INSIGHT INTO PRIMORDIAL SOLAR SYSTEM OXYGEN RESERVOIRS FROM RETURNED COMETARY SAMPLES. D. E. Brownlee[1] and S. Messenger[1], [1]Johnson Space Center, Code SR, 2101 NASA Parkway, scott.r.messenger@nasa.gov, [2]Department of Astronomy, University of Washington, Seattle WA

Introduction: The recent successful rendezvous of the Stardust spacecraft with comet Wild-2 will be followed by its return of cometary dust to Earth in January 2006. Results from two separate dust impact detectors suggest that the spacecraft collected approximatedly the nominal fluence of at least 1,000 particles larger than 15 micrometers in size. While constituting only about one microgram total, these samples will be sufficient to answer many outstanding questions about the nature of cometary materials.

More than two decades of laboratory studies of stratospherically collected interplanetary dust particles (IDPs) of similar size have established the necessary microparticle handling and analytical techqniques necessary to study them. It is likely that some IDPs are in fact derived from comets [1], although complex orbital histories of individual particles have made these assignments difficult to prove.

Analysis of bona fide cometary samples will be essential for answering some fundamental outstanding questions in cosmochemistry, such as (1) the proportion of interstellar and processed materials that comprise comets and (2) whether the Solar System had a ^{16}O-rich reservoir. Abundant silicate stardust grains have recently been discovered in anhydrous IDPs, in far greater abundances (200 – 5,500 ppm) than those in meteorites (25 ppm) [2-4]. Insight into the more subtle O isotopic variations among chondrites and refractory phases will require significantly higher precision isotopic measurements on micrometer-sized samples than are currently available.

References:

Joswiak D. and Brownlee (2000) LPS **31**, #1500. [2] Messenger S. et al. (2003) *Science* **300**, 105-108. [3] Floss C. and Stadermann F.J. (2003) *LPS* **34**, #1238. [4] Nguyen A. and Zinner E. (2004) *Science*, *in press*