

CARBONATITE VOLCANISM ON MARS. N. Hoffman, WNS GeoScience: 22, Marlow Place, Eltham 3095, Australia (nhoffman@vic.bigpond.net.au).

Introduction: In the White Mars paradigm, it is implicit that with CO₂ as the dominant volatile in the crust, volcanism will be somewhat different than on Earth. Carbonatite magmas would be more common on a CO₂-dominated Mars than on an H₂O-dominated planet. Carbonatite magmas are unusual in being extremely fluid and having very low solidification temperatures (~500°C). Minor element chemistry of Carbonatites is very different than "normal" igneous rocks. High concentrations of rare-earth and alkali metals are typical

Observation: Large areas of Mars are surfaced by what is interpreted as flood basalts, although detailed studies of the surface textures imply voluminous outflows at high rates. Interesting patterns of bright and dark surfaces on high resolution MGS/MOC images suggest that plates of solidified lava crust have been rafted and torn apart or stacked up on a very large scale. No good analogs exist on Earth.

Insight: Carbonatite volcanism is rare on Earth. The only active carbonatite volcano is Oldoinyo Lengai in the East African Rift. This is a particularly alkalic carbonatite and at times erupts flows rich in Sodium Carbonate. Other carbonatite volcanoes on

Earth are less alkalic and more dominated by Ca, Fe, and Mg Carbonates. On Mars, due to the presence of CO₂ as the dominant volatile, carbonatite magmas and lava flows would be more common. There, Fe Carbonates would be a major constituent due to the relatively iron-rich crust and mantle of Mars compared to Earth. At present this is largely speculation but further research will establish key criteria to identify or exclude carbonatites in remote sensing and surface observations. Mars soil and rock analysis from the Pathfinder location fails to generate a "normal" mineral assemblage, perhaps because the method used is insensitive to Carbonate in the sample [1]. Some interesting trends exist with the soil appearing to have a minor element composition more typical of a carbonatite (plus sulphate), than the rocks at the Pathfinder landing site. Carbonatites are relatively weak and erodible rocks, and would have been preferentially ground down in the debris flows and cryoclastic flows that emplaced the Pathfinder materials in Ares Vallis.

References: Rieder, R., et al., 1997, *Science*, 278, 1771-1774.