

# AKR DIURNAL, SEMI-DIURNAL AND SHORTER TERM MODULATIONS DISENTANGLED BY CASSINI/RPWS OBSERVATIONS

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## Abstract

During the flyby of the Earth by Cassini in 1999, the Radio and Plasma Wave Science (RPWS) instrument recorded one month of quasi-continuous observations of Auroral Kilometric Radiation (AKR). Analyzing the Stokes parameters of incoming radio waves, we found AKR to be 100% circular left-handed (LH) or right-handed (RH). We analyzed separately the northern - RH - emission, from the southern - LH - one with respect to the magnetic equator. AKR power variations reveal (i) a log-normal distribution at time scales of minutes, (ii) bursts of emission at time scales of a few hours, and (iii) a clear modulation at 24 hours, with a weaker modulation at 12 hours (especially visible for LH emissions). The prominent 24 h modulation is found to modulate LH and RH AKR in phase opposition. This is interpreted as being due to visibility effects related to the precession of the terrestrial magnetic dipole, making Cassini oscillate relative to the average AKR beaming pattern from each hemisphere. We accordingly quantified the AKR beaming vs explored latitudes. On time scales shorter than a few hours, LH and RH emissions are found to be correlated. This is attributed to the actual conjugacy of the corresponding sources, simultaneously turned on by substorm occurrence. The geometrical anti-correlation (at 24 h) dominates close to Earth, while the short term correlation (substorms) dominates far from Earth, where the detection threshold makes the visibility less important than the occurrence of substorms. Finally, the 12 h modulation is detected when it is not masked by strong visibility effects, i.e. for the LH emission which is observed mostly near the magnetic equator along the path of Cassini. A 12 h modulation being also observed in some geomagnetic indices, we suggest that a physical process (e.g. semi-diurnal variable efficiency of the reconnection between interplanetary and geomagnetic fields, or magnetotail oscillations) may be responsible of the observed AKR 12 h modulation.

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