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Ground-based observation of Saturn lightning: Emission timescales

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Abstract

Radio emission generated by Saturn lightning was simultaneously observed by the Cassini spacecraft and by the radio telescope UTR-2 (observing in the frequency range 10-30 MHz). While the ground-based observations are complicated by local radio frequency interference (RFI) and by ionospheric disturbances, the joint observations with Cassini allow to test and validate the ground-based observations and the associated data analysis technique. In this work, we analyze the timescales involved in Saturn lightning radio emission as measured by UTR-2. In particular, we compare the distribution of burst durations for Saturn lightning discharges and for RFI events, showing that the different distributions can be used to validate the astronomical signal. Using the distribution of the discharge timescales, we also show that Saturn lightning events are not statistically independent of each other, but occur in groups of events.