



Cold Regions Hydrological Modelling Geography 898.1 T1

Professor John Pomeroy, Dept of Geography 12.1 Kirk Hall

Department Approval Required: must be taken for credit

September 4-5, 2013

Course Objectives

This class aims to:

- Familiarize students with the principles of object-oriented physically-based hydrological process modelling for the cold regions of western and northern Canada
- Train students to use the Cold Regions Hydrological Modelling Platform (CRHM) to create purpose-built hydrological models that are appropriate for hydrological prediction problems in western and northern Canada

On completion, students should be able to:

- Describe which physical process algorithms are most appropriate for modelling forested, prairie, mountain and arctic river basins under various levels of meteorological and parameter data availability
- Use CRHM to construct and run an appropriate hydrological model for small river basins in western and northern Canadian environments

Contact Hours and Schedule

Lectures and practical sessions will take place intensively over a two-day period, followed by time for questions and review

Enrollment Limit: 40 students

Pre-Requisites

Students must be graduate students and have had an upper year undergraduate physical hydrology class before taking this class. Students should be comfortable with numerical methods as applied in physical hydrology. Students must have a laptop computer and be able to load software provided by the instructor on it.

Marking and Evaluation

Marks will be awarded as follows:

- 20% active participation in the class tutorials
evaluation: successfully installing and running CRHM model on own laptop
- 80%: quantitative exercises on hydrological modelling
evaluation: exercise to develop a hydrological model using CRHM and apply it to snowpack, soil moisture and predict streamflow in a basin

Course Outline

- Day 1, AM Principles of cold regions hydrological modelling
- Day 1, PM CRHM features and operation
- Day 2 CRHM Operation Tutorial (exercises assigned)

Course Texts and Reading

Manual (provided at commencement of course):

- Cold Regions Hydrological Model Manual. Centre for Hydrology, University of Saskatchewan, 2013

Journal Articles – selection:

- Gray, D.M., Toth, B., Pomeroy, J.W., Zhao, L. and R.J. Granger. 2001. Estimating areal snowmelt infiltration into frozen soils. *Hydrological Processes*. 15. 3095-3111 [PDF](#)
- Pomeroy, J.W. and L. Li. 2000. Prairie and Arctic areal snow cover mass balance using a blowing snow model. *Journal of Geophysical Research*, Vol. 105, No. D21. 26619-26634 [PDF](#)
- Pomeroy, J.W., J. Parviainen, N. Hedstrom and D.M. Gray. 1998. Coupled modelling of forest snow interception and sublimation. *Hydrological Processes*, 12, 2317-2337 [PDF](#)
- Pomeroy, J.W., D.M. Gray, K.R. Shook, B. Toth, R.L.H. Essery, A. Pietroniro and N. Hedstrom. 1998. An evaluation of snow accumulation and ablation processes for land surface modelling. *Hydrological Processes*, 12, 2339-2367 [PDF](#)
- Pomeroy, J., Fang, X. and Ellis, C. 2012. Sensitivity of snowmelt hydrology in Marmot Creek, Alberta, to forest cover disturbance. *Hydrol. Process.*, 26: 1891-1904. [PDF](#)
- MacDonald, M., J.W. Pomeroy and A. Pietroniro. 2010. On the importance of sublimation to an alpine snow mass balance in the Canadian Rocky Mountains. *Hydrol. Earth Syst. Sci.*, 14, 1401-1415 [PDF](#)
- Ellis, C.R., Pomeroy, J.W., Brown, T., and MacDonald, J. 2010. Simulation of snow accumulation and melt in needleleaf forest environments. *Hydrol. Earth Syst. Sci.* 14: 925-940 [PDF](#)
- DeBeer, C. and J.W. Pomeroy. 2010. Simulation of the snowmelt runoff contributing area in a small alpine basin. *Hydrol. Earth Syst. Sci.*, 14, 1205-1219 [PDF](#)
- Armstrong, R.N., J.W. Pomeroy, L.W. Martz. 2010. Estimating evaporation in a Prairie landscape under drought conditions. *Canadian Water Resources Journal*, 35(2), 173-186 [PDF](#)
- Fang, X., J.W. Pomeroy, C.J. Westbrook, X. Guo, A.G. Minke and T. Brown. 2010. Prediction of snowmelt-derived streamflow in a wetland dominated prairie basin. *Hydrol. Earth Syst. Sci.*, 14, 991-1006 [PDF](#)
- Dornes, P.F., Pomeroy, J.W., Pietroniro, A., Carey, S.K., and W. L. Quinton. 2008. Influence of landscape aggregation in modelling snow-cover ablation and snowmelt runoff in a sub-arctic mountainous environment. *Hydrological Sciences Journal*, 53(4), 725-740 [PDF](#)
- Pomeroy, J.W., Gray, DM, Brown, T., Hedstrom, N.H., Quinton, W.L., Granger, R.J. and S.K. Carey. 2007. The cold regions hydrological model: a platform for basing process representation and model structure on physical evidence. *Hydrological Processes*, 21, 2650-2667 [PDF](#)

Registration

Please contact Professor John Pomeroy (john.pomeroy@usask.ca), with details of your current studies and reasons for wishing to join the course.

There may be a fee payable, details of which will be made known when available.