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The configuration of the Earth's magnetotail inferred from the low-altitude isotropic boundaries

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Understanding the interplay between ionospheric, auroral and magnetospheric phenomena requires detailed knowledge of Earth's magnetic field geometry under various solar wind conditions. This geometry is directly relevant to the magnetic field mapping between different regions of near-Earth space.

To evaluate the instantaneous geomagnetic field configuration we probe the isotropic boundaries (IB) of energetic particles measured at low altitudes. Those are interpreted as the boundary between the regions of adiabatic and stochastic particle motion in the equatorial magnetotail and provide information regarding the degree of magnetic field stretching.

We investigate the topology and dynamics of the magnetotail current during active and quiet times as dependent on solar wind and IMF parameters based on NOAA/POES MEPED and DMSP SSJ/4 measurements in combination with global magnetospheric simulations using the Space Weather Modeling Framework (SWMF).

The extensive NOAA/POES MEPED low-altitude data sets give the locations of isotropic boundaries, which are used to extract information regarding particle distributions and field structure in the source regions in the magnetosphere.

We present a comparison between the magnetic field lines with the observed IB latitude and those computed from the SWMF using the theoretical relation for IB locations in the magnetotail, i.e. where the ratio between curvature radius and Larmor radius is close to 8. This investigation assesses the accuracy of the model magnetic field and the structure of the magnetotail. The results are examined in relation to the solar wind and IMF conditions to determine the corresponding configuration and dynamics of the magnetotail.