

Scientific and Operational Objectives for FMARS-10
Flashline Mars Arctic Research Station, Devon Island, Nunavut, Canada
July 9-August 6, 2005
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Geology:

- Identify and locate possible base surge (explosive) induced concretions and compare to Mars "blueberries", MDRS concretions sites, Meteor Crater base surge induced concretions and other concretion sites located throughout Northern Arizona and Southern Utah (See Brine Base Surge abstract)
- Identify and locate geological habitats of extremophiles. Perform detailed stratigraphic and petrographic analysis of these locations.
- Regolith and landform mapping with collaboration from RST member Jon Clarke
- Sapping sites associated with theater head tributaries as a comparison to Utah MDRS and Northern Arizona sites

Paleontology:

- Locate and Identify possible fossil sites—Brachiopods and Trilobites
- Operational research related to exploration strategies on Mars in possible extinct environments (Farmer Paper)

Exploration Strategies:

- Extensive Photo documentation of field/sample sites
- RST Communication/Collaboration
- Space Suit constraints

Abstract--Abstracts with Programs - Geological Society of America, vol.36, no.5, pp.21, Nov 2004:

Brine splat interpretation of features seen at the Opportunity landing site on Mars

Images and preliminary data from Opportunity lander do not provide convincing evidence for aqueous sedimentation and later formation of diagenetic concretions. The light-colored layers are better explained by mechanical emplacement following impacts into a megaregolith holding concentrated brines and salts (Knauth and Burt, 2002; Burt and Knauth, 2003). The Opportunity site lies among possible rampart craters and ejecta aprons usually interpreted as the result of impact into wet targets. Owing to evaporation followed by fractional crystallization during freezing of the early hydrosphere, the megaregolith over large regions must contain subsurface crystalline salts and near-eutectic brines as well as water ice. Large impacts into such material should generate ejecta sheets resembling base surge

(explosion) deposits around terrestrial volcanoes, but on a far larger scale. Such deposition commonly produces finely laminated, cross-bedded, and lapilli-rich deposits almost indistinguishable from those observed at the Opportunity site. For large impacts, vapor condensate spherules could occur as well as lapilli and accretionary lapilli. Such features provide a simple explanation for the uniformly-sized and rounded Mars "blueberries", which lack the morphologic and size distribution features of terrestrial concretions. In this scenario, the chloride, sulfate, and bromide salts found by Opportunity were deposited mechanically along with the mainly basaltic materials, ice, and brine. Following emplacement, interactions of the fresh ejecta with the martian atmosphere over long times would allow the hygroscopic eutectic chloride and bromide salts to deliquesce and flow downwards, or be washed into the deeper regolith during ice melting to account for the vugs. Differential solubility can preferentially remove chlorides and bromides and leave sulfates. Slow atmospheric weathering could also account for oxidation of Fe in near-surface spherules and alteration of emplaced sulfides to jarosite. Features at the Opportunity site thus do provide additional evidence of an early hydrosphere on Mars, but it had already disappeared into the megaregolith when impacts produced this remarkable deposit.