Overview of the preliminary results from the Phoenix Lander on Mars

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Overview

- Phoenix Timeline
- Phoenix in a Nutshell
- On-board Instruments
- Latest Results:
  - Geology
  - Mineralogy
  - Chemistry
  - Atmospheric Science
- What's Next?
- Conclusions
Phoenix Timeline

- Mission proposal selected in Aug 2003
- Launched Aug 4th, 2007
- Landed in the North Polar regions on May 25th, 2008 (68.21 N, 234.25 E)
- Passed the Primary Mission Phase on Aug 25th, 2008
- Current Sol: 135 (and counting!)

Phoenix in a Nutshell

- Length: 5.5 m total, 1.5 m for the deck
- Height: 2.2 m
- Mass: 350 kg
- The Robotic Arm (RA) extends 2.35 m from its base on the lander, and can dig down to 0.5 m below the surface
On board Instruments

- Robotic Arm Camera (RAC)
- Surface Stereo Imager (SSI)
- Optical Microscope (OM)
- Atomic Force Microscope (AFM)
**On board Instruments**

- Thermal and Evolved Gas Analyzer (TEGA)
- Wet Chemistry Lab (WCL)
- Meteorological Station (MET)
- Thermal and Electrical Conductivity Probe (TECP)
Phoenix is sitting on the ejectal blanket of Heimdal Crater.

Polygons are ubiquitous at the landing site.
White material typically seen at 5 cm depth.

Seems to sublimate...

Snow Queen
Geology

OM Air fall Sample:
Material collected during descent

Mineralogy/ OM
The soils show a Bimodal distribution:
1) Coarse strongly magnetic grains and
2) weakly magnetic fine material that is at times below the resolution limit of the OM.

The AFM sees what is very similar to sheet silicates (Clay minerals).
**Chemistry/TEGA**

- Water Vapor is seen to evolve at high temperature, indicative of clay minerals
  - Sheet Silicates a high possibility

- CO₂ evolves at high temperature
  - Carbonates! (in the order of 3 - 7%)

**Chemistry/WCL**

- Soil pH: Slightly alkaline (~ 8.3)
  - almost that of Ocean water!

- Carbonates: as CaCO₃
  - Needs liquid water to form!

- Perchlorates \((M\ [\text{ClO}_4]_n)\)!
  - A desiccant that can form liquid brines down to -68 °C
- Temperature rose till the Summer solstice, and since then has been steadily dropping.
- Atmospheric pressure has been decreasing in the order of 0.01 millibar (1 Pascal) per day.

**SUMMARY OF MARS WEATHER – SOL 183**

- **AVERAGE MAX**
  - -30 °C / -22 °F
- **AVERAGE MIN**
  - -76 °C / -109 °F

- Slight increase in temperature from Sol 1-13 (about 4 degrees)
- Wind southerly during the day, Easterly at night. Average wind speed of 14.4 km/h or 8.9 mph
- Pressure steadily decreasing from 8.5 to 7.85 millibars
- **AVERAGE VISIBILITY**
  - Clear to clear with dust haze

**Atmospheric Science**

**General Weather**

SOL 80

**Observations/ Frost**

SOL 114
Atmospheric Science

Observations/ Clouds

Atmospheric Science

Wind & Dust Devils
What’s next?

- Filling the remaining TEGA ovens.
- Continue atmospheric observations
- Night-time imaging
- Basically, try to do as much science as we can before we run out of power.

Conclusions

- Phoenix has confirmed the earlier predictions that a rich and shallow water ice table exists.
- There are strong indications that the landing site has “seen” liquid water in an earlier time, a key element in addressing habitability.
- The geochemistry of the area is very different from what we have seen with the MERs or even the Vikings.
- It is safe to say that Phoenix will add an important chapter into our book of knowledge about Mars’ Geology, Chemistry, and Climatology.
Thanks!!