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V shaped streaks recorded on board DEMETER above powerful thunderstorms: a statistical study

Farida El-Lemdani Mazouz (1), Hervé De Feraudy (1), Jean-Louis Pinçon (2), and Michel Parrot (2)

(1) Laboratoire ATmosphère Milieux Observations Spatiales (LATMOS), 11 boulevard d'Alembert, 78280 Guyancourt, France.(farida.mazouz@latmos.ipsl.fr), (2) Laboratoire de Physique et de Chimie de l'Environnement et de l'Espace, 3A Avenue de la Recherche Scientifique, 45071 Orléans cedex 2, France.

We report here observations of both symmetric and asymmetric forms of V shaped streaks on VLF spectra observed on board the low altitude satellite DEMETER during orbits above highly active thunderstorms region. At satellite altitude, wave activity is mainly dominated by upcoming whistler waves. The V-shaped streaks are associated with intense and numerous 0+ whistlers in the VLF range. To understand the origin of the different spectral forms of the V shaped emissions, we performed a systematic survey of these observations via a visual inspection of the VLF spectrograms covering 5 years and an half of DEMETER data. Asymmetric events are more frequently observed for high latitude regions, where the inclination of the magnetic field is more important than for medium latitude regions. We checked the modes and the direction of propagation of the waves transmitted from troposhere to satellite altitude using Budden's radio window theory. The results show that the waves propagate in a quasi parallel mode with respect to the magnetic field. Finally, we performed a detailed analysis of an asymmetric V-shaped emission for which the corresponding Meteorage data were available. From the knowledge of the precise localization of the active thunderstorm associated with the V shaped emission, it becomes possible to confirm the importance of the local B field orientation.