



The Canadian external urban and land surface modeling system: Summertime evaluation over the Montreal metropolitan area

S. Leroyer, S. Bélair, and J. Mailhot

Environment Canada, Meteorological Research Division, Dorval, QC, Canada (sylvie.leroyer@ec.gc.ca)

The Canadian urban and land surface external modeling system (urban GEM-SURF) has been developed to improve numerical weather prediction of surface and near-surface meteorological variables and to become a tool for environmental applications. Following the methodology used for complex terrain and natural covers using the Interactions between the Surface, Biosphere, and Atmosphere (ISBA) land surface model (Carrera et al 2010, Bernier et al. 2011), the two-dimensional system is augmented with the Town Energy Balance (TEB) model for the built-up covers (Leroyer et al. 2011). The urban modeling system is driven by coarse resolution forecasts from the 15-km Canadian regional operational model. This new system was tested for a 120-m grid-size computational domain covering the Montreal metropolitan region from 1 May to 30 Sept 2008. The numerical results were first evaluated against local observations of the surface energy budgets, air temperature, and humidity taken at the three tower sites of the Environmental Prediction in Canadian Cities (EPiCC) field experiment. As compared with the 15-km regional model, important improvements are achieved with this system over urban and suburban sites. GEM-SURF's ability to simulate the Montreal surface urban heat island was also investigated and the radiative surface temperatures were compared between this system and two operational systems at the Meteorological Service of Canada (the 15-km regional model and the so-called limited-area model LAM with 2.5-km grid size). Finally, comparison of urban GEM-SURF outputs against remotely sensed observations from the MODerate Resolution Imaging Spectroradiometer (MODIS) reveals relatively good agreement for urban and natural areas.

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