



Overview of 3 years of ChemCam' chemical compositions along the Curiosity's traverse at Gale Crater.

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Curiosity rover has been in Gale crater for more than 3 years now. It drove ~12 km from its landing point up to the Bagnold Dunes. The ChemCam instrument is widely used to assess the chemistry of rocks and soils at the submillimeter scale. As of sol 1200, ChemCam sampled >1000 targets, corresponding to >300000 laser shots, >6000 images, and many passive spectra.

The Bradbury landing site, a plain located at a distal portion of the alluvial fan from Peace Vallis, exposed several float rocks presenting igneous compositions ranging from mafic up to a trachytic end-member. These observations provided an important clue concerning the diversity of early Mars magmatism that was not previously recognized. More igneous float rocks have been observed all along the traverse, being more felsic closer to the landing site, and more mafic near the cratered unit, after the Kimberley formation.

The Sheepbed area is essentially composed of mudstones that show a very homogeneous composition, close to the average Martian crust, providing evidence of aqueous episodes with little alteration in this area. ChemCam showed that the bedrock host experienced other diagenetic events with Mg- and Fe-rich clays in erosion-resistant raised ridges on one hand, and calcium sulfate veins on the other hand.

The nearby Shaler fluvial sandstone outcrop, the first outcrop of potential deltaic foreset beds, shows K enrichment. This enrichment is also observed at the Kimberley formation (another drill site flanked by foreset beds), located 7 km SW of Shaler, with up to 5.3 wt % at the Mount Remarkable member.

Conglomerates have been analyzed in detail all along the traverse as they represent a link between the source rocks and the finer-grained sediments such as the sandstones and mudstones. They have shown an average composition that is enriched in alkalis, Al, and Si compared to the average Martian crust, with a clear enrichment in K₂O in the vicinity of the Kimberley formation. Enrichment in K₂O at Kimberley in conglomerates and in sandstone outcrops reveals the presence of an alkali-rich source rock.

Further along the traverse, the Pahrump outcrop corresponds to the first observed material at Mt Sharp's base and is part of the Murray Formation, mainly constituted of mudstones. Its facies suggest a stronger alteration, with presence of F-bearing materials such as apatite, fluorite and phyllosilicates.

Both Murray and Stimson formations (overlying unit) are highly enriched in SiO₂ (>80 wt %). This enrichment in Si is debated and could be due to deposition of Si, but acidic alteration or hydrothermalism are also possible explanations.

ChemCam analyzed > 200 soil locations. The analyses indicate that fine-grained soils have a mafic composition that nevertheless contains contributions from local bedrocks. Analysis of coarser grains gave the possibility to study the link between local rocks and soils. ChemCam also adds new information on the ubiquitous hydration of these soils.

As of sol 1200, Curiosity is entering the Bagnold Dunes area, in order to study for the first time active dunes.