Auroras are the manifestation of a specific form of coupling between magnetosphere and ionosphere. Understanding the electric current circuit responsible for this coupling is essential for evaluating the importance of interhemispheric differences.

We focus on auroral systems in which the generator is located in the magnetosphere, and where the ionosphere represents a load. The behaviour of the current system is controlled by current continuity. The generator is described either in terms of idealized observed magnetospheric auroral electric fields (converging, diverging, monopolar, bipolar ...) or by relying on a tangential discontinuity model. The ionospheric load is modelled in a very simple way. The crucial role of the current-voltage relation is highlighted.

Analytic and numerical solutions are obtained. These are used to illustrate the various types of auroral and subauroral signatures that are found in the Earth’s magnetosphere-ionosphere system. The model results are compared to observations. In particular, the various parameters that affect the similarity or difference between the signatures in both hemispheres are discussed.

As a conclusion, interhemispheric differences are found to arise as the result of differences in the generator, in the magnetic connection to the ionosphere, in the current-voltage relations, and/or in the ionospheric conductivity. Despite the differences, the model results suggest that there are reasons enough for observing also much similarity between the events observed in both hemispheres.