

Deriving maps of field-aligned current from IMAGE FUV and SuperDARN

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Many efforts have been made for deriving the spatial distribution of field-aligned currents (FACs) in the high-latitude ionosphere. To date, however, it has been still difficult to construct a map of FACs as a snap shot without any assumptions. In this study, we employ the ionospheric conductances estimated from the IMAGE/FUV auroral images together with the electric field deduced from Super Dual Auroral Radar Network (SuperDARN), and then derive a map of FACs in the high-latitude. The primary objective is to visualize the mesoscale structure of FACs in the vicinity of auroral bulges. If the 2D distribution of the bulge-associated FACs is clarified, the closure of the substorm currents can be discussed in terms of the magnetosphere-ionosphere coupling system. We have estimated the distribution of FACs for two case examples, one on September 25, 2001 and the other on January 12, 2002. During both intervals, nicely developing auroral bulges were observed by the IMAGE satellite and lots of backscatter echoes were obtained by the SuperDARN radars, which is a favorable condition for estimating the distribution of FACs in the vicinity of auroral bulge. We demonstrate how the procedure works in deriving the FAC system and discuss the closure of the substorm current system from the initial results.