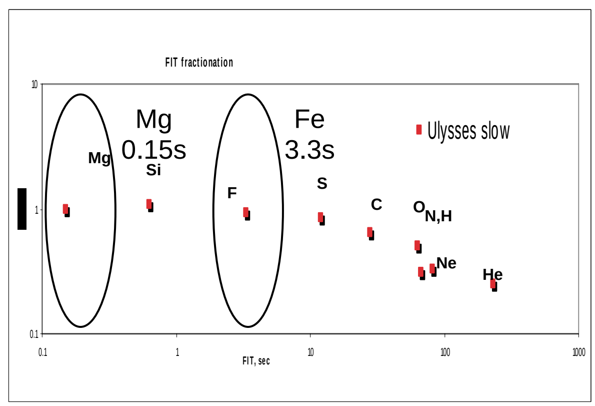

Fig. 7. FIT fractionation from spacecraft data.

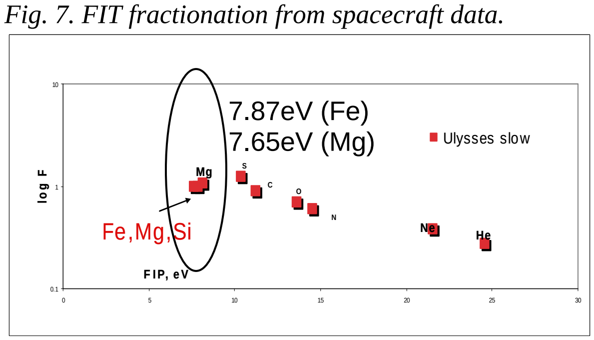

Fig. 8. FIT fractionation from spacecraft data.