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Interhemispheric Magnetic Conjugacy

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The concept of the interhemispheric magnetic conjugacy was investigated by comparing the conjugate points in the northern and southern hemispheres using the Tsyganenko T02 magnetic field model together with the IGRF model for the internal magnetic field to follow the magnetic field lines. We studied the influence of the dipole tilt angle, solar wind (solar wind dynamic pressure and flow direction) and IMF parameters (IMF By and Bz) on the latitudinal and longitudinal differences between the footpoints of magnetic field lines in both hemispheres. It was found that the dominant difference up to 30 degrees is longitudinal, while latitudinal differences are about 2 degrees. The largest differences are observed at dawn and dusk MLTs for large dipole tilt angles during high solar wind dynamic pressure (16-20 nPa) and large IMF By values (-15 and 15 nT). The asymmetry of conjugate points is present due to nonzero values of IMF By but there is no real dependence on the magnitude of IMF By. The influence of IMF Bz on the interhemispheric conjugacy depends on the sign of the IMF Bz but not much on the magnitude. The rotation of the tail current sheet from the Sun-Earth line by several degrees resulted in latitudinal differences of 1 degree and longitudinal differences of 15 degrees at dawn and dusk MLTs for equinox. Testing the concept of magnetic conjugacy with previously reported auroral event observed at Tjornes (Iceland) and Syowa (Antarctica) observatories confirmed the importance of taking into account the solar wind flow direction, especially when it deviates from radial by more than 2 degrees.