

オーロラ画像と地上磁場から推定されたサブストーム時の沿磁力線電流

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Field-aligned currents during an intense substorm as estimated from global images and ground magnetic observations

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The spatial distribution of field-aligned currents (FACs) relative to auroras was studied in detail for an intense substorm of January 12, 1997. We first estimated the height-integrated ionospheric Hall and Pedersen conductances from ultraviolet images taken by the Polar satellite. We also estimated the equivalent current system at the ionospheric altitude from ground magnetic field perturbations according to the spherical harmonics analysis. To derive FACs, we then assumed Ohm's law for the ionosphere and applied the Kamide-Richmond-Matsushita (KRM) method to these input conductances and equivalent currents. It is believed that upward FACs are normally co-located with discrete auroras. An upward FAC was found to be located, however, in the poleward half of an auroral bulge during the expansion phase of an isolated substorm, which started at 0724 UT. This upward FAC came from the ionospheric Hall current, which is connected to a downward FAC estimated in the equatorward half of the bulge. This result indicates that a meridian Hall current loop enclosed the auroral bulge for this particular event.