GRS Measurement of Chlorine on Mars

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The Gamma Ray Spectrometer (GRS) aboard Mars 2001 Odyssey has measured the distribution of chlorine at the near surface (top ~30 cm) of Mars. While we are unable to provide reliable concentration values in polar regions where large amounts of water ice are present, we observe an average chlorine concentration at equatorial latitudes of 0.51 wt%. However, the distribution of chlorine across the planet is far from homogeneous, with global concentration values varying by over a factor of 2.5 even after smoothing with a 15°-radius boxcar filter. Of particular note, a large region of elevated chlorine concentration is found to the west of the Tharsis volcanoes centered over the Medusae Fossae Formation materials which have been mapped by Scott and Tanaka [1986] and Greeley and Guest [1987] as potential ignimbrite deposits. While contributions from potentially chlorine-rich aeolian deposits in the area cannot be discounted, we propose that the signature of elevated chlorine in this region of sustained volcanic activity is related to acid fog reactions associated with volcanic exhalations in the region or to chemical alteration associated with hydrothermal or hydrologic activity.

References:

Greeley, R, and J. E. Guest. 1987. Geologic map of the eastern equatorial region of Mars, *USGS Misc. Inv. Ser. Map I-1802B (1:15,000,000)*.

Scott, D. H., and K. L. Tanaka. 1986. Geologic map of the western equatorial region of Mars, *USGS Misc. Inv. Ser. Map I-1802-A (1:15,000,000)*.