MULTI-TECHNIQUE ANALYSIS OF MICROMETEOROIDS CAPTURED IN LOW EARTH ORBIT. A. J. Westphal[1], G. A. Graham[2], G. Bench[3], S. Brennan[4], K. Luening[4], P. Pianetta[4], C. Snead[1], G. Domínguez[1], P. Grant[3], S. Bajt[5] and J. P. Bradley[2]. [1]SSL, University of California at Berkeley, Berkeley, CA 94720-7450, USA, [2]IGPP, LLNL, Livermore, CA 94551, USA, [3]CAMS, LLNL, Livermore, CA 94551, USA, [4]SSRL, SLAC, Stanford, CA 94025, USA, [5]PAT, LLNL, Livermore, CA 94551, USA

Introduction: The use of low-density silica aerogel as the primary capture cell technology for the NASA Discovery mission *Stardust* to Comet Wild-2 [1] should be a strong motivation for researchers within the Meteoritics community to develop techniques to handle this material. The unique properties of silica aerogel mean that dust particles can be captured at hypervelocity speeds and remain relatively intact, although the same unique properties present difficulties in the preparation of particles for analysis. Notwithstanding these problems, our previous work [2-3] has shown that particles can be routinely extracted from aerogel. It is now important to not only further refine these extraction techniques but also to develop protocols for analyzing the captured particles. However as *Stardust* does not return material to Earth until 2006, researchers must either analyze particles that are impacted in the laboratory using light-gas-gun facilities [e.g. 4] or examine aerogel collectors that have been exposed in low-Earth orbit (LEO) [5]. While there are certainly benefits in laboratory shots, i.e. accelerating known compositions of projectiles into aerogel, the LEO capture particles offer the opportunity to investigate real particles captured under real conditions.

Experiemental: The aerogel collectors used in this research are from the NASA Orbital Debris Collection Experiment that was exposed on the MIR Space Station for 18 months [5]. Preserved impact features have been located using optical microscopy and then subsequentially extracted using the methods described in [2-3]. The extracted aerogel wedges containing both the impact tracks and the captured particles have been characterized using the synchrotron total external reflection X-ray fluorescence (TXRF) microprobe at SSRL, the Nuclear Microprobe at LLNL and the synchrotron infrared microscopy at the ALS facility at LBL.

Discussion: The techniques that have been applied on the extracted wedges are essentially non-destructive or have limited detrimental effects on the particles. While it is important assess the suitability of the various analytical techniques, the particles captured in LEO offer an opportunity to examine material that has not been subjected to selection and modification processes that occur during atmospheric transit by the particles terrestrial repositories of cosmic dust. Of course the captured particle may have undergone alteration during hypervelocity capture. From the X-ray maps acquired using proton induced X-ray emission it is clearly possible to identify fine Fe rich particulate material on the sub micrometer scale that have fragment down the length of the impact track. However the identification of light elements from the data acquired from proton elastic scattering analysis and proton backscattering analysis would suggest that while the particles may fragment during hypervelocity capture the volatile elemental chemistries are not lost. This is clearly important when it come to the analysis of any organic material.

References: [1] Brownlee D. E. et al (2000) *Meteorit. Planet. Sci., 35,* A35. [2] Westphal A. J. et al. (2002) *Meteorit. Planet. Sci., 37,* 855-865. [3] Westphal A. J. et al (2003) LPS XXXIV, #1826. [4] Burchell, M. J. et al (2001) *Meteorit. Planet. Sci., 36,* 209-221. [5] Horz F. et al. (2000) *Icarus*, *147*, 559-579.