High resolution air temperature maps for urban planning and management

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Existence of more or less dense urban meteorological networks is nowadays relatively common, even if often heterogenous in scopes, hardware and management. Those networks are undoubtedly useful tools for a variety of practical purposes. Nevertheless, they are generally unfit to climatological studies, and unable to describe Air Temperature in the Urban Canopy Layer (UCL) with sufficient spatial resolution: for example, as required by several professional activities and for local adaptation measures to climate change.

On the other hand, remote sensing data from space has become more and more frequent and easily available, offering a higher spatial resolution (but a still very low frequency) of surface characteristics as the Land Surface Temperature (LST). Often used to describe Urban Heat Islands (UHI), LST has not a simple correlation with canopy layer Air Temperature, which on the contrary is the most required variable for planning and management purposes in cities.

Using both high quality in situ measurements of Air Temperature at top of UCL obtained by a dedicated urban network as a primary variable, and satellite derived LSTs as the secondary one, a Co-Kriging based methodology has been developed and tested to obtain medium to high spatial resolution Air Temperature maps. Instantaneous as well as long period mean fields of fine spatially resolved Air Temperature find relevant application not only in monitoring and assessing activities of adaptation and mitigation measures in the urban environment, but also in urban climate studies.

In this paper the methodology is shortly described, and results for the metropolitan area of Milan and the neighbourhoods, obtained in the framework of the first 2 years of ClimaMi Project (https://www.progettoclimami.it/), are presented and discussed together with error estimations.