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The origin of the prenoon-postnoon asymmetry for Sq current system

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Sq (solar quiet-day variation) is generally generated by atmospheric tide-dynamo in ionosphere, and it is controlled by the electric field, electric conductivity in ionosphere and neutral wind in middle-high altitude atmosphere. In this paper, the geomagnetic field data observed by 90 ground-based observatories is used to analyze the variation of Sq. Sq is derived from five quiet days geomagnetic data in every month. We found that the variation of Sq exist a prenoon-postnoon asymmetry. This asymmetry is dominant in Spring, Summer and Winter. The X-component at 1200~1300 MLT is about 5 nT larger than it at 1100~1200 MLT. The Sq equivalent current system is obtained using sphere harmonic analysis. The pattern of Sq current system indicates the prenoon-postnoon asymmetry may be caused by the electric field in the high latitude region. This electric field has two effects. The one is that the electric field in high latitude directly extends to the mid-latitude region. The other is this electric field penetrate to the low-latitude region. These two electric fields in low/mid latitude result in the prenoon-postnoon asymmetry of Sq.

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