

Home

Online Library HESS

- Recent Final Revised Papers
- Volumes and Issues**
- Special Issues
- Library Search
- Title and Author Search

Online Library HESSD

Alerts & RSS Feeds

General Information

Submission

Review

Production

Subscription

Comment on a Paper



[Volumes and Issues](#) [Contents of Issue 2](#)

Hydrol. Earth Syst. Sci., 12, 565-585, 2008  
www.hydrol-earth-syst-sci.net/12/565/2008/

© Author(s) 2008. This work is distributed under the Creative Commons Attribution 3.0 License.

## Extension of the Representative Elementary Watershed approach for cold regions: constitutive relationships and an application

L. Mou<sup>1</sup>, F. Tian<sup>1</sup>, H. Hu<sup>1</sup>, and M. Sivapalan<sup>2</sup>

<sup>1</sup>State Key Laboratory of Hydrosience and Engineering & Department of Hydraulic Engineering, Tsinghua University, Beijing 100084, China

<sup>2</sup>Departments of Geography & Civil and Environmental Engineering, University of Illinois at Urbana-Champaign, 220 Davenport Hall, MC-150, 607 S. Mathews Ave., Urbana, IL 61801, USA

**Abstract.** The Representative Elementary Watershed (REW) approach proposed by Reggiani et al. (1998, 1999) represents an attempt to develop a scale adaptable modeling framework for the hydrological research community. Tian et al. (2006) extended the original REW theory for cold regions through explicit treatment of energy balance equations to incorporate associated cold regions processes, such as snow and glacier melting/accumulation, and soil freezing/thawing. However, constitutive relationships for the cold regions processes needed to complete these new balance equations have been left unspecified in this derivation. In this paper we propose a set of closure schemes for cold regions processes within the extended framework. An energy balance method is proposed to close the balance equations of melting/accumulation processes as well as the widely-used and conceptual degree-day method, whereas the closure schemes for soil freezing and thawing are based on the maximum unfrozen-water content model. The proposed closure schemes are coupled to the previously derived balance equations and implemented within the Thermodynamic Watershed Hydrological Model (THModel, Tian, 2006) and then applied to the headwaters of the Urumqi River in Western China. The results of the 5-year calibration and 3-year validation analyses show that THModel can indeed simulate runoff processes in this glacier and snow-dominated catchment reasonably well, which shows the prospects of the REW approach and the developed closure schemes for cold regions processes.

[Final Revised Paper](#) (PDF, 1137 KB) [Discussion Paper](#) (HESSD)

Citation: Mou, L., Tian, F., Hu, H., and Sivapalan, M.: Extension of the Representative Elementary Watershed approach for cold regions: constitutive relationships and an application, Hydrol. Earth Syst. Sci., 12, 565-585, 2008. [Bibtex](#) [EndNote](#) [Reference Manager](#)



Search HESS

Library Search

Author Search

News

- New Service Charges
- Financial Support for Authors
- ISI Impact Factor: 2.270

Recent Papers

01 | HESSD, 28 Apr 2009: Integrating field and numerical modeling methods for applied urban karst hydrogeology

02 | HESSD, 28 Apr 2009: Analyzing the relationship between peak runoff discharge and land-use pattern – a spatial optimization approach

03 | HESSD, 27 Apr 2009: Dynamically vs. empirically downscaled medium-range precipitation forecasts