Source characteristics of Jovian QP-40 bursts

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The Ulysses spacecraft has revealed many significant, new results during its encounter with Jupiter. One of them is quasiperiodic Jovian radio bursts with about 40 min periodicity (QP-40) observed with Unified Radio and Plasma Wave Experiment (URAP). QP-40 bursts are broad-band radio emission (typically from 1 to 200kHz) and were primarily observed in the outbound pass from Jupiter where the Ulysses was at southern jovigraphic latitudes of 30 to 40 degrees. MacDowall et al. (1993) suggested that the source location of them is near the southern Jovian magnetic pole and that they are L-O mode emission.

A 3D ray path analysis has been made to investigate the source location of QP-40 bursts in more detail. We have assumed some basic conditions for the analysis as follows:

1.magnetic field model : VIP4 (Connerney et al., 1998)
2.plasma model : Divine and Garrett (1983)
3.wave frequency : 30kHz, 100kHz
4.wave mode : L-O mode
5.emission direction at the source : perpendicular to magnetic field line
6.source location : on magnetic field line of L=50

Changing the source position between the local plasma frequency and the local upperhybrid frequency, we have examined the distribution of the ray path in space.

The analysis shows that if the source position is near the local plasma frequency, QP-40 bursts can be observed in high jovigraphic latitudes. If the source is near the local upperhybrid frequency, one can observe QP-40 bursts in lower latitudes. Because Ulysses did not detect QP-40 bursts in the low latitude but in the high latitude of Jupiter, their source position is considered to be near the local plasma frequency. It is also shown that the source positions at the frequency of 30kHz and 100kHz are located nearly same altitude. These results suggest that QP-40 bursts are emitted at the altitude of about 1 or 2 Jovian radii above polar region of Jupiter.