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Magnetospheric Line Radiation: observations, classification and sources

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We present a survey of Magnetospheric Line Radiation (MLR) events observed by the DEMETER satellite. A statistically significant set of events (˜100) has been obtained both by using an automatic identification procedure and visual inspection of the data. All the identified events are thoroughly analyzed and classified according to the observed frequency spacing: 1) the events with frequency spacing 50/100 Hz or 60/120 Hz (Power Line Harmonic Radiation, PLHR) and 2) the events with other frequency spacing ("real-MLR"). Their different origin, properties and the most favorable conditions for their observations are demonstrated. Moreover, in the ELF range (where all the six electromagnetic components are measured during the Burst mode), a detailed wave analysis has been performed. For the "real-MLR" class of the events, the sudden reversal of the parallel component of the Poynting flux observed close to the geomagnetic equator strongly suggests that the generation region is located in the equatorial plane. Moreover, supposing that the waves are generated at multiples of local proton cyclotron frequency, the radial distance of a source region can be estimated from the observed frequency spacing.