



## Interhemispheric Field-Aligned Currents: Simulation Results

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We present simulation results of the 3-D magnetosphere-ionosphere current system including the Region 1, Region 2, and interhemispheric (IHC) field-aligned currents flowing between the Northern and Southern conjugate ionospheres in the case of asymmetry in ionospheric conductivities in two hemispheres (observed, for instance, during the summer-winter seasons). We also computed the maps of ionospheric and equivalent ionospheric currents in two hemispheres. The IHCs are an important part of the global 3-D current system in high-latitude ionospheres. These currents are especially significant during summer and winter months. In the winter ionosphere, they may be comparable and even exceed both Region 1 and Region 2 field-aligned currents. An important feature of these interhemispheric currents is that they link together processes in two hemispheres, so that the currents observed in one hemisphere can provide us with information about the currents in the opposite hemisphere. Despite the significant role of these IHCs in the global 3-D current system, they have not been sufficiently studied yet.

The main results of our research may be summarized as follows:

- 1) In winter hemisphere, the IHCs may significantly exceed and be a substitute for the local Region 1 and Region 2 currents;
- 2) The IHCs may strongly affect the magnitude, location, and direction of the ionospheric and equivalent ionospheric currents (especially in the nighttime winter auroral ionosphere).
- 3) The IHCs in winter hemisphere may be, in fact, an important (and sometimes even major) source of the Westward Auroral Electrojet, observed in both hemispheres during substorm activity.

The study of the contribution from the IHCs into the total global 3-D current system allows us to improve the understanding and forecasting of geomagnetic, auroral, and ionospheric disturbances in two hemispheres. The results of our studies of the Interhemispheric currents are presented in papers:

(note: for publications my last name is Lyatskaya)

- Lyatskaya, S., W. Lyatsky, and E. Zesta (2015), Effect of interhemispheric currents on equivalent ionospheric currents in two hemispheres: Simulation results, *J. Geophys. Res.*, Accepted: 18 Nov 2015; doi: 10.1002/2015JA021167.
- Lyatskaya, S., W. Lyatsky, and G.V. Khazanov (2014), Effect of Interhemispheric Field-Aligned Currents on the Region 1 Currents, *Geophys. Res. Lett.*, 41, 3731–3737, doi: 10.1002/2014GL060413.
- Lyatskaya, S., G. V. Khazanov, and E. Zesta (2014), Interhemispheric Field-Aligned Currents: Simulation Results. *J. Geophys. Res.*, doi: 10.1002/2013JA019558.