PHYSICAL PROPERTIES OF METEORITE FALLS IN RELATION TO PLANETARY DEFENSE.

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Introduction: With the ever growing number of near Earth objects the hazard risk to the planet increases [1]. Measurements of the physical properties of meteorite falls not only helps determine the physical characteristics of the parent asteroids, they are essential in determining how these objects will behave in the atmosphere. Understanding these properties will also help determine methods to deflect potentially hazardous asteroids.

The new Ames Meteorite Characterization Laboratory will examine the physical proprerties of a diverse selection of meteorites. Meteorite classes will range from water-rich to basaltic to stony-irons to metallic, all with none or various levels of shock [2]. These variations can cause a range in atmospheric/planetary interactions. For example Chelyabinsk was a large meteorite fall that resulted in an air burst, while the Canyon Diablo object resulted in the small impact crater [3,4].

Laboratory Measurements: To reduce the effects of terrestrial weathering, all meteorites examined by the Ames Meteorite Characterization Laboratory will be falls. Each meteorite will be processed by the full suite of observations and measurements. Petrographic studies will highlight diversity and any unique features, along with any fractures in the meteorite that might affect their physical properties. Also shock effects will be examined to see how they can either stengthen the sample, widespread melt production, or weaken, by veins [5]. Densities and porosities provide clues to the physical environment that the meteorite was lithified and how it evolved [6]. Thermal conductivity, heat capacity, and thermal emissivity provide a way of characterizing the meteorite for a range of thermal applications [7]. Thermal properties also help constraints models for the Yarkovsky and YORP processes. Acoustic velocity, both longitudinal and shear, give insights to the wave propagation through a meteorite and gives additional indication the internal structure and porosity [8]. Splits of the present samples will be sent to the mechanical engineering facilities at Ames for compressive, tensile, and deformation strength analysis, while other samples will be sent to Lawrence Livermore National Laboratory for measurements specifically related to deflection technologies.

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Acknowledgements: We are thankful to Jim Arnold for leading the planetary defense group at Ames Research Center, and NASA's NEO program for funding the effort.