EPSC Abstracts
Vol. 7 EPSC2012-246 2012
European Planetary Science Congress 2012

Periodic Jovian radio emission observed in decametric frequency range.

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Abstract

We report the observations of the periodic Jovian non-Io radio emission recorded by Cassini, Wind and STEREO spacecraft in the decametric frequency range. The main group of these periodic radio features is observed as a series of arc-like radio bursts reoccurring with an averaged period of 10.07 hours or ~1.5% longer than the rotation rate of the planet's magnetosphere. The sources of these bursts sub-corotate with Jupiter being active during several Jupiter rotations. In most of the observed episodes the burst has small negative frequency drift in the time-frequency coordinates similar to vertex-late arcs of the Io-DAM. Besides this main group of periodic burst, we have also found two other groups of the periodic features rarely observed in the radio spectra - 1) ”vertex-early” periodic non-Io DAM bursts or arcs with positive frequency drift and 2) non-arc periodic radio features. In contrast to the main group of the periodic non-Io bursts these ”vertex-early” bursts reoccurred with the period close to the Jupiter rotation and typically were observed during 7-10 Jupiter rotations. The other rare group of the periodic non-arc radio features which are observed in form of broad beamed radio emission lacked clear discrete features.

In our study we analyzed the properties of the different morphological groups of the periodic non-Io DAM bursts. This study comprise the determination of the averaged period of the bursts repetition as well as examination of our data for the existence of active Jovian longitudes at which periodic bursts of the different morphological groups occur more often. Additionally, on basis of observations over more than one Jupiter’s 11.86 year orbital period we have also checked the dependence of the morphology of the periodic bursts on the declination of the Jovigraphic equatorial plane with respect to the ecliptic plane. We also suggest that the different morphological groups of the periodic features may have different origins and may be attributed to different particle dissipation processes in the Jovian magnetosphere.

Acknowledgements

The authors are pleased to acknowledge the Plasma Physics Data Center (CDPP), STEREO/WAVES, Cassini/RPWS, Wind/Waves and Ulysses/URAP teams for access to data. This work was financed by the Austrian Science Fund FWF (project P23762-N16).