Exploring the Mawrth Vallis Stratigraphy South of 20° N

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Introduction

• The Mawrth Vallis Region was one of the “Final Four” candidates for a MSL landing site

• It is noteworthy for
  ▫ its age: Noachian
  ▫ Exposure
  ▫ Mineralogic diversity, occurrences of:
    ▪ Fe/Mg smectites
    ▪ Al smectites
    ▪ Kaolinite group minerals
    ▪ Hydrated silica
    ▪ Ferrous mica or chlorite
    ▪ Sulfates

• But...
LATITUDE Challenges

• From the 2010 report of the MRR-SAG:
• “Latitude access for a solar-powered rover with a minimum of a 1-Earth-year primary mission lifetime is restricted to between 25°N and 15°S”
• Experience with Spirit, near 15°S, has shown the challenges of pushing the limits of solar-powered rovers
  ▫ Need to winter-over on an equator-facing slope
FRT 8838
R = BD
2200
G = D 2300
B = IRR2
Al phyllosilicates overlying Fe/Mg smectites
Prolonged history of water flow…
Rectilinear fracture patterns in the dark “mantle”
Sulfates on top of the Al Phyllosilicate unit?

• Recent paper in the *Mars Journal* by Noe Dobrea et al. (2011) pointed out some occurrences of an “acid leaching” component in the upper portions of the Al phyllosilicate unit and some scattered occurrences of jarosite

• Farrand et al. (2009) found a discrete patch of jarosite in an ~ 3 x 2 km ovoidal area in N. Mawrth Vallis

• The jarositic patches on top of the Al phyllosilicate unit are more scattered
Non-linear mixture modeling of jarositic spectrum

- Applying a *Shkuratov et al.* (1999) derived scattering model to the jarositic spectrum *ala Farrand et al.* (2011):

<table>
<thead>
<tr>
<th>Substance</th>
<th>Cronstedtite</th>
<th>Halloysite</th>
<th>Montmor 1</th>
<th>Plag 1</th>
<th>Alunite</th>
<th>Jarosite 3</th>
<th>Glass</th>
<th>Ferrihydrite 1</th>
<th>RMS error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>0.065</td>
<td>0.0191</td>
<td>0.1107</td>
<td>0.2537</td>
<td>0.0211</td>
<td>0.1283</td>
<td>0.1638</td>
<td>0.1245</td>
<td>0.000711</td>
</tr>
</tbody>
</table>
Conclusions

• The area south of Mawrth Vallis described in this presentation presents a broad expanse of the distinctive Mawrth Vallis stratigraphy in a more southerly latitude allowing for better solar insolation
• This area has exposures of Fe/Mg smectites, Al phyllosilicates, and, apparently, scattered occurrences of jarosite
• Geomorphology of the region includes inverted topography channels indicating a protracted history of aqueous activity
• The channels converge on a depression to the southeast... a possible paleo-pond?
We’re ready to go...