PhD Candidate
Sara Gasparini

Thesis
Large-scale dynamics of auroral oval morphology

Abstract
At high latitudes in each hemisphere there is an almost constantly present ring of aurora, known as the auroral oval. The auroral oval is sensitive to conditions in the solar wind—in particular the solar wind's embedded "interplanetary magnetic field." Changes in the interplanetary magnetic field have an effect on the rate of magnetic reconnection on the Earth's dayside and ultimately changes in the auroral oval morphology/topology. Understanding these changes allows for the study of the physical processes and time scales that dictate the shape and dynamics of the large-scale auroral oval. My PhD thesis seeks to understand the mechanisms which are responsible for the growth and contraction of the auroral oval, determining its shape and its changes over time. Why is the auroral oval sometimes wider at dawn than at dusk? How does the width of the auroral oval change in proportion to the magnitude of the ionospheric convection flow? Does the auroral oval shrink, "disappearing" when transport to the dayside increases? These are the primary questions I will address during my PhD.

My PhD work in the Dynamics of the Asymmetric Geospace group at the BCSS currently consists of working with IMAGE (Imager for Magnetopause-to-Aurora Global exploration) satellite images. Satellite images are a good tool to study large scale dynamics of the auroral oval because they continuously show the global response of the ionosphere to particle precipitation, usually the cause of visible aurora. Precipitating charged particles—protons and electrons with energies varying from approximately 100 eV to 20 keV—travel along the magnetic field lines from the magnetosphere into the upper-atmosphere and their collisions with the ionospheric neutrals cause auroral emissions. This not only creates beautiful patterns in the sky, which have astonished humans since before Christ, but also gives us a tool for keeping track of the precipitating particles and studying their collective behavior in the ionosphere. In my research I will combine these images with SuperDARN (Super Dual Auroral radar network) data and ground-based magnetometers data which will help us to globally quantify ionospheric convection. Ionospheric convection measurements together with the images will allow me to understand the shape and the temporal evolution of the auroral oval. These results will be interpreted with solar wind data parameters to understand the auroral behaviour and the physical mechanisms that drive its dynamical changes.

"Dwell on the beauty of life. Watch the stars, and see yourself running with them."

Hobbies
Meditating, discover new places and being in nature are my favourite hobbies. From time to time I like to read about biology and philosophy. Marcus Aurelius is one of my favourite philosophers. I often go swimming at the pool, and I enjoy water activities very much.
As I am a very curious person, I like to try new things, therefore new hobbies are always on the list!

Contact information
Institutt for Fysikk og Teknologi
Allégaten 55
Room 403
sara.gasparini@uib.no