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Multi-instrument study of the Jovian radio emissions triggered by solar wind shocks and inferred magnetospheric subcorotation rates

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Abstract

The influence of solar wind conditions on the Jovian auroral radio emissions has long been debated, mostly because it has always been difficult to get accurate solar wind and radio observations at the same time. We present here a study of Jupiter's radio emissions compared to solar wind conditions using radio (RPWS) and magnetic (MAG) data from the Cassini spacecraft from October to December 2000, just before its flyby of Jupiter. The spacecraft was then in the solar wind and could record both the radio emissions coming from the Jovian magnetosphere and the solar wind magnetic field (IMF). With these data, we found a good correspondence between the arrival of interplanetary shocks at Jupiter and the occurrence of radio storms. Our results confirm those from previous studies showing that fast forward shocks (FFS) trigger mostly dusk emissions, whereas fast reverse shocks (FRS) trigger both dawn and dusk emissions. FFS-triggered emissions are found to occur 10−30 h after the shock arrival when the IMF is weak (below 2 nT), and quasi-immediately after shock arrival when the IMF is strong (above 2 nT). FRS-triggered emissions are found to occur quasi-immediately even when the IMF is weak. We show and discuss in depth the characteristic morphologies of the radio emissions related to each type of shock and their implications.

We also used simultaneous radio observations from the ground-based Nançay

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