Solar Modeling and Forecasting Presentations

10:00-12:00 Friday 13 October 2006
Gamble Hall, 615 Booth Street, Ottawa
Natural Resources Canada

10:00-11:00 **Physical origin of fluctuations in the amplitude of the solar activity cycle**
Paul Charbonneau, Canada Research Chair in Solar Physics, Université de Montréal
http://www.astro.umontreal.ca/~paulchar/grps/grps.html

The 11-year solar activity cycle strongly modulates the occurrence frequency of all geoeffective solar eruptive phenomena, such as flares and coronal mass ejections. Understanding the underlying physical origin of the pronounced fluctuations of the cycle's amplitude, as evidenced e.g. by the sunspot record, is thus the starting point of long-term solar activity forecasting. In this talk I will describe recent advances in our understanding of the physical origin of these fluctuations. I will argue that they can be understood as the consequence of a long time delay in the regenerative loop characterizing the temporal evolution of the large-scale solar magnetic field powering all aspects of solar activity. I will also briefly describe ongoing research efforts in the Solar Group at the Université de Montréal, aiming at furthering our understanding of the basic dynamo mechanisms at play in the solar context. If time allows, I will also present very recent and exciting results in our ongoing efforts to use data assimilation techniques to carry our flare forecasting in the context of avalanche models of solar flares.

Biographical sketch

Originally trained in stellar astrophysics, Professor Charbonneau is an internationally recognized authority in the field of solar and stellar physics, and in particular in solar cycle modelling. He spent much of his research career at the National Center for Atmospheric Research (NCAR), an American research institution located in Colorado and recognized as a world-leader in atmospheric and solar-terrestrial physics. While at NCAR he developed a number of state-of-the-art computational techniques and software that, when introduced, were unrivaled in their power and flexibility, and led to numerous scientific breakthroughs.

In 2002 he was appointed Canada Research Chair in Solar Physics at the Physics Department of the Université de Montréal, where he has been building up a research group focusing on the modelling of the sun's magnetic activity cycle, and related eruptive phenomena.

Together with several other Canadian scientists, Prof. Charbonneau is rebuilding Canada's research capabilities in solar physics, and seeks to raise awareness of the important influence of the Sun on a variety of terrestrial phenomena,.

- *To ensure yourself of a seat in Gamble Hall (capacity limit of 60 people), and to assist with the new security procedures, please confirm your attendance by email to: bhowell@nrcan.gc.ca*
- *Please also note that the Third Annual Canadian Solar Workshop will be held in Montreal, 30Nov-01Dec06. http://www.astro.umontreal.ca/~paulchar/grps/CSW06.html*

11:00-11:10 Geomagnetism and Space Weather – a quick introduction

David Boteler, Research Scientist, Geomagnetic Laboratory, Natural Resources Canada
Geomagnetic Field Monitoring: www.geolab.nrcan.gc.ca ; Space Weather Forecasting: www.spaceweather.gc.ca

The Earth's magnetic field is an ever-changing phenomenon that influences human activity and the natural world in a variety of ways. The geomagnetic field changes from place to place, and on time scales ranging from seconds to decades to eons. The geomagnetic field, along with its associated phenomena, can both assist and degrade navigation and surveying techniques; it can impede geophysical exploration; it can disrupt electric power utilities, and pipeline operations; and it can influence modern communications systems, spacecraft, and more.

This talk will provide a brief overview of the space weather phenomena that cause geomagnetic disturbances and how different technological systems are affected. The presentation will also describe that is being done at NRCan, in close collaboration with industry, to reduce the risk to critical infrastructure from space weather hazards.

Bio: David Boteler is a research scientist in the Earth Science Sector, Natural Resources Canada. He has over 20 years experience studying the effects of geomagnetic disturbances on technology such as power systems and pipelines. He is currently project leader for Space Weather Hazards Assessment within the Reducing Risk from Natural Hazards program.

11:10-11:25 Astronomical drivers of terrestrial phenomena

David Thomson, Canada Research Chair in Statistics and Signal Processing, Queen's University
http://appsci.queensu.ca/research/profiles/thomson/

For several hundred years scientists have observed sometimes tenuous or short-lived correlations between astronomical processes and terrestrial phenomena such as agricultural cycles, tree ring indications of forest growth, disease, and climate change. However, models are improving, far better data is available, and advanced mathematical and statistical tools are evolving. These hold promise for a much better understanding of the influence of Astronomical drivers of Earth processes. In turn, this may lead to much improved understanding, forecasting, and planning and preparations for changes in the Earth processes that have a major impact on the environment and humanity.

Bio: David Thomson has worked at Bell Telephone Laboratories, and was also a Distinguished Member of Technical Staff in the Communications Analysis Research Department and a Green Scholar at Scripp's Institution of Oceanography. In 2002 he became a Canada Research Chair in Statistics and Signal Processing in the Department of Mathematics and Statistics at Queen's University.

11:25-12:00 Question and discussion period Open format

The intent of this part of the session is to provide an open format to pursue curious observations, fun results and insight into terrestrial-astronomical links, and possible lines of inquiry. It will be a rare opportunity to ask questions of a wide range of experts from geology, to astrophysics, health (pandemics and radiation), the vulnerability of complex systems like telecommunications.