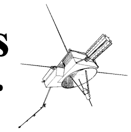
Ulysses Radio Observations of Jupiter's Space Weather



- **Beginning in February 1999, a well-developed interaction region formed in the solar wind beyond 1 AU; large, cyclic variations in solar wind velocity (not shown) and density were observed by the Ulysses spacecraft. The Ulysses radio investigation also observed the response of the Jovian magnetosphere to the interaction region, as subsequent compression and expansion allowed the escape of trapped radio emission known as Jovian nonthermal continuum. The Ulysses-Jupiter separation was nearly 10 AU, a very large distance for the detection of this radio emission. The Ulysses observations provide useful diagnostics of changing Jovian "space weather" for correlation with observations by Galileo (inside the Jovian magnetosphere) and by Earth-based observatories.**

N R. MacDowall/GSFC

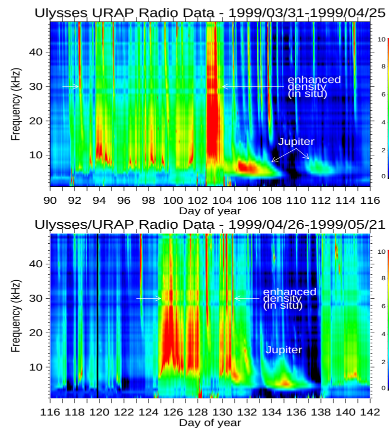


Figure caption: Two 26-day intervals of Ulysses radio spectrograms showing in situ density enhancements and associated radio emission escaping from the Jovian magnetosphere. (Color scale indicates relative intensity.)

Space Science MO&DA Programs - June 1999 - Page 1

Ulysses URAP Jupiter Observations

Occasionally, large-scale, well-developed regions form in the solar wind that are characterized by large, cyclic variations in solar wind bulk speed and density. The variations are on a time scale of several days, with velocity varying over a factor of about 2-3 and density over a factor of about 50-100. The cycles repeat approximately one to four times every 26-day solar rotation.

Such large solar wind variations were measured in situ by Ulysses beginning in February 1999 when the spacecraft was nearly 10 AU from Jupiter. Because the solar wind structures are expected to be large-scale, scientists expected that the effects might be observable at Jupiter. In March, the Ulysses URAP (Unified Radio and Plasma Waves) experiment detected Jovian nonthermal continuum emission emanating from the Jovian magnetosphere (see URAP spectrograms). The intense radio waves were emitted in response to the large-scale compressions and subsequent expansions of the magnetosphere caused by the cyclic solar wind density and speed variations. A factor of 100 change in solar wind density with a factor 3 change in speed will result in at least a factor 3 change in the Jovian magnetopause distance. The resulting solar wind-magnetosphere interaction triggers the generation of powerful radio emissions, among them the Jovian continuum observed by Ulysses URAP in late March. Remote sensing of Jovian radio emissions provides a powerful tool for diagnosing solar wind conditions at Jupiter's magnetosphere.