

M.Sc. Defense
May Lee
DATE: Thursday, April 15th, 2010
TIME: 11:00 a.m.
PLACE: MacNaughton Room 222
University of Guelph

THESIS TITLE:
EMPIRICAL INVESTIGATIONS OF COMPTON
AND RAYLEIGH SCATTERING IN APXS SPECTRA

ABSTRACT:

Compton and Rayleigh scattering peaks can be used to quantify the content of low atomic number elements that do not generate detectable characteristic peaks in an X-ray spectrum. Here, this method is used for quantifying water content in spectra obtained by the Alpha-particle X-ray spectrometers (APXS) on the Mars Exploration Rovers (MER).

As part of the analysis, a Monte Carlo simulation program is needed to determine the Compton to Rayleigh scattering (C/R) ratio based on sample content. Improvements were made to this simulation program and the new version was used to determine the most important parameters that influence the C/R ratio. Analyzing spectra from MERB, the Endurance Crater and Victoria Crater region were estimated to have $13 \pm 4\%$ and $18 \pm 4\%$ water respectively. A new extrapolation method was also developed that reduces the number of simulations required to arrive at a water estimate for any given MER spectrum.

EXAMINING COMMITTEE:

Chair: Dr. Robert Wickham

Advisor: Dr. Ralf Gellert

Advisory Committee Member(s): Dr. Iain Campbell, Dr. Joanne O'Meara