The Canadian Space Agency has agreed to supply the Phoenix Lander with a meteorological (or MET) weather station. This includes a pressure sensor, three temperature sensors located along a vertical one-metre mast, and a wind speed and direction sensor (called a Tell-Tale), mounted atop the MET mast. The MET suite of instruments will also include the first extraplanetary lidar system. The lidar will measure the distribution of Martian dust in the atmosphere up to altitudes of 20 km.

Members of the MET Science Team include Dalhousie Faculty member Tom Duck, who is providing input to the instrument design and operation, and model estimates of the data returned by the Phoenix Lidar System by Cameron Dickinson. Matt Coffin, a graduate student at Dalhousie, is working on obtaining the optical properties of the Martian dust as observed using the lidar.

The term “lidar” is an acronym for Light Direction And Ranging, and works in a similar manner to its earlier cousins RADAR (Radio Detection And Ranging) and SONAR (Sound Navigation And Ranging). Similar to sonar, a pulse of light (equivalent to a sonar ping?) is directed straight up. Any molecules, dust or clouds (whales or submarines for sonar), cause the the pulse to bounce back to the detector.

In a lidar system, pulses of light are produced by a laser (1). When the light pulse encounters dust, fog, clouds and/or molecules, scattering occurs in all directions (2), and some of the scattered light is redirected back towards the ground (3), where it is gathered by a telescope, electronically detected and digitized. The time that it takes to travel from the laser to the cloud, dust, or molecules and back to the telescope can be converted into a distance using the speed of light (Distance = time traveled * speed of light * ?)

Signals, such as those below collected on Earth at the Atmospheric Optics Laboratory at Dalhousie, are representative of what we might observe on Mars. Cloud layers would produce an increased signal, and we could measure how thick and at what altitude they occur. Observing them over time will reveal how Martian weather unfolds over both a single sol (also known as a diurnal cycle) and over many sols. The information gathered by the Phoenix lidar will allow scientists back on Earth to understand how Martian weather evolves. Similar processes occur on Earth, and through comparison and contrast, projects such as the Phoenix Lander will allow us to better understand how weather on Earth develops.

*Article courtesy of Mara Cranston, Dalhousie University.*