



## ULF waves in Ganymede's magnetosphere

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### Abstract

Ganymede's magnetosphere is continually interacts with the Jupiter's corotating magnetosphere. As Ganymede's and Jupiter's magnetic fields are oppositely directed, bursty magnetic reconnection is happening on the upstream side of the moon. This reconnection can be an energy source for ULF waves in Ganymede's magnetosphere. During Galileo's G8 flyby, the spacecraft entered into the moon's magnetosphere and encountered the closed field line region. Near closest approach, the spacecraft remained on approximately the same L-shell ( $L \approx 2$ ) and the magnetometer data showed a harmonic spectrum that was interpreted as field line resonances by Volwerk et al. [1].

In the first encounter of Galileo with Ganymede, G1, the spacecraft did not encounter closed field lines; however, there is a region with strong harmonic waves in the magnetometer data. Later in Galileo's mission, during the G28 flyby, the spacecraft entered more deeply into the upstream magnetosphere and remained near  $L \approx 1.5$  around closest approach. Again, a harmonic spectrum was found in the magnetometer data, which may be caused by field line resonances. On the outbound path, the spacecraft encountered the  $L \approx 2$  region again, and strong low frequency waves were observed, however EPD data and simulations show that the spacecraft is on open field lines, thus these ULF waves cannot be field line resonances.

In this presentation we will take a closer look at these strong ULF waves in Ganymede's magnetosphere. We will try to characterize the various wave modes through a combination of magnetometer (MAG), energetic particles (EPD), plasma wave (PWS) and plasma (PLS) data. From the possible field line resonances we can obtain an indication of plasma density in Ganymede's magnetosphere. The other strong (harmonic) ULF waves on open field lines

seem to have a fundamental frequency which is near the bursty reconnection period.

### References

- [1] Volwerk, M., Kivelson, M.G., Khurana, K.K. and McPherron, R.L., Probing Ganymede's magnetosphere with field line resonances, J. Geophys. Res., 104, 14729-14738, 1999.