PRIMITIVE MATERIALS ON ASTEROIDS.

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Introduction: The linkage between asteroids and meteorites is critical if we are to fully understand the origin and evolution of the primitive materials of the solar system [1]. Usually, astronomical spectra are obtained and meteorite matches are sought. We are reversing this, and searching for what we perceive to be likely primitive materials among the asteroid spectra, emphasizing NEA [2-4]. We are focusing on type 3 ordinary chondrites and terrestrial phyllosilicates, not relying on the rare C chondrite observed falls as a point of comparison because of selection effects of the atmosphere. To add to the database of published spectra, we also run our own program of IRTF observations.

Type 3 (unequilibrated) ordinary chondrites (UOC): To date we have located IR spectra of six UOC, run the MGM spectral analysis program [5,6] and plotted the data on the Gaffey plot [7]. Few if any of the UOC plot in the ordinary chondrite fields of the Gaffey plot, but when analyzed by MGM all have absorption dips at ~2 µm normally associated with calcic pyroxene. This band is almost certainly due to monoclinic pyroxene a major phase in UOC [2,3]. The question thus arises whether any of the asteroids for which calcic pyroxene has been reported are actually the source objects for UOC. The discovery of asteroids whose surfaces are uniformly covered with UOC material would suggest that those objects are internally heated monoliths, with equilibrated ordinary chondrites coming from the interiors during fragmentation. The presence of UOC material on one side of the asteroid would indicate fragmentation, whereas patchy occurrences of UOC material, only observable with spacecraft resolution, would indicate rubble piles.

Phyllosilicates: While some authors have focused on finding bands of hydrated minerals or water on asteroids [8,9], others have used continuum slope as a basis for comparison [10]. We find that the slope of the continuum of phyllosilicate IR spectra depends on composition and structure, and does not overlap with similar data for the C asteroids unless the phyllosilicates are heated in the laboratory to temperatures ~900^{o}C [4]. This suggests that the surfaces of C asteroids are covered with hydrated phyllosilicates, presumably dehydrated by the heat of micrometeorite impact. We are optimistic that further analysis will make it possible to constrain the nature of the phyllosilicates and the degree of heating.

References: [1] G. Wetherill & C. Chapman (1988) In Meteorites and the Early Solar System, p. 35. [2] K. Gietzen and C. Lacy (2007) *Lunar Planet. Sci*. **38**, #xxxx. [3] K. Gietzen et al., (2008) *Lunar Planet. Sci*. **39**, #xxxx. [4] D. Ostrowski et al (2008) *Lunar Planet. Sci*. **39**, #xxxx. [5] J.M. Sunshine & C.M. Pieters (1993) *Jour. Geophys. Res.* **98**, 9075. [6] J.M. Sunshine & C. M. Pieters (1998) *Jour Geophs. Res.* **103**, 13675. [7] Gaffey M. J. *et al*. (1993) *Icarus* **106**, 573. [8] F. Vilas & M. J. Gaffey (1989) *Science* **246**, 790-792. [9] T. D. Jones et al. (1990) *Icarus* **88**, 172-192.