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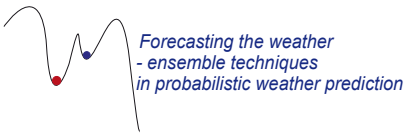

Urban-rural air temperature patterns from remotely sensed (ASTER) land surface temperature

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In a new approach, 90-m thermal imagery from the ASTER instrument onboard the TERRA satellite platforms was employed to derive 2-m air temperature. The study domain consisted of the urban area of Madrid and surroundings, for the day of 25 June 2008. The approach was based on the aerodynamic formulation of the surface sensible heat flux, involving the surface-air temperature difference and a drag coefficient, together with a simple atmospheric heat dispersion model. The major challenge consisted of finding a suitable parameterization for the thermal roughness length, as a function of land cover characteristics and terrain heterogeneity.

The 2-m air temperature fields obtained were validated using observed values at a few meteorological stations in the study domain, yielding mean errors of around 1°C and pattern correlation coefficients of approximately 0.8, both for day- and night-time conditions. It was found that, for the results obtained from the morning pass of the ASTER instrument, the city of Madrid exhibits a slight ‘cool island’ on the day considered. Air temperatures obtained from the evening pass showed a pronounced heat island pattern, urban air temperatures being warmer by up to 4-5°C compared to the rural areas.