



A study of the Urban Heat Island of Barcelona using a fast urban climate model.

Markel García-Díez (1), Joan Ballester (1), Koen De Ridder (2), Hans Hooyberghs (2), Dirk Lauwaet (2), and Xavier Rodó (1)

(1) Catalan Institute of Climate Sciences, Climate Dynamics and Impacts Unit, Spain (markel.garcia@ic3.cat), (2) VITO – Flemish Institute for Technological Research, Mol, Belgium

Computational resources are a very important limitation for the design of climate simulations at the city level. The reason is that very high resolutions are needed in order to correctly represent the influence of the city in the climate, namely the Urban Heat Island (UHI), i.e. the significantly warmer atmospheric temperatures in highly-populated metropolitan regions than in the surrounding rural areas. Here, we analyse the performance of a fast urban climate model (UrbClim) over the city of Barcelona, whose climate is characterized by mild winters and warm and relatively humid summer conditions affected by southerly sea breezes. The UrbClim model is designed to reproduce the essential physics of the UHI at a higher resolution, and with a minimum amount of computational power, compared to global and regional climate models. Thus, allowing the fast dynamical downscaling of long-term simulation ensembles. The results of the model are compared with observations (from meteorological stations and from MODIS) and with a high-resolution simulation carried out with a computationally-heavy mesoscale model (Weather Research and Forecasting, WRF) with urban physics. Several schemes are tested for UrbClim boundary conditions, i.e. nesting the model in a global reanalysis and in a high-resolution regional simulation. Future prospects on using the UrbClim model for impact studies, especially temperature-related mortality, are discussed. These are the first results of a collaboration between the Flemish Institute for Technological Research and the Unit of Climate Dynamics and Impacts of the Catalan Institute of Climate Sciences (IC3).