

Masterproject: Reaction times of the ionospheric current system due to changes in the IMF

We offer a master project in the space plasma group at Umeå University to investigate the dynamics the ionospheric current flow!

1 Background

There are large electric currents flowing in the polar ionosphere (the upper ionized part of the atmosphere) due to interaction of the Earth's magnetic field with the interplanetary magnetic field (IMF). The size and shape of these currents is dependent on the direction and strength of the IMF.

The Iridium satellite constellation consists of 66 satellites orbiting the Earth at low altitude. These satellites were launched to provide telecommunication over the entire planet, but they also carry magnetometers to measure disturbances in the Earth's magnetic field. These can then be used to estimate currents flowing in the ionosphere, an example of such a current map is given in Figure 1.

The aim of the project is to find the delay time of the current system in the ionosphere to adapt to changes in the interplanetary magnetic field. Furthermore, we want to find what parameters influence the time delay.

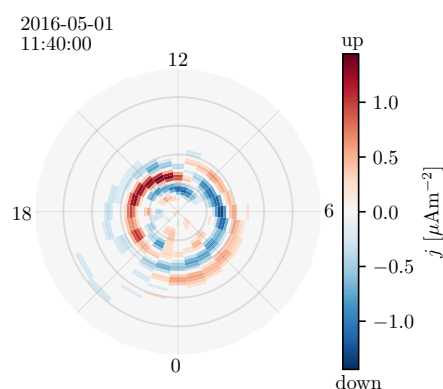


Figure 1: Example of a current map showing the current system in the ionosphere of the northern hemisphere

2 Methodology and Tasks

You will be working with NASA's OMNI data base for the IMF data and AMPERE data for the current maps of the ionosphere. You will learn how to handle, process, and visualize large data sets, containing data from multiple years of satellite observations. The first task will be to identify large changes in the IMF. The next step is then to identify these changes in the ionospheric current maps and measure the time delays. Finally, the significance of different IMF parameters will be investigated.

3 Requirements

This project involves data analysis and data visualization, therefore basic programming skills, preferably in Matlab or Python, are required. However, no background in space physics is needed. We will go through the knowledge that is needed during the project.

4 Contact information

Are you interested in the project or do you have any questions? Feel free to contact Maria Hamrin (maria.hamrin@space.umu.se) or Eva Krämer (eva.kramer@umu.se).