SIMULATION OF THE WEATHERING PROCESSES ON MARS. M.S. Kareev, D. W. G. Sears, and P. H. Benoit. Arkansas-Oklahoma Center for Space and Planetary Sciences, University of Arkansas, Fayetteville, Arkansas 72701.
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We believe that extensive experimental investigations of physical and chemical weathering in the Martian environment are necessary because previous work was largely theoretical with few observational constraints. Despite a variety of hypotheses concerning the nature of chemical oxidation by ultraviolet irradiation of minerals, its significance on Mars has been cast into doubt by experimental studies producing conflicting results [1, 2]. Physical weathering may have included rock splitting through growth of ice, salt or secondary silicate crystals in voids. Chemical weathering most probably involved reactions of minerals with water, oxygen and carbon dioxide although predicted products might vary sensitively with the abundance and physical state postulated for the water.

We intend to use the Andromeda Environmental chamber at the University of Arkansas to simulate atmosphere-surface-aerosol interactions (weathering reactions) under realistic Martian conditions. We will study the dynamics of weathering in and above different types of soil simulant with respect of chemical composition, including *JSC Mars-1*, (Hawaiian volcanic ash) and *artificial-Mars* (fine-grained smectite/basalt/iron oxide), at a variety of temperatures, humidity and atmospheric conditions. The facility includes a large experimental chamber (0.8 m diameter by 2.1 m tall cylinder), which can be evacuated to 10^{-3} torr or operated with a simulated Martian atmosphere, and cooled or heated within a range of about -180^0C to $+100^0$C. A high power light source with special filters allows simulation of the solar spectrum at the surface of Mars. Micro-gas-chromatograph 2000C (VICI) and mass-spectrometer combined with multi-position valve/suction pump sampling system will allow analyzing the expected changes of volatile environment due to surface/gas-phase photo-chemical reactions.

Because weathering rates are expected to be very low [3], such experiments would be useful only if different alteration scenarios can be reconciled (atmospheric and surface driven processes). *In situ* measurements will include trace-component monitoring and analysis of the near surface atmosphere and subsurface probes to determine the volatile abundance and physical state of free water. Such gas monitoring/analysis will identify volatile components that might be active agents of chemical weathering. The soil-water analysis will indicate whether liquid-based weathering reactions might be supportable in the contemporary and paleo-pedogenic environment.

References: [1] Huguenin, R.L. (1973) *JGR* **78**, 8481; Huguenin, R.L. (1974) *JGR* **79**, 3895. [2] Morris & Lauer (1981) *JGR* **85**, 10893; Blackburn *et al.* (1979) *JGR* **84**, 8391. [3] Gooding *et al.* (1992) in *Mars*, p. 626.