

Automatic extraction of frequency sweep rate of chorus from a huge data set of Akebono

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Chorus emission is one of the most popular plasma waves observed in the Earth's magnetosphere. It has a distinctive feature in spectrum, that is, frequency sweep in a very short time period. The chorus is known to be generated at the magnetic equator and propagates to higher latitude along a magnetic field line. Its generation mechanism has been controversial for many years. In recent years, a theory was proposed that growth of the chorus is caused by a non-linear mechanism. An important point of the theory is a dependence of the frequency sweep rate on wave amplitude. We performed a statistical analysis of the dependence using data obtained by the Akebono satellite. The Akebono satellite had observed plasma waves in the inner magnetosphere for 26 years. In order to find chorus emissions in the huge data set automatically, we adopted a modified template matching to the data set. One of the essential modifications is that intensity distribution of the template is determined according to that of target chorus elements. By this method, we successfully extracted chorus elements. We, then, investigated relations between frequency sweep rates and wave amplitudes of the extracted chorus elements. As a result, positive correlation is found between them.

Keywords: chorus emission, Akebono satellite, automatic extraction