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# High-resolution simulations with COSMO-LM including TERRA-URB parameterization for the representation of Urban Heat Islands over South Italy

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The Urban Heat Island (UHI) effect is one of the most relevant meteorological features of urban environment, since it has substantial implications on human well-being. In the last years, Limited Area Models have employed very high spatial resolution, to improve local forecasts, especially for dangerous convective phenomena and to capture better the urban features. In the COSMO-LM model, cities are represented by natural land surface with an increased surface roughness length and a reduced vegetation cover. This basic representation could not reliably capture the urban physics and associated urban climatic effects including UHI. For this reason, further developments have been carried out and in particular the TERRA-URB scheme. This is a bulk parameterization scheme including prescribed Anthropogenic Heat Flux and Impervious Surface Area datasets, offering intrinsic representation of the urban physics with modifications of input data, soil module and land atmospheric interactions. In the period 8-10 August 2017, Campania Region, and the city of Naples in particular, experienced extreme temperature values and uncomfortable conditions for the population. In fact, August 2017 has been recorded as the second hottest period in Naples in the last 40 years. This is the reason why this area and this period represents a suitable benchmark to test the urban parameterization of COSMO-LM. Numerical simulations have been performed over a domain (12.22° – 14.55° E; 40.63° - 41.88° N) located in the south-Italy, centered over Campania region, employing a spatial resolution of 0.009° (about 1 km). The computational domain is made up of 260 x 138 points, 60 vertical levels, while the time step is set equal to 10 s. Initial and boundary conditions are provided by the ECMWF IFS model, at resolution of 0.075° (about 8.5 km). Model evaluation has been performed against hourly time series of 2m temperature and 2m relative humidity provided by a meteorological station (University of Naples) located in Fuorigrotta quarter (urban area). Moreover, daily values for temperature and humidity for rural stations provided by the Civil Protection (Campania Region) have been used in order to highlight differences between simulated values in urban and rural areas. Results show that the usage of TERRA-URB provides benefits in terms of maximum and minimum temperature in urban areas, while the bias of humidity is increased.