

North/South flux ratio of Saturn kilometric radiation

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Abstract

It is well-known that Saturn kilometric radiation (SKR) has two periods varying with time; one is attributed to the northern hemisphere, and the other to the southern hemisphere [1]. The hemispherical origin of SKR can be clearly identified by its polarization, measured with the Cassini RPWS instrument. SKR predominantly emits X-mode radiation, which is right-handed polarized coming from the north (N), and left-handed polarized from the south (S) [2]. In this way one can gain frequency-integrated N-SKR fluxes and S-SKR fluxes (unit of W/m^2). The SKR periods can be found by a periodicity analysis using the integrated SKR flux, which can be averaged over certain time intervals. To show the typical 10.7 h periodicity close to Saturn's rotation period, a frequency-integrated SKR flux with a resolution (averaging interval) of 10 minutes is used. The integrated SKR flux also shows a 25–27 day periodicity due to the rotation of the Sun, and in this case it is sufficient to use SKR fluxes averaged over one day. The N and S-SKR intensities highly depend on the latitude of the observer, and so we determined orbital averages of SKR fluxes in a restricted latitude interval within 5 degrees around the equatorial plane. From this we determined the North/South (N/S) SKR flux ratio from 2004 until the end of 2016, to see which hemisphere is dominating the SKR emission. We see a clear southern dominance until mid-2007, an oscillation around a ratio of 1 from mid-2007 until mid-2012, and a switch to northern dominance after mid-2012. This behavior is thought to be caused by the changing season at Saturn, and the summer hemisphere is the dominant one. Interestingly, the N/S SKR flux ratio also shows an oscillation of around 200 days, which could be related to external influence from the Sun or to an oscillatory energy exchange between two weakly coupled oscillators.

References

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