ISOTOPIC COMPOSITIONS OF COMETARY MATTER RETURNED BY THE STARDUST MISSION.

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Introduction: The STARDUST spacecraft flew through the coma of comet 81P/Wild2 on Jan. 2, 2004, at a distance of ~236km and a relative velocity of ~6.1 km/s [1]. Dust particles, which were released from the comet hours before the encounter, were captured in silica aerogel and successfully returned to the Earth on Jan. 15, 2006. Cometary debris was also retained in small impact craters on Al-foil strips adjacent to the aerogel collector cells. A prelimary examination team (PET) of ~150 scientists has been engaged in studying the mineralogy/petrology, chemistry, optical properties, organic materials, fluence, and isotopic compositions of a subset of the returned cometary materials [2,3]. This report will summarize what has been learned regarding isotopic compositions of select elements by the PET during its 6 month investigation.

Goals of PET Isotope Analysis: The PET is designed to provide an initial characterization of the isotope properties of Wild2 samples, concentrating primarily on major isotope systems (e.g., C, H, O, N) that permit comparison to a larger database of isotope reservoirs found in primitive solar system materials (meteorites and IDPs) and in individual presolar grains. It is hoped that isotopic abundances can help ascertain whether comets are merely mechanical agglomerations of unprocessed presolar materials, or whether their constituents were processed and mixed with other materials in the solar accretion disk. Even if most Wild2 materials are not distinguishable from solar system matter on the basis of their isotope abundances, it is still possible that the comet could provide an enhanced reservoir of presolar grains with distinct nucleosynthetic histories (i.e., 'stardust') which, in principle, could be different than the populations so far identified in meteorites. Coordination with other investigations, especially mineralogy/petrology and organics, can also help decide the nature of specific materials collected by the mission. Additional isotope analyses will be undertaken opportunistically on grains with appropriate mineralogy, e.g., Mg isotopes in refractory grains.

References: [1] Brownlee, D.E., et al (2004). *Science* 304, 1764-1769. [2] Brownlee D. E. et al. 2006. Abstract #2286. 37th Lunar & Planetary Science Conference. [3] Tsou P. et al. 2006. Abstract #2189. 37th Lunar & Planetary Science Conference.