GALILEO -
FIRST SCIENTIFIC RESULTS FROM THE JUPITER SYSTEM

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The Galileo Mission is designed to study all aspects of the huge, complex Jupiter system. Its primary objectives are: 1.) Jupiter, 2.) the Galilean satellites, and 3.) the Magnetosphere. Since its arrival in the Jupiter system on 7 December, 1995, Galileo has provided a nearly continuous stream of data concerning all its objectives and has already made several major discoveries.

The Probe phase of the mission provided the first ever in situ study of Jupiter's atmosphere. Initial results from the Probe include:

- Discovery of an intense radiation belt inside Jupiter's rings
- Discovery of a very hot thermosphere at extremely high altitudes
- Detection of radio signals from lightning suggesting less frequent but larger lightning strokes than on Earth
- Precise measurement of the Helium abundance, showing that it is closer to the original solar value than believed previously
- Discovery that Jupiter's strong, jet-stream like winds persist to great depth, suggesting that it's meteorology is largely driven by internal heat, not absorbed solar energy
- Recognition that the Probe descended in a nearly cloud free, very dry part of the atmosphere (a 5-micron "hot spot"), raising the possibility that regional or local meteorology (large down-drafts) are playing a major role in the composition of the upper atmospheric layer
- Measurements of noble gases, showing that some are highly depleted relative to solar values while others are "normal", suggesting at least some degree of He "rain" to provide selective depletion

During its first four orbits the Galileo Orbiter has made measurements of Jupiter, all four of the Galilean satellites, Jupiter's ring and small satellites, and the magnetosphere. Important initial results include:

- Io is a differentiated satellite, probably possessing a metallic core of iron and iron-sulfide with a radius about half that of the satellite.
- Io strongly perturbs Jupiter's magnetic field in its vicinity as a result of large current systems and possibly an intrinsic magnetic field.
- There are intense, powerful field aligned currents of electrons flowing from Io to Jupiter's ionosphere.
- Galileo flew through a high altitude, high density (>10^4 cm^-3), cold plasma "cloud" or ionosphere at Galileo's closest approach (900 km).
- Ganymede, the largest moon in the solar system has its own magnetosphere, probably produced by a relatively strong internal magnetic field.
- Gravity data shows that Ganymede is also highly differentiated,

with a low density ice shell ~700 km thick overlying a denser iron/rock mixture, which in turn is probably differentiated into a metallic core and rock mantle as is Io.

- Ganymede's icy surface has been extensively resurfaced by tectonic forces, e.g. fracturing and faulting, with less evidence of icy volcanism than expected previously.
- Europa's icy crust shows evidence of extensive disruption and motions of small scale plates, suggesting a relatively thin brittle layer over a ductile or liquid substrate. There are also numerous diffuse patches associated with lineaments suggesting some form of eruptive geyser like activity.
- There are regions in Jupiter's atmosphere resembling large convective cells which rise to high altitude and change on short time scales, suggesting thunderstorm type activity which may be an important component of the energy transfer in the atmosphere.

Galileo's exploration of Jupiter's system is scheduled to last until Dec. 1997, and may be extended beyond that if the spacecraft remains healthy. Galileo the spacecraft and the international mission engineering and science community are continuing the tradition of exploration and discovery began by Galileo the man in Padua 387 years ago.