GEOCHEMICAL SIGNATURE OF TERRESTRIAL WEATHERING IN HOT-DESERT LUNAR METEORITES. R.A. Zeigler, R. L. Korotev, B. L. Jolliff, Dept. Earth & Planetary Sciences, Washington University, Campus Box 1169, St. Louis, MO 63130 zeigler@levee.wustl.edu.

Most meteorites recovered on Earth are finds in hot and cold deserts. These meteorites typically have terrestrial residence times on the order of many thousands of years [1-2]. Many studies have shown that despite its arid environment, the desert imparts a compositional and mineralogical signature upon the resident meteorites, particularly so in the hot deserts [2-4]. Previous studies have concentrated on ordinary and carbonaceous chondrites. In this study we consider only lunar meteorites, using compositions determined by INAA (instrumental neutron activation analysis) as a record of chemical change in hot-desert lunar meteorites relative to cold-desert lunar meteorites.

Over the past 25 years we have analyzed thousands of Apollo samples and 488 subsamples (~10-40 mg each) of 60 different numbered stones comprising 36 different lunar meteorites (there are ~39 different lunar meteorites, consisting of ~94 numbered stones [5]). The proportion of hot-desert to cold-desert subsamples is nearly equal (44:56). Elements routinely measured by INAA are: Na_2O, K_2O, CaO, Sc, Cr, FeO, Co, Ni, Zn, As, Se, Br, Rb, Sr, Zr, Ag, Sb, Cs, Ba, La, Ce, Nd, Sm, Eu, Tb, Yb, Lu, Hf, Ta, W, Ir, Au, Th, and U.

We do not observe any substantial differences in bulk composition between Antarctic (cold-desert) lunar meteorites and Apollo samples. Thus, all enrichments in hot-desert lunar meteorites discussed below are relative to Antarctic meteorites of similar bulk composition. The most obvious contaminants in hot-desert lunar meteorites (as in chondrites [2]) are Ba (up to 18x) and Sr (25x). Two other elements that show modest enrichments are Br and As, both ranging up to ~4-5x our detection limit for those elements (Apollo and Antarctic lunar meteorites are typically below detection). The U:Th ratio in lunar breccias is largely invariant, ~0.3 [6]. Some hot-desert lunar meteorites have U:Th ratios considerably greater than this, up to 9, indicating enrichment in U. The Ca-rich nature of most lunar meteorites makes observing excess Ca due to the addition of carbonate- or sulfate-mineral contamination more difficult than in chondritic meteorites. When Ca is plotted against Fe (or even better, Al), modest enrichments in Ca are evident, however. An enrichment in the light REEs (LREE) owing to terrestrial weathering is observed in some samples, with a La/Sm ratio of up to ~3 observed (compared to <2.25 in most Apollo samples). Concentrations of Au are elevated by up to 75x in some hot-desert lunar meteorite subsamples. The cause is most likely contamination from human handling, not chemical weathering, however.

Different hot deserts impart different chemical signatures on lunar meteorites. The Omani lunar meteorites have high relative concentrations of Ba, Sr, As, and U. Whereas the African lunar meteorites show high relative concentrations of As and Br, moderate relative concentrations of Ba and U, and an increase in the LREE/HREE ratio. Meteorites from all desert regions show elevated Au and Ca concentrations.

References: [1] Jull A. J. T. 1998. *Geol. Soc. Spec. Publ.* 140:75-91. [2] Al-Kathiri A. et al. *MAPS* 40:1215-40. [3] Lee M. R. and Bland P. A. 2004. *GCA* 68:893-917. [4] Rubin A. E. and Huber H. 2005. *MAPS* 40:1123-30. [5] http://epsc.wustl.edu/admin/resources/moon_meteorites.-html. [6] Korotev R. L. 1998. *JGR* 103:1691-701. **Acknowledgements:** This work was supported by NASA grant NNG04GG10G.