CONTROL ID: 2817613

TITLE: Evidence of Collisional Histories of Asteroids, Comets and Meteorites: Comparisons with Shocked Minerals

ABSTRACT BODY:

Abstract (2,250 Maximum Characters): Evidence of the collisional history of comets and asteroids has been emerging from analyses of cometary forsterite and enstatite returned from Comet Wild 2 by the Stardust mission (Keller et al.Geochim. Cosmochim. Acta 72, 2008; Tomeoka et al. MAPS 43, 2008; Jacobs et al. MAPS 44, 2009). Likewise, shock metamorphism is observed in many meteoritic forsterites and enstatites (McCausland et al. AGU, 2010), suggesting similar collisional histories for asteroids. Further exploration of the effects of collisions is slated for the upcoming Asteroid Impact Mission/Double Asteroid Redirection Test (AIM/DART) mission, expected for launch in 2020. DART will impact Didymoon, the companion of the larger 65803 Didymos (1996 G2) asteroid, and AIM will use its instrumentation to characterize the impact.

A suite of relevant impact experiments have been carried out in the Experimental Impact Laboratory at the NASA Johnson Space Center at velocities ranging from ~2.0 – 2.8 km s^{-1} and temperatures from 25°C to -100°C. Targets include a suite of minerals typically found in cometary dust and in asteroids and meteorites: Mg-rich forsterite (olivine), enstatite (orthopyroxene), diopside (clinopyroxene), magnesite (Mg-rich carbonate), and serpentine (phyllosilicate). Transmission Electron Microscope (TEM) imaging indicates evidence of shock similar to that seen in forsterite and enstatite from Comet Wild 2. Fourier Transform Infrared (FTIR) Spectroscopy will also be used for comparisons with meteorite spectra. A quantitative analysis of the shock pressures required to induce planar dislocations and spectral effects with respect to wavelength will also be presented.

Funding provided by the NASA PG&G grant 09-PGG09-0115, NSF grant AST-1010012. Special thanks to NASA EIL staff, F. Cardenas and R. Montes.

CURRENT CATEGORY: Asteroid Physical Characteristics:

CURRENT : None

AUTHORS (FIRST NAME, LAST NAME): Susan M. Lederer[1], Elizabeth Jensen[2], Douglas Smith[3], Michael Fane[3], Akbar Whizin[4], Zoe A. Landsman[4], Diane H. Wooden[5], Sean S. Lindsay[6], Mark Cintala[1], Lindsay P. Keller[1], Michael Zolensky[1]

INSTITUTIONS (ALL):

1. NASA Johnson Space Center, Houston, TX, United States.
2. Planetary Science Institute, Houston, TX, United States.
3. Cal State Univ SB, San Bernardino, CA, United States.
4. Univ. Central Florida, Orlando, FL, United States.
5. NASA Ames Research Center, Mountain View, CA, United States.
6. Univ. Tenn. Knoxville, Knoxville, TN, United States.

Contributing Teams: (none)