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Does the South Atlantic Anomaly influence the ionospheric Sq current system?

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We study if and how the South Atlantic Anomaly (SAA) influences the ionospheric Sq current system. In order to counterbalance the northern hemisphere observatory dominance, we exploit the data for the time span (from November 1989 till December 1990) when the global geomagnetic observatory network was augmented by the AWAGS (Australia Wide Array of Geomagnetic Stations) network. The AWAGS network comprised 53 observation sites that were regularly distributed over the Australian mainland and equipped with portable vector magnetometers. The data from 49 geomagnetically quiet days are processed and the Sq foci tracks are analyzed. The computed tracks result in pronounced bands in the northern and southern hemisphere, which seems to neither follow the geographic nor the geomagnetic or dip equator. We interpret this observation as the Sq foci tracks are controlled by an interplay of the Earth-Sun constellation (which causes the seasonal variations of Sq) and the Earth's main magnetic field. Remarkably, we observe a distinct scattering of the tracks over the SAA. This systematic scattering is due to a larger shift of the southern hemisphere focus northwards during northern summer solstice and southwards during the southern summer solstice. Our explanation of this behavour is that if the main magnetic field is weak, which is the case for the SAA, the Earth-Sun constellation becomes the dominating factor leading to a larger sensitivity of Sq current system on seasonal variations in South Atlantic Anomaly region.