Elevation vs. Wind Streaks
Scientific Question

- Are wind streaks more common in higher or lower elevations on the Southern Hemisphere of Mars?
Why This Is Important

- Answering this question may help give us a better understanding of how elevation effects the consistency of wind streaks in the Southern Hemisphere of Mars.
- This question is an interesting one because in order to be accepted for the ASU Mars program, we needed to take part in a good learning experience and intriguing topic for the ASU professors to take notice.
Hypothesis

- **Main Hypothesis**
  - The higher the elevation, the more wind streaks will commonly appear in the Southern Hemisphere of Mars.

- **Alternate Hypothesis One**
  - The lower the elevation, the more wind streaks will commonly appear in the Southern Hemisphere of Mars.

- **Alternate Hypothesis Two**
  - There is no correlation between elevation and wind streak patterns in the Southern Hemisphere of Mars.
Definitions

- Elevation
  - The height to which something is elevated above a point of reference such as the ground.

- Wind Streaks
  - Some of the most prominent Aeolian features on the surface of Mars are wind streaks. They appear in numerous images of the surface and are the result of wind erosion and deposition. As surface wind markers these streaks are very important in helping to understand the surface circulation patterns on Mars. The most common type of streaks are bright and dark streaks, which are almost always observed in the lee of topographic features such as craters, hills and scarps. High resolution images taken by the Mars Global Surveyor show that these streaks change over a short period of time. The bright streaks in particular are the most common of all surface Aeolian features.
Wind Streaks
On Mars.

http://nssdc.gsfc.nasa.gov/imgcat/hires/vo2_041b51.gif

On Earth.

http://explanet.info/images/Ch06/06_29.jpg
Information

How They Are Formed

Wind streaks are formed by the interaction of wind with surface features. Wind streaks form downwind from the crater, either from deposition or erosion of fine debris. Wind streaks can therefore serve as a type of wind vane, indicating the prevailing wind direction when the streaks were formed. Wind streaks also change over time and can be used to gauge seasonal or long-term changes in surface wind direction.
Informa
(continued)

○ Scientific Research
  — NASA continues to use THESIS images to research the formation and consistency of wind streaks on Mars.

○ Why do some craters on Mars produce depositional wind streaks, while others produce erosional ones? There is no evidence to suggest that crater morphology or topography plays the determining role. Cornell University found that some craters can form either type of streak at different times of the Martian year, suggesting that the controlling factor is meteorological.
By observing wind streaks on the surface of Mars, we came to our hypothesis. Noting how frequent the wind streaks seemed to be, we wondered about whether or not the wind streaks appear more often in certain elevations in the Southern hemisphere of Mars.
Procedures

I. Log into the school computer using your PUSD Student ID.

II. Open Internet Explorer.

III. Go to the web page http://themis.asu.edu/

IV. Open the Image Gallery.

V. Go to THEMIS Images by Topic.

VI. Go to Wind/Dust.

VII. Evaluate images found with negative latitude.

VIII. Chart these pictures and their elevation in a selected data table.

IX. Open JMARS.

X. Click Add New Layer > Stamps > THEMIS Stamps.

XI. Enter the V-Stamp into JMARS.

XII. Go to the THEMIS Stamps tab and click Find Stamp.

XIII. Render the ABR.

XIV. Count the number of wind streaks found in the picture.

XV. Evaluate the image and write observations in the data table.

XVI. Repeat steps from step VI to step XI, nineteen more times.
Experimental Design

- The specific geological features represented in this experiment are wind streaks found in the Southern Hemisphere. The subject chosen was tested because it seemed interesting and enjoyable. Information on the subject will mostly be found using the ASU THEMIS website.

- The materials used in this experiment include the following:
  - The Mars Odyssey Space Craft
  - THEMIS
  - http://jmars.asu.edu/
  - JMARS
### Data Table

<table>
<thead>
<tr>
<th>Image ID (V#)</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Elevation</th>
<th>Number of Wind Streaks</th>
<th>Observations</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>V41239001</td>
<td>-1.463331</td>
<td>207.055</td>
<td>Low</td>
<td>2</td>
<td>Formed Over a Hill</td>
<td>SW</td>
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<tr>
<td>V26903003</td>
<td>-11.602725</td>
<td>180.416</td>
<td>Low</td>
<td>1</td>
<td>Young / New</td>
<td>SW</td>
</tr>
<tr>
<td>V06386004</td>
<td>-11.9798</td>
<td>177.294</td>
<td>Low</td>
<td>2</td>
<td>Old</td>
<td>SE</td>
</tr>
<tr>
<td>V40280001</td>
<td>-3.2495</td>
<td>152.34</td>
<td>Low</td>
<td>2</td>
<td>Around Craters</td>
<td>SE</td>
</tr>
<tr>
<td>V05214001</td>
<td>-5.11965</td>
<td>137.488</td>
<td>Low</td>
<td>1</td>
<td>Inside of Gale Crater</td>
<td>SE</td>
</tr>
<tr>
<td>V20051001</td>
<td>-1.2067</td>
<td>204.531</td>
<td>High</td>
<td>3</td>
<td>Older Surface From Below Is Being Re-Exposed</td>
<td>SE</td>
</tr>
<tr>
<td>V19191001</td>
<td>-6.9681</td>
<td>173.794</td>
<td>High</td>
<td>3</td>
<td>Wind Pulls Streaks From Crater</td>
<td>SW</td>
</tr>
<tr>
<td>V40611004</td>
<td>-81.517</td>
<td>296.925</td>
<td>High</td>
<td>1</td>
<td>Looks Like Boxes</td>
<td>SE</td>
</tr>
<tr>
<td>V39861009</td>
<td>-83.3642</td>
<td>327.367</td>
<td>High</td>
<td>1</td>
<td>Large</td>
<td>SW</td>
</tr>
<tr>
<td>V02378002</td>
<td>-2.5097</td>
<td>202.991</td>
<td>High</td>
<td>2</td>
<td>Near Craters</td>
<td>SE</td>
</tr>
<tr>
<td>V05484015</td>
<td>-6.867</td>
<td>243.72</td>
<td>High</td>
<td>1</td>
<td>Near a Volcano</td>
<td>SW</td>
</tr>
<tr>
<td>V11200001</td>
<td>-4.6235</td>
<td>287.38</td>
<td>High</td>
<td>1</td>
<td>In a Canyon</td>
<td>SW</td>
</tr>
<tr>
<td>V08512206</td>
<td>-67.1119</td>
<td>53.3178</td>
<td>High</td>
<td>1</td>
<td>Inside a Crater</td>
<td>SE</td>
</tr>
<tr>
<td>V26903004</td>
<td>-66.5111</td>
<td>162.262</td>
<td>High</td>
<td>1</td>
<td>Young</td>
<td>SE</td>
</tr>
<tr>
<td>V03676002</td>
<td>-5.5022</td>
<td>209.4</td>
<td>Low</td>
<td>1</td>
<td>Near Lava Channels</td>
<td>SW</td>
</tr>
<tr>
<td>V05725001</td>
<td>-5.5562</td>
<td>184.059</td>
<td>Low</td>
<td>2</td>
<td>Features Shaped by Wind</td>
<td>SW</td>
</tr>
<tr>
<td>V03635002</td>
<td>-7.8062</td>
<td>184.059</td>
<td>Low</td>
<td>1</td>
<td>Sand Blown because of Wind</td>
<td>SW</td>
</tr>
<tr>
<td>V24120002</td>
<td>-9.677</td>
<td>183.94</td>
<td>Low</td>
<td>2</td>
<td>Wind Caused Volcano Erosion</td>
<td>SE</td>
</tr>
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<td>V15901002</td>
<td>-10.034</td>
<td>37.189</td>
<td>Low</td>
<td>1</td>
<td>Wind Erosion on Channel</td>
<td>SE</td>
</tr>
<tr>
<td>V14522895</td>
<td>-14.5225</td>
<td>175.789</td>
<td>Low</td>
<td>2</td>
<td>Surrounded by Craters</td>
<td>SE</td>
</tr>
</tbody>
</table>
Representational Graph

Elevation vs. Number of Streaks

Number of Streaks:

<table>
<thead>
<tr>
<th>Elevation</th>
<th>Number of Streaks</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>16.2</td>
</tr>
<tr>
<td>Low</td>
<td>15.0</td>
</tr>
</tbody>
</table>
In the experiment, the results proved that there is a correlation between whether or not wind streaks are more often on the Southern Hemisphere in higher or lower elevations. Wind streaks are, indeed, more common in higher elevations on the Southern Hemisphere of Mars than in lower elevations.

The results imply that, in the past, on the Southern Hemisphere of Mars, wind streaks occurred more often in higher elevated places. Currently, there are wind streaks visible. In the future, more wind streaks will appear in higher elevations on the Southern Hemisphere of Mars.
Conclusion

Are wind streaks more common in higher or lower elevations on the Southern Hemisphere of Mars? The higher the elevation, the more wind streaks will commonly appear in the Southern Hemisphere of Mars. Answering this question may help give us a better understanding of how elevation effects the consistency of wind streaks in the Southern Hemisphere of Mars. We hope to be accepted to use the THEMIS visible camera at ASU with this experiment because our data was represented clearly in all the required ways, we worked hard and well as a team, and we feel as though our representation is deserving. In the experiment, the data proved that wind streaks are more common in higher elevations on the Southern Hemisphere of Mars. Our hypothesis was supported by our data. For example, in image V39861009 (seen in the next slide), the wind streaks are clearly visible and in high elevations. Sources of error could be the possibility of repeating V-Numbers, or copying information incorrectly. The higher the elevation, the more wind streaks will commonly appear in the Southern Hemisphere of Mars.
References

- Works Cited
  - THEMIS Images - http://themis.asu.edu/image_of_the_day/wind_dust
  - JMARS - http://jmars.asu.edu/