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Characteristics of reverse current equatorial electrojet sidebands

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The equatorial electrojet (EEJ) is a prominent ribbon of eastward ionospheric currents above the magnetic equator. During about half of the time westward-directed currents appear at the flanks of the EEJ. Based on five years (2001-2005) of magnetic field measurements made by the CHAMP satellite latitudinal profiles of the equatorial electrojet have been derived. This study provides for the first time a detailed characterization of the reverse current EEJ sidebands. These westward currents peak at $\pm 5^{o}$ quasi-dipole latitude with typical amplitudes of 35% of the main EEJ. The diurnal amplitude variation is quite comparable with that of the EEJ. Similarly to the EEJ the intensity is increasing with solar EUV flux, but with a steeper slope, indicating that not only the conductivity plays a role. For the longitude distribution we find in general larger amplitudes in the western than in the eastern hemisphere. It is presently common understanding that the reverse current EEJ sidebands are generated by eastward zonal winds at altitudes above about 120 km. In particular a positive vertical gradient (increasing eastward wind velocity with altitude) generates prominent westward currents at magnetic latitudes outside of 3° dip-latitude. Interesting information about these features can be deduced from the sidebands' tidal characteristics. The longitudinal variation of the amplitude is dominated by a wave-1 pattern, which can primarily be attributed to the tidal components SPW1 and SW3. In case of the hemispheric amplitude differences these same two wave-1 components dominate. The longitudinal patterns of the latitude, where the sidebands peak, resemble to some extent those of the amplitude. Current densities become larger when the peaks move closer to the magnetic equator.