Clay continuity along the Martian dichotomy

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Résumé

The study of clay-rich deposits is key to understanding past water activity on Mars and its early habitability potential. Strong phyllosilicate signatures have been identified over the Mawrth Vallis plateau based on the OMEGA instrument (1). Similarly, large clay-rich deposits have been detected in Oxia Planum (2), the landing site of the *ExoMars Rosalind Franklin* rover mission. The rover, planned for launch in 2028, will investigate the Martian surface and subsurface with its two-meter-deep drill, searching for potential traces of past life preserved in these phyllosilicate-bearing units (3).

Aqueous alteration minerals from the selected landing site exhibit spectral features consistent with Fe/Mg-rich phyllosilicates, best fitted with vermiculite or saponite due to the position & shape of the 2.3μm absorption band, and a Fe2+ oxidation upward slope from 1μm to ~1.7μm (2). These large clay units date back to the Noachian period (4). 300km northeast, clays found in Mawrth Vallis are consistent with montmorillonite (Al rich) and nontronite (Fe3+/Al rich) smectites, as indicated by spectral absorptions at respectively ~2.2μm and ~2.3μm, as well as their overall shape (5). These units are also dated to the Noachian period (6).

The proximity of both sites and their similar position straddling the crustal dichotomy calls for the investigation of the relationship between these two significant phyllosilicate-bearing regions.

Spectral analysis reveals two distinct clay types, as introduced earlier: the "Oxia Planum"-like and the "Mawrth Vallis"-like. Layered crater walls, observed with HiRISE, seem to confirm the presence of clays between these two major regions – more closely related than we initially believed, but showing signs of a different ancient aqueous history. We are now deciphering the stratigraphic relationship between the two types of clays and broadening the scope of our study to the clay-rich margins of Chryse Planitia.
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