



Mars Science Laboratory: Results From Bradbury Landing to Glenelg

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The Mars Science Laboratory rover, Curiosity, analyzed rocks, soils, and the atmosphere between Bradbury Landing and the contact with a light-toned, fractured, high-thermal inertia unit ~500 meters to the east ("Glenelg"). A number of in-place outcrops were encountered along this traverse that allows a simple stratigraphy to be constructed. A variety of siliciclastic sedimentary rocks are present in the section, possibly also including minor basaltic volcanics. At several localities en route to Glenelg, Curiosity observed conglomeratic bedrock containing rounded pebbles ranging in size from 5-40 mm, forming beds at least 5 cm thick with locally well-developed planar stratification; this, plus grain-supported and imbricated clast fabrics suggest transport in aqueous flows with depths of 0.1-0.8 m, and velocities of 14-63 cm/sec. These conglomerates were likely derived from the Gale crater rim and transported down the Peace Vallis channel network; ChemCam data suggest the presence of feldspar and basaltic composition rock fragments as pebbles.

APXS and ChemCam data show the out-of-place rock, "Jake Matijevic", to have an evolved, alkaline composition similar to nepheline-normative muegerites, and suggestive of high pressure partial melting of the mantle. Other, stratigraphically in-place rocks show basaltic composition, with high K₂O, low SiO₂, and high FeO.

Between Sols 56 and 110 Curiosity studied the "Rocknest" eolian deposit which was selected for scooping and eventual delivery to CheMin and SAM. The APXS composition of this deposit is consistent with average Mars soils encountered by previous missions (SO₃ + Cl ~6 wt.%). Scooped samples delivered to CheMin reveal the presence of forsterite, pigeonite, augite, plagioclase, and several trace minerals including quartz, anhydrite, magnetite, hematite and illmenite. SAM analysis of the scooped soil yielded four different Evolved Gas Analysis (EGA) experiments depending on the temperature at which evolved gases were sent to the TLS versus the hydrocarbon trap and GC. Heating of the sample to 825 °C EGA yielded a rich set of gases with variable overlap including H₂O, CO₂, O₂, and SO₂. These suggest the likely presence of perchlorates, sulfates and/or sulfides, and carbonates in the soil. Detection of simple Cl-bearing organic compounds (such as CH₃Cl) by the QMS does not demonstrate the presence of organics in the Rocknest soil until terrestrial contaminant sources can be ruled out. A D/H measured by TLS of ~5x terrestrial values indicates significant enrichment, suggestive of early H escape.