ST. FRANCIS XAVIER UNIVERSITY

Physics Colloquium

Friday, 27 November 2009, 4:00pm, PSC 3046

Marielle Lespérance

Are Temperature Trends Preserved in the Subsurface?

The thermal regime of the continental subsurface contains the record of the most recent changes in the energy balance at the ground surface. Borehole paleoclimatology methods can be applied to infer past ground surface temperature changes and to estimate the heat storage of the subsurface, thus contributing to ascertain the overall energy budget of the climate system. A crucial point is to understand the nature of the coupling between the atmosphere and the ground. Previous studies have examined air and ground temperature relationships working under the assumption that linear trends in surface air temperature should be equal to those measured at depth within the terrestrial subsurface. Here, a purely conductive model of heat conduction will be used to investigate this assumption. Resulting ground temperature trends will be analyzed using a synthetic linear surface temperature trend, both with and without noise, as upper boundary condition to force the model. An error estimate for the corresponding underground trend variation will be determined by performing a Monte Carlo simulation. Finally, ECHO-G General Circulation Model air temperature projections will be used for a more realistic simulated data set, and ground and surface temperature data collected in Armagh, Ireland and Fargo, North Dakota will serve as a means to compare our simulated results to meteorological data.

Brock Fraser

Spectroscopy in Atmospheric Physics

With global warming being a hot topic of discussion these days, there are many opportunities for atmospheric physicists to apply their knowledge in to develop techniques to aid in the effort to mitigate this massive problem. There is always room for improvement in the study and detection methods of the greenhouse gases causing the earth's continued rise in temperature. The following begins with a brief introduction into the world of atmospheric physics, specifically absorption spectroscopy, and later delves into the relatively new method of trace gas detection using whispering gallery mode absorption spectroscopy. This method has the potential to be the basis for an efficient new generation gas sensor. Experimentally there are some challenges a head, one being the implementation of an optical fiber tuning mechanism. After addressing the fundamental theory behind the detection method the tentative design will be presented.