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Simulations of the Montréal urban heat island

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The current population of Montreal is around 3.8 million and this number is projected to go up in the coming years to decades, which will lead to vast expansion of urban areas. It is well known that urban morphology impacts weather and climate, and therefore should be taken into consideration in urban planning. This is particularly important in the context of a changing climate, as the intensity and frequency of temperature extremes such as hot spells are projected to increase in future climate, and Urban Heat Island (UHI) can potentially raise already stressful temperatures during such events, which can have significant effects on human health and energy consumption. High-resolution regional climate model simulations can be utilized to understand better urban-weather/climate interactions in current and future climates, particularly the spatio-temporal characteristics of the Urban Heat Island and its impact on other weather/climate characteristics such as urban flows, precipitation etc. This paper will focus on two high-resolution (250 m) simulations performed with (1) the Canadian Land Surface Scheme (CLASS) and (2) CLASS and TEB (Town Energy Balance) model; TEB is a single layer urban canopy model and is used to model the urban fractions. The two simulations are performed over a domain covering Montreal for the 1960–2015 period, driven by atmospheric forcing data coming from a high-resolution Canadian Regional Climate Model (CRCM5) simulation, driven by ERA-Interim. The two simulations are compared to assess the impact of urban regions on selected surface fields and the simulation with both CLASS and TEB is then used to study the spatio-temporal characteristics of the UHI over the study domain. Some preliminary results from a coupled simulation, i.e. CRCM5+CLASS+TEB, for selected years, including extreme warm years, will also be presented.