

# The 3rd National Mars Science Seminar

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## *Megashears at the crustal dichotomy in Valles Marineris and implications for metalliferous mineralizations*

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Two large shear zones that formed in the brittle-ductile domain of the early Martian crust are exposed in a deep erosional window in the Valles Marineris troughs, where it joins the planetary dichotomy boundary. Assemblage of primary minerals revealed in the sheared basement using a new method of nonlinear spectral unmixing gives a magmatic origin. The presence of copiapite, jarosite, and szomolnokite suggests hydrothermal alteration of sulfides crystallized in the shear zone fracture networks. The shears probably initiated as normal faults during the pre-Noachian. Shear zone development, long-lasting tectonic activity, mafic basement composition, hydrothermal circulation, and exhumation, provide one of the most promising environments for primary deposition, concentration, and exposure of base and precious metals, perhaps of cut-off grade. Some metals might have been transported through outflow channels toward the northern lowlands, leaving placer deposits in low-energy environments.



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