

RAPIDLY MOVING SOURCES OF UPPER-BAND ELF/VLF CHORUS NEAR THE MAGNETIC EQUATOR

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Multiple simultaneous wideband [Gurnett et al., 2001] measurements on the Cluster spacecraft of upper band chorus emissions near the magnetic equator (at magnetic latitudes between -20 deg. and 10 deg. and L shells ranging between $L = 4$ and $L = 5$) are used to deduce the properties of the compact source regions of ELF/VLF chorus emissions. The frequency differences exhibited by the same chorus emissions observed on different spacecraft are interpreted [Inan et al., 2004] in terms of a differential Doppler shift, using a simple model involving rapidly moving sources traveling at speeds comparable to the parallel resonant velocity of counterstreaming gyroresonant electrons. These observations are used to determine the location and size along the Earth's magnetic field lines of the source of the chorus. These frequencies and time differences are interpreted as a direct consequence of the rapid motion of highly localized source regions of chorus. In this paper, we examine the previously presented model of rapid motion of sources of chorus, extending the calculations to a 3D space, using measurements of the four Cluster spacecraft. These calculations of source location and velocity as a function of frequency indicate that chorus sources extend over approx. 6000 km along the field lines. The emitted chorus waves at the source, are assumed to have a wide range of wave normal angles, but the rays reaching the spacecraft seem to be the ones with lower angles (with some exceptions). The ranges of velocity obtained vary in frequency around values ranging from $0.01c$ to $0.04c$.

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