University of Victoria | Graduate Studies

Notice of the Final Oral Examination for the Degree of Master of Science

of

GILLIAN WALKER

BSc (McGill University, 2006)

"Effects of Climate Variability and Change on Surface Water Storage within the Hydroclimatic Regime of the Athabasca River, Alberta, Canada"

Department of Geography

Wednesday, March 30, 2016
10:00AM
David Turpin Building
Room B215

Supervisory Committee:
Dr. Terry Prowse, Department of Geography, University of Victoria (Supervisor)
Dr. Yonas Dibike, Department of Geography, UVic (Member)
Dr. Barrie Bonsal, Department of Geography, UVic (Member)

External Examiner:
Dr. Daqing Yang, Environment Canada

Chair of Oral Examination:
Dr. Tsung-Cheng Lin, Department of Pacific and Asian Studies, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

Warmer air temperatures projected for the mid-21st century under climate change are expected to translate to increased evaporation and a re-distribution of precipitation around the world, including in the mid-latitude, continental climate of the Athabasca River region in northern Alberta, Canada. This study examines how these projected changes will affect the water balance of various lake sizes. A thermodynamic lake model, MyLake, is used to determine evaporation over three theoretical lake basins – a shallow lake, representative of perched basins in the Peace-Athabasca Delta near Fort Chipewyan; an intermediate-depth lake representative of industrial water storage near Fort McMurray; and a deep lake representative of future off-stream storage of water by industry, also near Fort McMurray. Bias-corrected climate data from an ensemble of Regional Climate Models are incorporated in MyLake, and the water balance is completed by calculating the change in storage as the difference between precipitation and evaporation. Results indicate that evaporation and precipitation are projected to increase in the future by similar magnitudes, thus not significantly changing the long-term water balance of the lakes. However, intra-annual precipitation and evaporation patterns are projected to shift within the year, changing seasonal water level cycles, and the magnitudes and frequencies of extreme 1-, 3- and 5-day weather events are projected to increase. These results demonstrate that future climate change adaptation and mitigation strategies should take into account increases in intra-annual variability and extreme events on water levels of lakes in mid-latitude, interior hydroclimatic regimes.