

Solar Quiet Daily (Sq) Geomagnetic Variation During Minimum of Solar Cycles 23/24

A. A. Soloviev^{1,2}, A. G. Smirnov^{1,3}

¹Geophysical Center of RAS, Moscow, Russia; ²Schmidt Institute of Physics of the Earth RAS, Moscow, Russia; ³Helmholtz Centre Potsdam GFZ - German Research Centre for Geosciences, Potsdam, Germany.

Email: artem.smirnov@gfz-potsdam.de

Abstract

- The most regular of all geomagnetic variations is the solar quiet daily (Sq) variation, attributed to the two vortices flowing in the E-region of the dayside ionosphere.
- We investigate the time-dependent parameters of Sq variation for the historical minimum of solar activity in 2008, based on data from 75 INTERMAGNET observatories and 46 SuperMag stations.
- Quiet days were selected using the 'Measure of Anomalousness' (MA) algorithm, based on fuzzy logic.
- We present global maps of seasonal Sq amplitudes of X,Y and Z components. The resulting amplitudes are in line with CMIT simulations.
- We analyze equivalent Sq current system using observatory data from narrow European-African latitudinal segment.
- Sq current system also strongly depends on solar activity, as current vortices are strongest in the local summer-hemisphere and disintegrate during local winter.

Geomagnetic Observatories

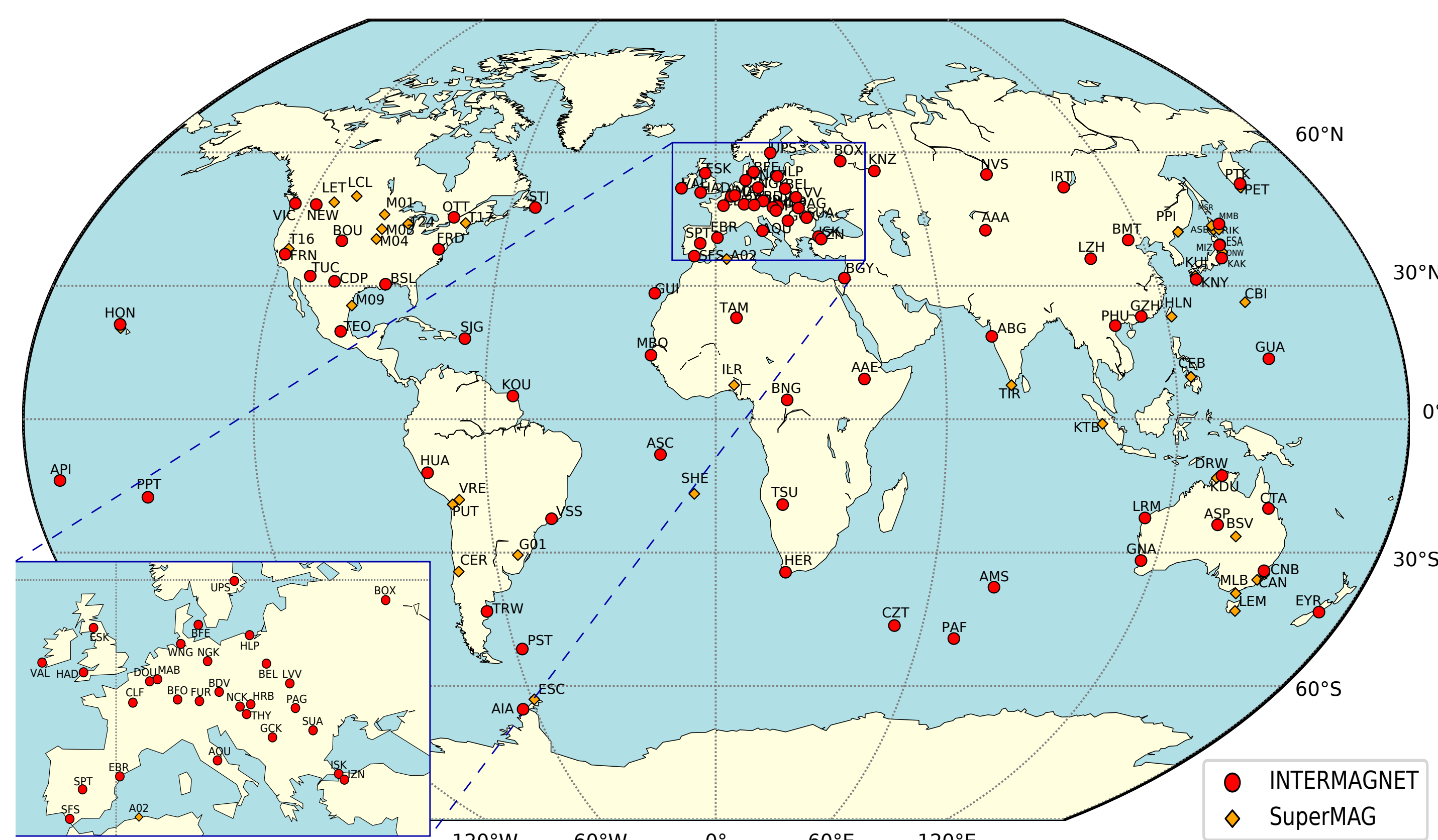


Fig. 1. INTERMAGNET observatories and SuperMag stations used in this study.

Sq Variations at Different Latitudes

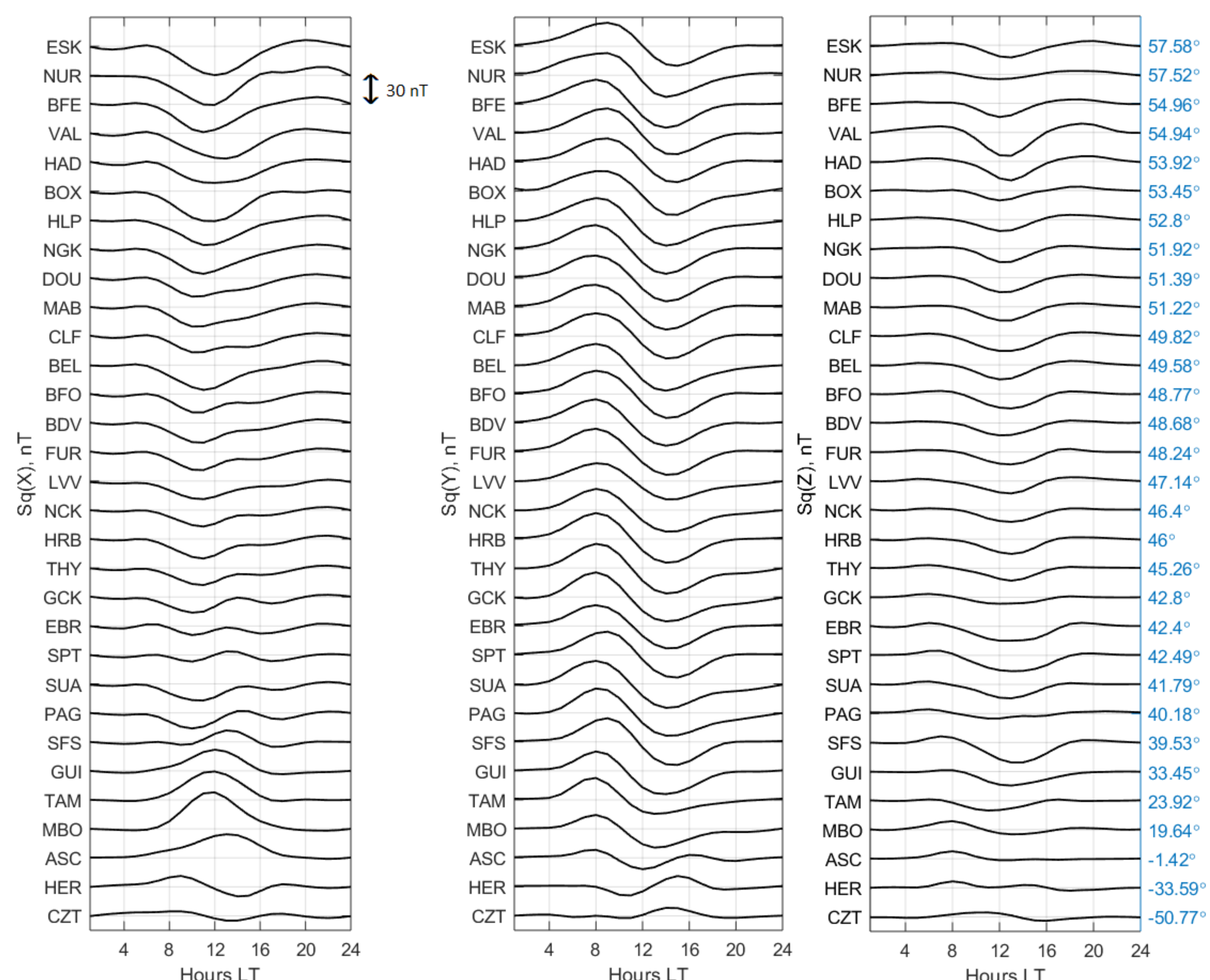


Fig. 2. Sq diurnal variations for J-season 2008 observed at European and African observatories in the LT frame. QD latitudes are shown on the right.

Comparison with CMIT Simulations

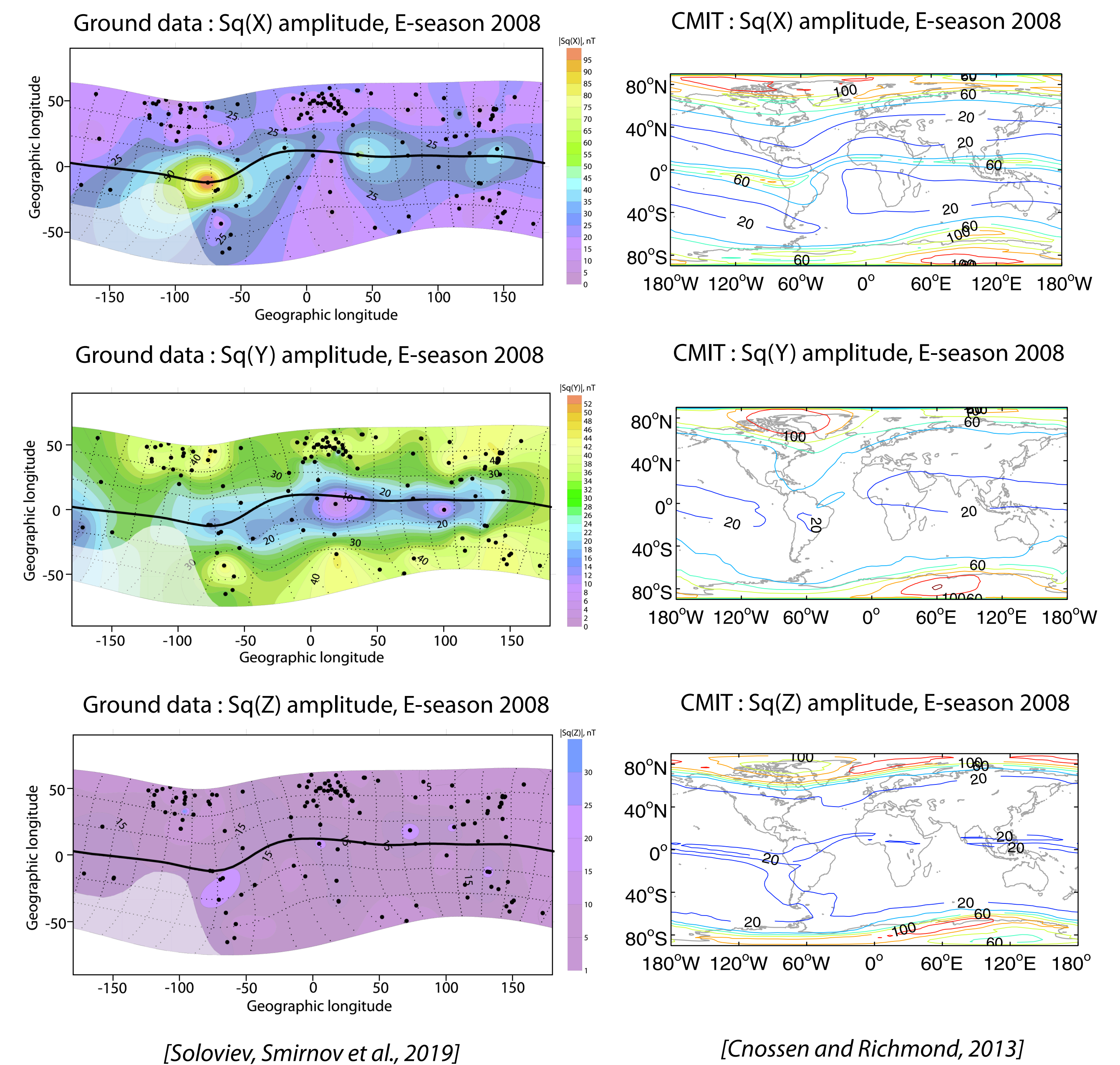


Fig. 3. Sq amplitudes of X,Y and Z components obtained from ground observatory data (left), and those from Coupled Magnetosphere Ionosphere Thermosphere (CMIT) model (right) for E-season in 2008.

Equivalent Sq Current System Modelling

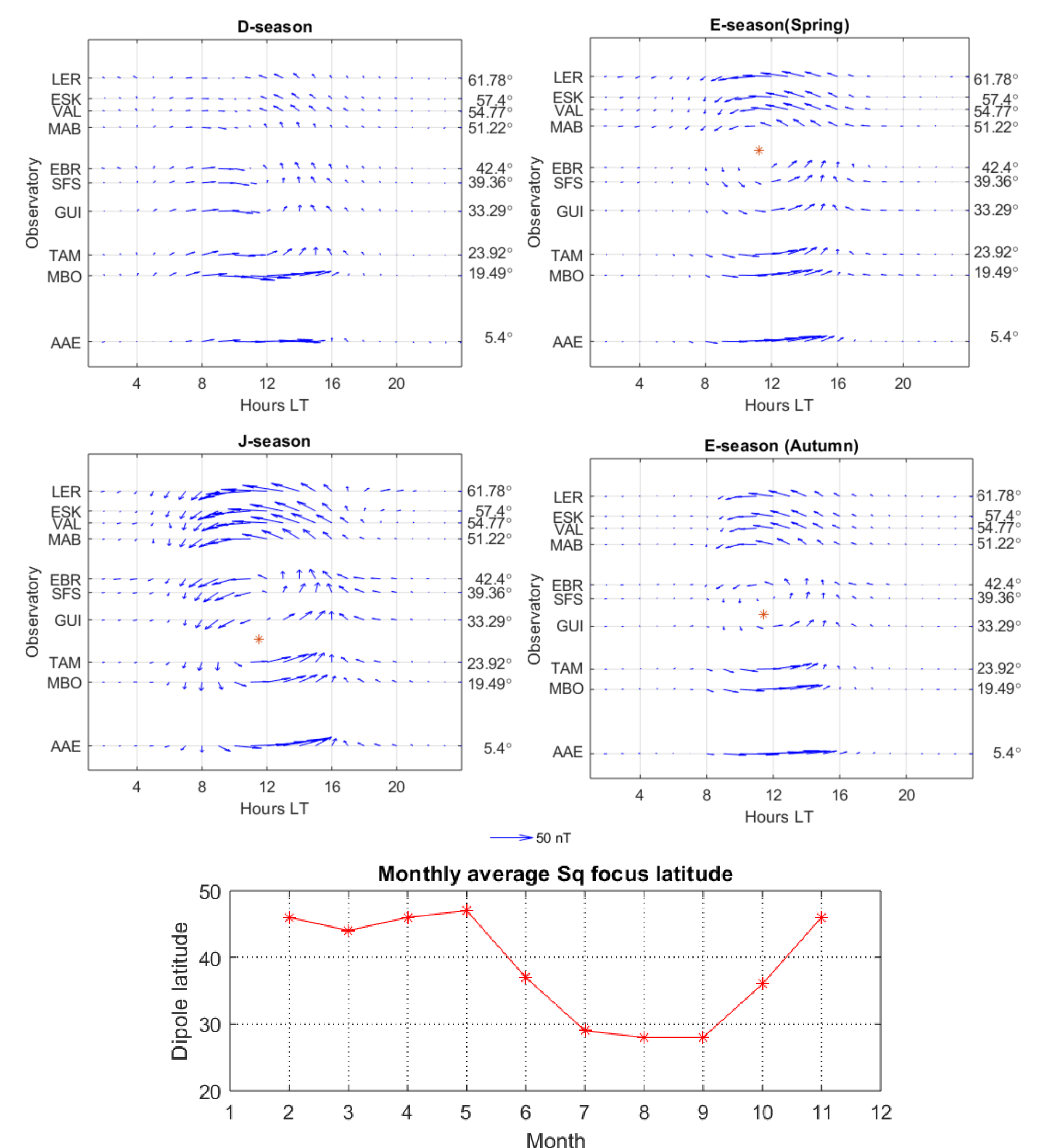


Fig. 4. Equivalent Sq current system for 4 seasons in 2008 in the Northern hemisphere, and monthly averaged position of Sq focus altitude.

References

A. Soloviev, A. Smirnov, A. Gvishiani, J. Karapetyan, A. Simonyan, Quantification of Sq parameters in 2008 based on geomagnetic observatory data, Adv. in Space Research, Vo. 64, Issue 11, 2019, DOI: 10.1016/j.asr.2019.08.038.