HOW HOMOGENEOUS ARE STONES FROM ORDINARY CHONDRITE SHOWERS?

G. J. Consolmagno SJ[1], R. J. Macke SJ[1,2] and D. T. Britt[3]. [1]Specola Vaticana E-mail: gjc@specola.va [2]St. Louis University, [3]University of Central Florida

Introduction: Many ordinary chondrites arrive as a part of a shower of meteorites: a third of all ordinary chondrite falls listed in the METBASE database have three or more recovered pieces. A common assumption is that these meteorite strewn field samples represent fragments of a larger stony mass which broke apart in the Earth's atmosphere [1]. Thus one way to examine the homogeneity of material in meteoroids is to examine the physical properties of many individual samples (whole rocks where possible) of a given meteorite fall. Such physical parameters include meteorite density and porosity [2,3], and meteorite magnetic susceptibility [4].

Density: In our density database, 22 ordinary chondrites have five or more density measurements. The typical spread of measurements (standard deviation of the bulk density) is 2.1% of the density itself, which is consistent with the reported error for individual measurements. The five meteorites with the largest spreads (3.8% to 4.5%) include all four LL chondrites in our set; all but one the nine meteorites with the smallest spreads (1.4% to 0.3%) include all but one of the nine H chondrites. Though the statistics are small, this suggests that LL chondrites tend to be less homogeneous, and H chondrites more homogeneous.

Susceptibility: A summary of the magnetic susceptibilities for the Vatican ordinary chondrite collection, measured by Rochette, was reported in [4]. Within our collection, three showers have numerous samples measured: Holbrook (13 measured), Pultusk (11), and Mocs (8). The susceptibility measurements are more precise (more repeatable) and, for falls at least, barring terrestrial weathering effects they should have less spread than density measurements.

In fact, while the standard deviation of the measurements of log for Mocs is 0.8%, the spread of the measures for Holbrook is 3.4%, and 5.6% for Pultusk. However, as noted in [4], these spreads are due entirely to two samples in each set that are clearly outliers: two odd samples Holbrook are notably weathered, while the two odd samples of Pultusk have susceptibilities consistent with L, not H, chondrites and may represent mislabeled samples. Removing the outliers brings the spread for Holbrook to 0.9%, and that of Pultusk to 1.3%. Note that in this case the one H measured has a spread similar to the two L meteorites.

Unfortunately, the samples measured for susceptibility tend to be different, smaller samples than those measured for density. This summer we hope to augment these data with a series of precise bulk and grain density measurements of these meteorites, which we plan to report at the meeting. We hope to see if the samples that are outliers in susceptibility also have a distinctly different density, presumably from different iron content.

References: [1] Baldwin B. S. 1971 J. Geophys Res. 76, 4653-4668. [2] Consolmagno G. J. and Britt, D. T. 1998. *Meteorit. Planet. Sci.* **33**, 1231–1242. [3] Britt, D. T. and Consolmagno G. J. 2003. *Meteorit. Planet. Sci.,* **38**, 1161-1180. [4] Rochette P. et al. 2003. *Meteorit. Planet. Sci.,* **38**, 251-268.