Pedogenic evidence for climate change and aridification on Mars

R. AMUNDSON, S. EWING, J. OWEN, W. DIETRICH, K. NISHIIZUMI[1] , O. CHADWICK[2], B. SUTTER[3] AND C. MCKAY[3]

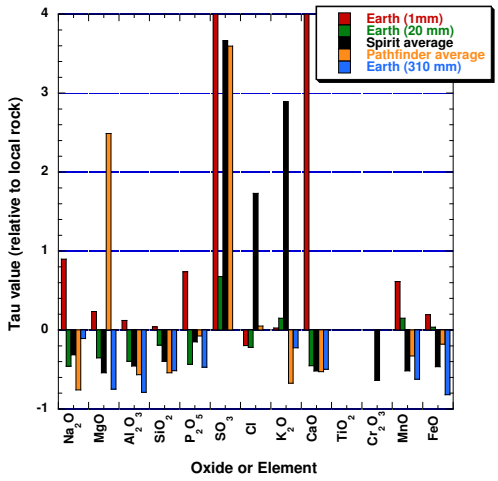
[1]Univerisity of California, Berkeley: earthy@nature.berkeley.edu, saewing@nature.berkeley.edu, jowen@nature.berkeley.edu, bill@eps.berkeley.edu, kuni@ssl.berkeley.edu

[2]University of California, Santa Barbara: oac@geog.ucsb.edu

[3]NASA Ames Research Center: skimars@earthlink.net, cmckay@mail.arc.nasa.gov

Data obtained by MERs reveal significant accumulations of sulfate in Mars soils. Here we re-analyze the Mars soil data to show they have also lost significant quantities of most major rock forming elements. We show that Earth soils, spanning its rainfall spectrum, provide evidence that Mars soil hydrological conditions have changed from those causing net elemental losses via leaching to conditions facilitating elemental gain. This is indicative of a profound aridificaiton of the planet. Additionally, we show that shallow soil profile excavations by MERs suggest a late stage downward migration of salts, and small amounts of downward moving liquid water, even in more recent Martian time.

Figure 1. Fractional elemental gains (positive tau) and losses



(negative tau) for average Spirit and Pathfinder soils, and Earth soils spanning semi-arid (310mm rain) to hyperarid (1mm) climates. All tau values are soil to parent material elemental comparisons, normalized to TiO_2.