

# MISSION CONTROL DATA

## OVERVIEW

This section provides a brief tutorial on the meaning of the data returned in the control room. Students are expected to interpret this data, and apply the information they gain to their development of a solution. It is **not** recommended that you teach students how to do this. Instead, let students try to figure out what these things mean on their own, then discuss their findings in class.

A complete list of the data returned in the Mission Status Center is given in the table, "Information on Worlds in Our Solar System."

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## BAROMETER



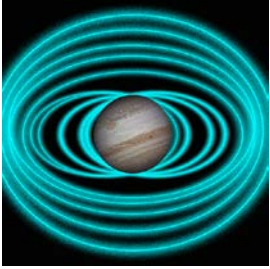
Barometers measure the density of an atmosphere, not how far an atmosphere extends from the surface of a world. Earth's atmosphere is defined as 1.0, so a reading that is less than 1.0 signifies an atmosphere that is less dense than Earth's.

0.01 atmospheres	1.6 atmospheres	90 atmospheres
Callisto has a very thin atmosphere, about one-hundredth of Earth's.	Titan has an atmosphere that is somewhat thicker (denser) than Earth's. It therefore has a higher atmospheric pressure.	Venus has an extremely dense atmosphere. It would crush you if you stood on the surface of Venus.

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## MAGNETOMETER

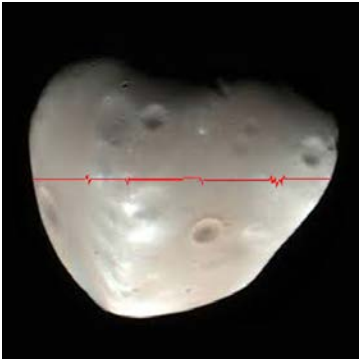
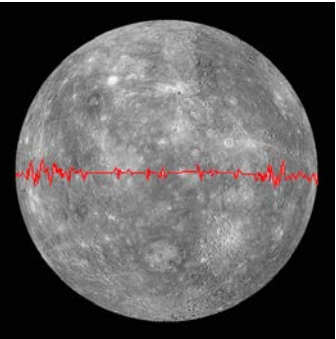
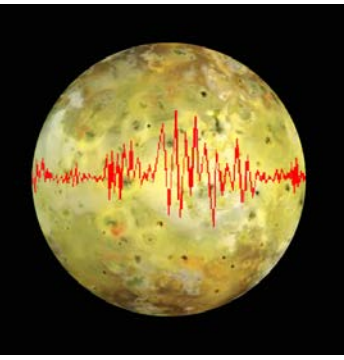
Magnetometers measure the strength of a world's magnetic field. Only worlds with liquid cores made of a metal such as iron have magnetic fields. A magnetic field protects a world from the solar wind, the particles that the sun blasts out into the solar system. Earth has a moderately strong magnetic field; without it life would not be possible because the solar wind would ravage the surface of the planet.

		
<p>Charon does not have a magnetic field, so there are no blue lines in the data returned in the control room.</p>	<p>Mars has a weak magnetic field.</p>	<p>Jupiter has an extremely strong magnetic field, as shown by the large number of lines and their distance from the planet.</p>

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## SEISMOGRAPH

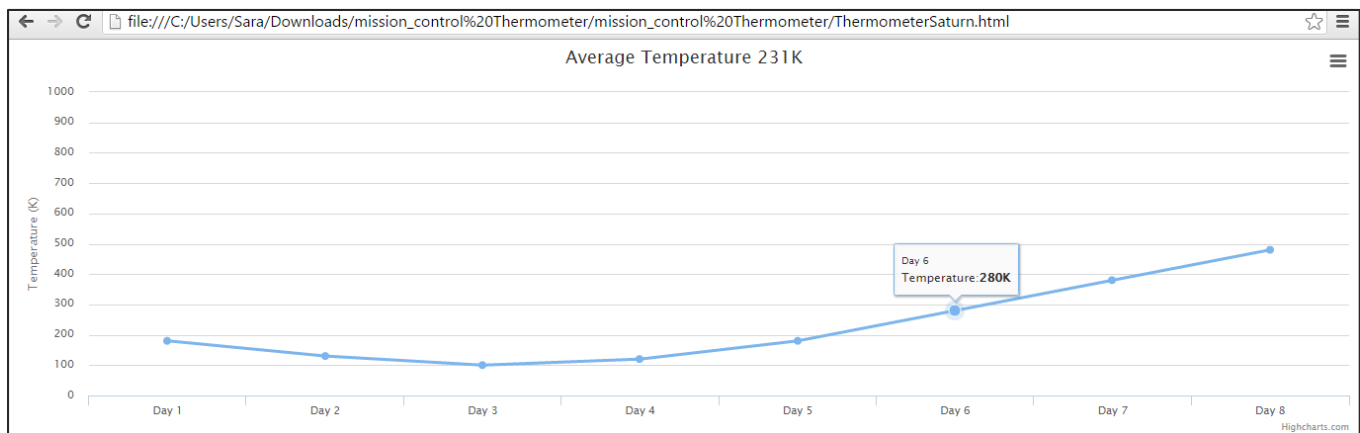
Seismographs work only on worlds with hard surfaces. They measure movement of the ground, and are used especially to study earthquakes.

		
<p>Deimos has almost no seismic activity.</p>	<p>Mercury has a moderate amount of seismic activity.</p>	<p>Io has a great deal of seismic activity because of the pull of Jupiter.</p>

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## THERMOMETERS

Two types of data are returned from the thermometers: the average temperature in Kelvin, and the fluctuation in temperature over a given time period. Thermometers can only be used on landers because they must come into contact with the atmosphere they are measuring.

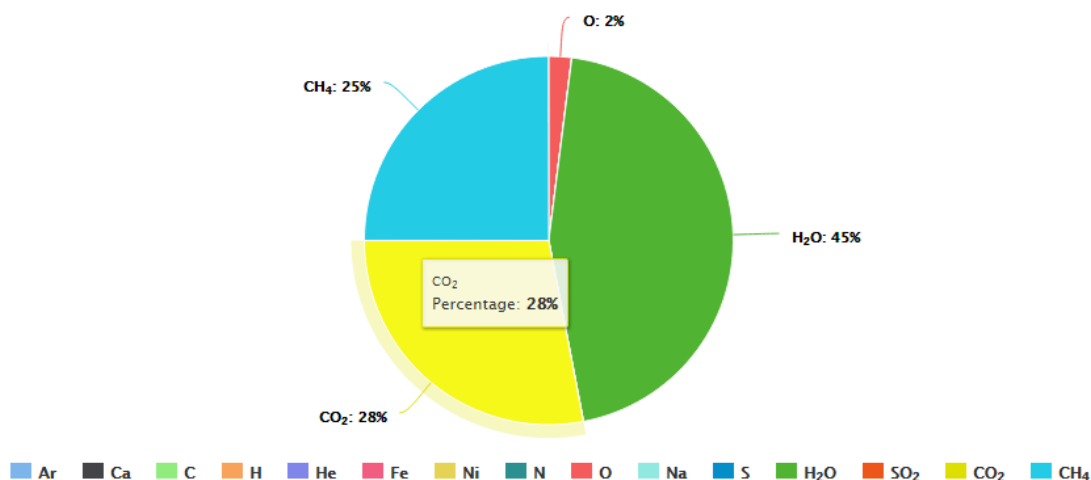


The above chart for Saturn shows the temperature readings gathered over the course of the probe's collection. The average temperature is displayed at the top. Hovering over a data point will tell the student the exact temperature reading for that point.

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## SPECTROGRAPHS

Spectrographs collect samples of substances in the atmosphere or on the surface of a world, then conduct tests to determine their composition. The interactive data returned show the substances (11 elements and 4 compounds) and give an idea of the percentage of each. Students must use the spectral database to figure out what the elements are. All elements and compounds are listed along the bottom and students can hover over each to highlight the amount of a specific percentages of composition.

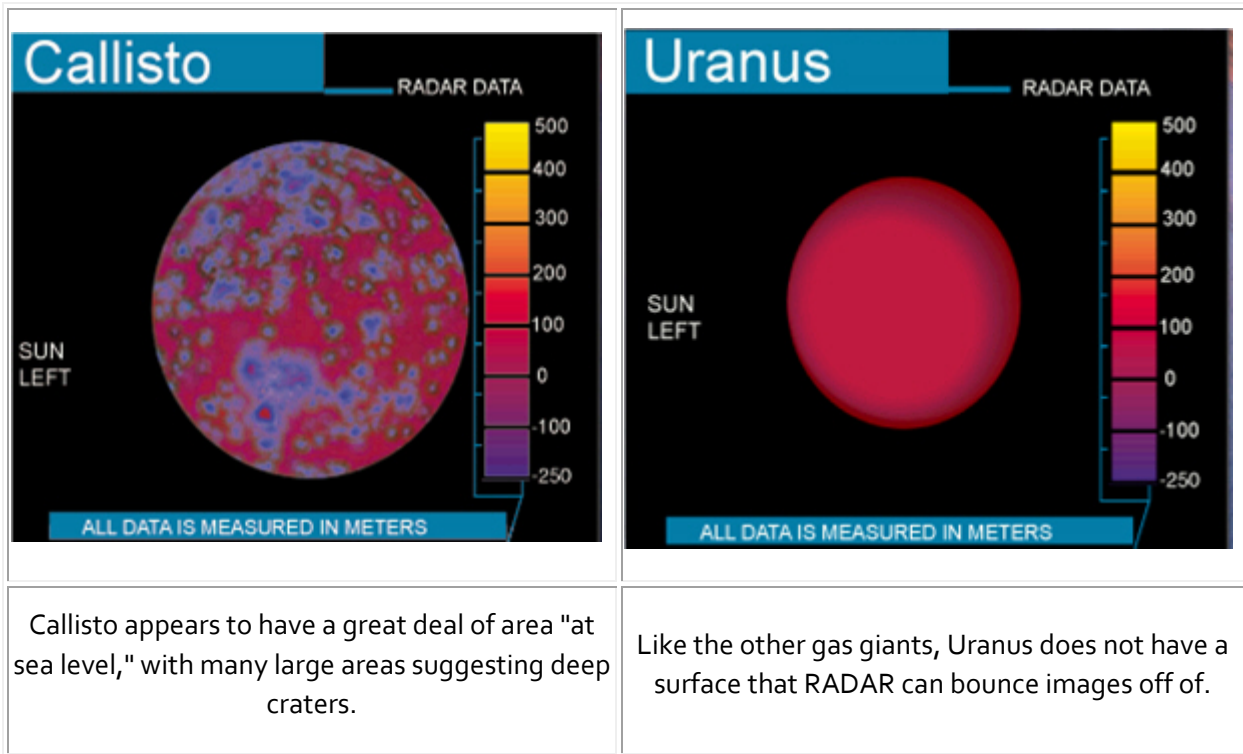


The above chart for Calisto shows that it largely composed of water and carbon dioxide, as well as methane and a small amount of oxygen.

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## RADAR

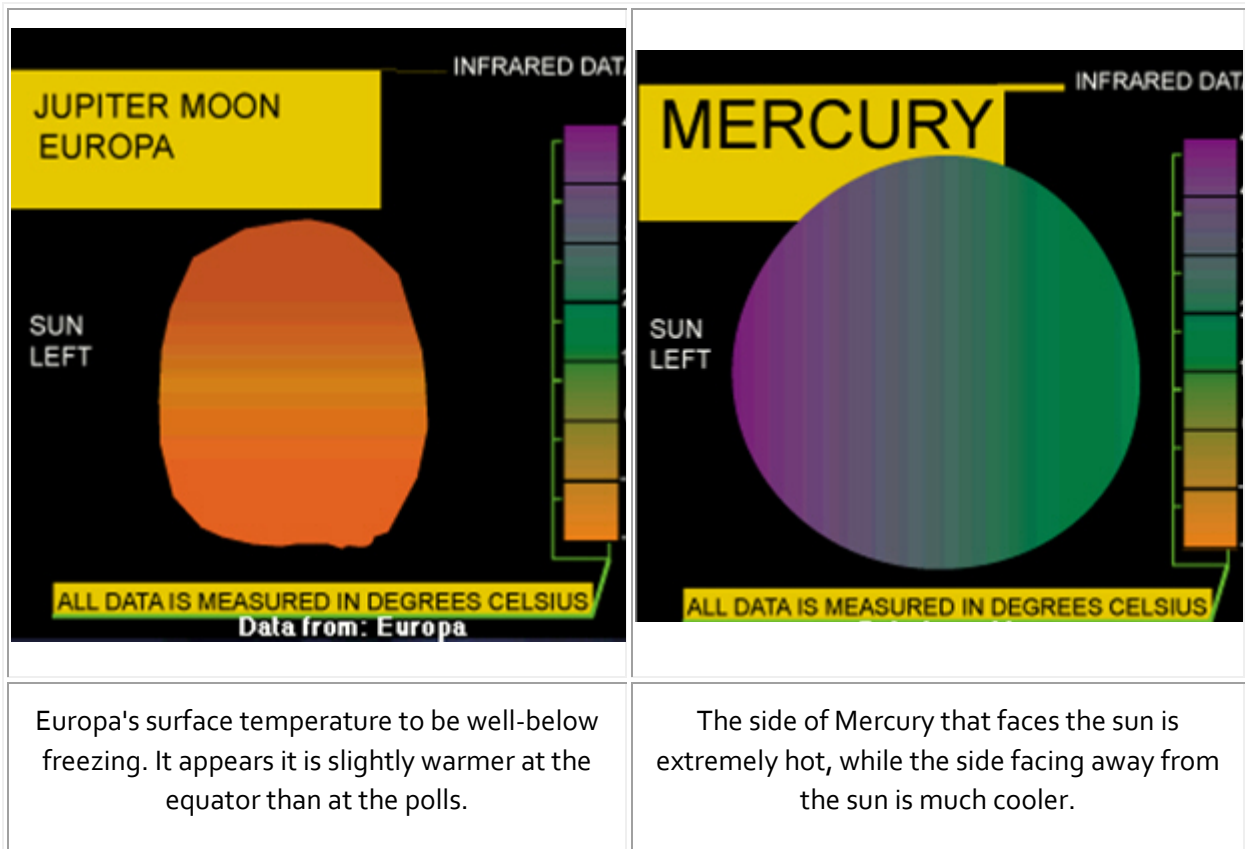
RADAR is used to map the surface of a world from space. In other words, it can be used to measure the height of mountains and depth of valleys or seas. This is not a very useful instrument for data collection in *Alien Rescue* because students do not need this information to solve the problem.



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## INFRARED CAMERA

Infrared cameras are used to measure heat. They work on flyby and orbiter probes, so they provide a good alternative to thermometers if a lander is not being used. Also, while thermometers gather data about one spot on a world, infrared cameras allow an opportunity to compare regions.



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