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The Location and Structure of the Chorus Emissions Source During the Perturbed Magnetosphere Conditions

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Discrete ELF/VLF chorus emissions are the most intense electromagnetic plasma waves that are observed in the Earth's radiation belts and outer magnetosphere. These waves are supposed to propagate roughly along magnetic field lines from a localized source region near the magnetic equator towards the magnetic poles. It is known that the local minimum of the geomagnetic field (on the given L-shell) is situated near the geomagnetic equator but can move away from it during periods of strong geomagnetic perturbations. This displacement can be as large as +/- 5° in geomagnetic latitude. Under quiet conditions, this position can be estimated by making use of magnetic field models. During periods of intense geomagnetic activity, however, the magnetic field minimum can be substantially displaced from its quiet position and also can have rather complicated fine structure, with, for instance, multiple local minima. Multipoint measurements reveal the dynamic character of the chorus source region, changing the Poynting flux direction at time scales shorter than a few seconds. From the analysis of the Poynting vector direction for chorus waves (based on Cluster data), we show that there are sources associated with different local minima. Multi-point magnetic field measurements strongly suggest that the velocity of these minima is close to that of fast magnetosonic waves. The evaluation of the position of the sources of chorus waves suggests that it coincides with the minima in the magnetic field.