Hydrogen Isotope Systematics of Maskelynites in the Los Angeles Shergottite. K. Tucker[1], R. Hervig[1], M. Wadhwa[1]. [1]School of Earth and Space Exploration, Arizona State University, Tempe, AZ 85287 (E-mail: Kera.Tucker@asu.edu).

Introduction: An intriguing question remains to be answered in planetary science: what were the initial D/H ratios of the Earth and Mars? Similarities or differences in these values could provide useful insight into planet-forming processes in the early Solar System. This study aims to increase our knowledge of this topic by analyzing hydrogen isotopes in the maskelynites of the Los Angeles shergottite.

The Los Angeles meteorite is a basaltic shergottite that is highly differentiated and enriched in incompatible elements [1]. Hydrogen isotope studies of chlorapatites in this meteorite show elevated δD values of +2630‰ to +4348‰, most likely through exchange of hydrogen isotopes with the D-enriched martian atmosphere [1,2]. We wish to further our understanding of the hydrogen isotope systematics of martian reservoirs by analyzing maskelynites in this sample. We chose to analyze maskelynite because it shows fewer cracks than the other phases such as phosphates and pyroxenes, and is thus less prone to terrestrial contamination, as shown by [3,4]. Despite being a nominally anhydrous mineral (NAM), plagioclase (the precursor to maskelynite) does incorporate enough H to obtain useful precision.Through the analyses of NAMs, we hope to contribute to our knowledge of the hydrogen isotopic signature of the shergottite parent magmas and their mantle source reservoirs on Mars.

Methods: Hydrogen isotopic analyses of individual maskelynite grains in a polished thin section of the Los Angeles meteorite were carried out using a Cameca IMS 6f at Arizona State University. For each analysis, a primary beam of $^{133}Cs^{+}$ at 8-10 nA was accelerated to 10 keV and rastered over 40×40 μm^2. Negative ions were accelerated to 5000 V into the mass spectrometer. For these analyses, we detected ions from a circular area ~17-20 μm in diameter into the mass spectrometer. The 40eV energy window was used, and the mass spectrometer was operated at a mass resolving power of ~400 (wide open). ^{1}H and ^{2}H were detected on an electron multiplier.

Results and Conclusions: We report a total of 25 hydrogen isotope analyses of maskelynites in the Los Angeles meteorite. δD values ranged from -105‰ to +402‰ (±50‰, 2σ is the worst case error in an individual analysis). There is no apparent correlation between the δD and water content of these maskelynites. Our recent studies have shown that maskelynite appears to be one of phases least affected by terrestrial contamination in the shergottites [3,4]. The δD values reported here are generally similar to those for maskelynites in another enriched shergottite, Zagami [4]. However, these values are significantly lower than in the chlorapatites in this meteorite [1,2], suggesting that NAMs did not exchange hydrogen isotopes as extensively with the martian atmospheric reservior. As such, the highest δD recorded in these maskeynites (i.e., ~400‰) likely defines the upper limit on the the magmatic δD value.

References: [1] Rubin A. E. et al. 2000. *Geology*. 28:1011-1014. [2] Greenwood J. P. et al. 2008. *Geophysical Research Letters*. 35, L05203, doi:10.1029/2007GL032721 [3] Mane, P. et al., 2013. Abstract #2220. 44th Lunar & Planetary Sciences Conference. [4] Tucker, K. et al., 2014. Abstract #2190. 45th Lunar & Planetary Sciences Conference.