Landscape evolution of northern New Mexico as recorded in jarosite

K.E. SAMUELS[1], V.W. LUETH[2], A.R. CAMPBELL[1] AND L. PETERS[2]

[1]E&ES Dept., New Mexico Tech, 801 Leroy Place, Socorro, NM 87801 (*correspondence: *ksamuels@nmt.edu)
[2]NMBGMR. New Mexico Tech, 801 Leroy Place, Socorro, NM 87801 (vwlueth@nmt.edu)

Supergene jarosite [$KFe_3(SO_4)_2(OH)_6$] preserved in distinct geomorphic positions in the Red River valley (RRV), Taos County, NM, records the changing land surface over the past 1.5 million years as well as the compositions of pyrite-oxidizing fluids. $^{40}Ar/^{39}Ar_{(jarosite)}$ dates range from 1.80 ± 0.80 Ma to 0.14 ± 0.10 Ma, and consistently preserve “inverse superposition” typical of incised landscapes. Alteration scar ages coincide with dates found by previous workers at nearby Creede, CO [1] and many stream terrace ages in northern New Mexico [2, 3].

$\delta D_{(jarosite)}$ decreases in younger samples and may record continental climate changes. The youngest jarosite samples formed during Pleistocene interglacial cycles.

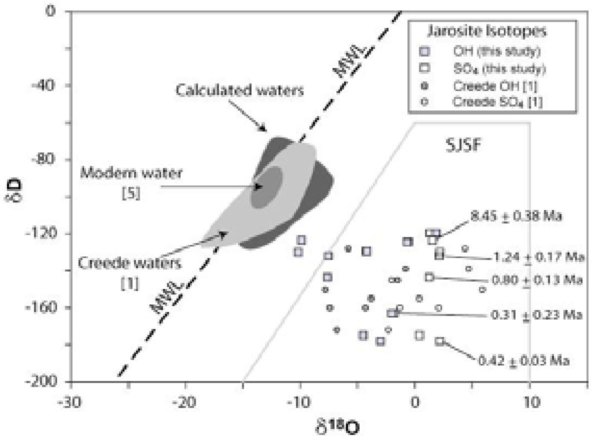

Figure 1: δD-$\delta^{18}O$ values and ages for RRV jarosites.

The average calculated RRV alteration scar incision rate is 77 m/my. This rate is consistent with published incision rates for the Rio Grande and uplift rates in northern New Mexico [4]. This type of study provides a unique data set for calibrating regional uplift and erosion of pyrite-bearing rocks.

[1] Rye *et al.* (2000) *GSA Spec. Pap.* **346**, 95-103. [2] Pazzaglia & Wells (1990) *NMGS Guidebook* **41**, 243-430. [3] Newell *et al.* (2004) *NMGS Guidebook* **55**, 300-313. [4] Connell *et al.* (2005) *NM Museum of Natural History & Science Bulletin* **28**, 125-150. [5] Nauss *et al.* (2005) *USGS SIR 2005-5088.*

REE Distributions in Shergottites RBT 04261 and 04262

M.E. SANBORN*[1], M. WADHWA[1], T. USUI[2] AND H.Y. MCSWEEN[2]

[1]SESE, Arizona State University, Tempe, AZ 85287-1404 (*correspondence: Matthew.Sanborn@asu.edu)
[2]Department of Earth and Planetary Sciences, University of Tennessee, Knoxville, TN 37996-1410

Roberts Massif (RBT) 04261 and RBT 04262 are two recently recovered, paired Antarctic Martian meteorites that were initially described as olivine-phyric shergottites [1], although a recent study suggests that they may be more closely related to the lherzolitic shergottites [2]. In this study, we made ion microprobe analyses of rare earth element (REE) abundances in minerals of RBT 04261 and RBT 04262 with the goal of understanding their petrogenesis on Mars and clarifying their relationship to the other shergottites.

The REE budget of RBT 04261 and RBT 04262 is dominated by merrillite (La~190×CI). The slightly LREE-enriched pattern of this mineral ([La/Yb]CI~1.6) is most similar to that of merrillite in the basaltic shergottites Shergotty and Zagami [3], and unlike the LREE-depleted pattern of merrillite in the other lherzolitic shergottites [3-5]. The REE abundances in the low- and high-Ca pyroxenes of RBT 04261 and RBT 04262 vary significantly. The absolute REE abundances in low-Ca poikilitic pyroxenes (La~0.04-0.59×CI) are typically higher than those in the other shergottites [3-5]. Plagioclase has an LREE-enriched pattern (La~0.8-1.4×CI; [La/Sm]CI~3.4-3.8) and a positive Eu anomaly (Eu/Eu*~30-35). Olivine exhibits a V-shaped REE pattern, a feature that is also observed in other Antarctic meteorites and likely results from weathering in a terrestrial environment [6].

Compared to other lherzolitic shergottites, RBT 04261 and RBT 04262 contain the highest modal abundances of plagioclase (20.2 and 15.9 vol%, respectively), and pyroxenes and olivines have the lowest Mg#. These petrographic observations along with the REE microdistributions presented here indicate that the RBT 04261/04262 parent melt was geochemically evolved and was characterized by a slightly LREE-enriched pattern (i.e., [La/Yb]CI similar to that of merrillite). Therefore, the RBT 04261/04262 parent melt was most similar to the parent melts of the basaltic shergottites and unlike those of the lherzolitic shergottites.

[1] *Antarct. Met. Newsletter* (2007) **30** (1) [2] Mikouchi *et al.* (2008) *LPS* **XXXIX**, #2403. [3] Wadhwa *et al.* (1994) *GCA*, **58**, 4213-4229. [4] Harvey *et al.* (1993) *GCA*, **57**, 4769-4783. [5] Hsu *et al.* (2004) *MAPS*, **39**, 701-709. [6] Crozaz *et al.* (2003) *GCA*, **67**, 4727-4741.