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Impact of urban regions on the surface energy and water partitioning over east North America

Gemechu Garuma (1), Laxmi Sushama (2), Diro Gulilat (3), and Roberge Francois (4)

(1) Institute of Environmental Science and Earth and Atmospherics Sciences, University of Quebec at Montreal (UQAM), Montreal , Canada (gemechu@sca.uqam.ca), (2) Earth and Atmospheric Sciences, University of Quebec at Montreal (UQAM), Montreal , Canada (sushama.laxmi@uqam.ca), (3) Earth and Atmospheric Sciences, University of Quebec at Montreal (UQAM), Montreal , Canada (diro@sca.uqam.ca), (4) Earth and Atmospheric Sciences, University of Quebec at Montreal (UQAM), Montreal , Canada (roberge@sca.uqam.ca)

In this study, two experiments were performed for an east North American domain to assess the impact of urban regions on the surface energy and water partitioning. The first experiment is performed with the Canadian Land Surface Scheme (CLASS), which treats urban regions as areas of bare soil with a high roughness length. The second experiment is similar to the first experiment, except that the urban regions are modeled using the single layer urban canopy model, TEB (Town Energy Balance). Results show that urban heat island (UHI; defined here as the surface temperature difference between urban and non-urban fractions of a given cell and simulation) is reasonably well simulated by the CLASS+TEB experiment. The UHI exhibits seasonal cycle, with UHI being higher in summer (1 deg. C to 5 deg. C). The experiment with CLASS and TEB also simulate higher urban surface runoff as a result of reduced infiltration. Comparison of surface energy fluxes from the urban and rural surfaces were also performed. As expected, results show higher sensible heat flux for urban regions and reduced latent heat flux due to reduced vegetation, and the presence of impervious surface. Following this, TEB has been implemented in the fifth generation Canadian Regional Climate Model (CRCM5), and this paper will also present some preliminary results related to the impact of urban regions on the regional climate over the same study domain.