



## **Time scales of Saturn lightning: from microseconds to years**

**G. Fischer** (1), D.A. Gurnett (1), W.S. Kurth (1), T. Averkamp (1), W.M. Farrell (2), A. Lecacheux (3)

(1) Dept. of Physics and Astronomy, Univ. of Iowa, Iowa City, USA, (2) NASA Goddard Space Flight Center, Greenbelt, USA, (3) Observatoire de Paris-Meudon, France

With Cassini in Saturn's orbit for nearly four years the RPWS (Radio and Plasma Wave Science) instrument has performed long-term radio observations of Saturn lightning in the frequency range from a few hundred kHz to 16 MHz. In this contribution we want to highlight the different time scales at which Saturn lightning is happening. Recently, Cassini/RPWS has succeeded in catching some Saturn lightning flashes with a high temporal resolution of some microseconds. We will present this first radio observation of the sub-pulses of Saturn lightning, which shows single strokes lasting a fraction of a millisecond with an interstroke time of a few milliseconds, somewhat similar to the sub-structure of a terrestrial intracloud flash. The duration of one complete Saturn lightning flash is not so much different compared to its terrestrial analogue, ranging from some tens of milliseconds up to half a second, and the duration distribution shows an exponential decrease in the number of flashes with increasing flash duration. The fast rotation of Saturn's atmosphere with respect to the orbital period of Cassini leads to the observation of Saturn lightning in episodes lasting about half a Saturn rotation, during which the causative lightning storm (often visually observed as a prominent cloud feature) is on the side of the planet facing the spacecraft. Lightning storms on Saturn typically last for several weeks and exhibit a highly variable flash rate that can change significantly within several hours. But, contrary to Earth, there were also month-long periods with no lightning activity.