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Longitudinal dependence of VLF electromagnetic emissions observed by the Van Allen Probes and the DEMETER spacecraft

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We use electromagnetic wave data obtained by the Van Allen Probes (2012–2016) to investigate longitudinal dependencies of average wave intensities in the very low frequency range. We calculate the dependencies for various frequency bands and magnetic local times. The main interest is to analyze the local time intervals about 10:30 LT and 22:30 LT in order to enable a comparison with the measurements performed by the DEMETER spacecraft (2004–2010) at low altitudes (≈ 700 km). Additional wave parameters which are available in the Van Allen Probes data set, e.g. directions of the wave propagation, are also considered. We attempt to evaluate the contribution of the lightning-generated whistlers to the overall wave intensity. The main idea of the performed analysis is that emissions generated in the magnetosphere should not depend on the geomagnetic longitude, i.e., any observed longitudinal dependence of the wave intensity should be of the terrestrial origin and possibly linkable to the lightning activity. The obtained results may have a potential impact on identifying the source of plasmaspheric hiss.