Summary of Spectroscopy

Results
Recap

- **VNIR** - visible/near-infrared spectrometer
  - 0.5 - 2.5 µm wavelengths, reflectivity
  - Rover-mounted
  - Sensitive to water (bound or atmospheric), iron (as a cation), carbonate

- **TIR** - thermal infrared spectrometer
  - 8.0 - 13.0 µm wavelengths, emission
  - Human operated
  - Sensitive to silicate minerals, carbonates, sulfates (less so for oxides, ionic salts)
Site B Results

- VNIR complications resulted in limited spectral return because of estimated length of time for acquisition (ops team assumed 2 minutes per)
  - VNIR ‘compass pan’ - one spectrum at cardinal points (rover coordinates) at a single elevation
  - VNIR results sensitive to relative humidity: increasing water vapor increases noise in spectra

- TIR limited in number of spectra/day
  - Best for targeted observations, tried to mimic VNIR targeting when specific targets not used.
IKONOS VNIR image
of landing area: red areas indicate chlorophyll
IKONOS again: zoom on actual traverse path (black line)

Note red areas on far side of coastal range; we attempted to target a reddish area that appeared to be on our side of the range (see arrow).
ASTER TIR:
“Mineralogy Map”
(from before ops)

Blue - intermediate volcanics
Green - felsic volcanics
Red - carbonates
ASTER TIR: “Mineralogy Map” (zoom on ellipse)

Revised mineralogy (post-ops):
- Blue - intermediate volcanics (altered?)
- Green - altered int. volcanics + sulfates(?)
- Red - carbonates
<table>
<thead>
<tr>
<th>Locale</th>
<th>Clays/Micas/Zeolites</th>
<th>Sulfates</th>
<th>Iron Oxide</th>
<th>Feldspar/Pyroxene</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locale 1</td>
<td>All</td>
<td>—</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Locale 2</td>
<td>All</td>
<td>Minor</td>
<td>Minor</td>
<td>—</td>
</tr>
<tr>
<td>Locale 3</td>
<td>All</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Locale 4</td>
<td>All</td>
<td>—</td>
<td>Minor</td>
<td>—</td>
</tr>
<tr>
<td>Locale 5</td>
<td>All</td>
<td>—</td>
<td>Y</td>
<td>—</td>
</tr>
<tr>
<td>Locale 6</td>
<td>All</td>
<td>—</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

All: present in all spectra at locale
Y: present in at least one spectrum, > 15%
Minor: present in at least one spectrum, < 15%
Red: VNIR result  Green: TIR result  Yellow: Seen by both
<table>
<thead>
<tr>
<th>Locale</th>
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<th>Sulfates</th>
<th>Iron Oxide</th>
<th>Feldspar/Pyroxene</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locale 7</td>
<td>All</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Locale 8</td>
<td>All</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Locale 10</td>
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<td>—</td>
<td>—</td>
<td>Y</td>
</tr>
<tr>
<td>Locale 11</td>
<td>All</td>
<td>—</td>
<td>(pyrite)</td>
<td>Y</td>
</tr>
<tr>
<td>Locale 14</td>
<td>All</td>
<td>—</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Locale 19</td>
<td>All</td>
<td>—</td>
<td>Y</td>
<td>—</td>
</tr>
<tr>
<td>Locale 20</td>
<td>All</td>
<td>—</td>
<td>Minor</td>
<td>Y</td>
</tr>
</tbody>
</table>
Site B: VNIR Example

Water absorptions at 1.4, 1.9 μm; noise is due to atmosphere.

Shape is most consistent with clay minerals (specifically palygorskite), and is observed at every locale with VNIR results.
Site B: TIR Examples

Locale 3; Pan 180, El -20
• Clays; pyroxene; anhydrite; mica
(no corresponding image)

Locale 8; Pan 90, El -15
• Zeolite, clay, feldspar
[Image at Pan 87, El -12]