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Cooling Town – How landscape is affecting urban climates in mountain regions

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Cities and urban areas are known to have a local climate different from that of surrounding rural landscapes. The so-called 'urban heat island' phenomenon results from the replacement of natural with impervious, non-evaporative surfaces such as concrete and asphalt. Urban areas usually have higher solar radiation absorption and a greater thermal conductivity and capacity that lead to greater heat storage during the day and heat release at night. This results in a modified climate that is warmer than the surrounding rural areas.
Despite being often considered as 'heating islands', cities are not isolated from their environment and are affected by their thermal properties. Reports for the cities of Vienna (Austria) or Stuttgart (Germany) document the importance of the environmental setting for the climate in the cities. Especially large forest areas around the cities have shown to provide cooling and higher air quality. It is therefore not only the core urban area that needs to be considered for climatic effects but also the large-scale surrounding and environmental setting of the city. But only very few studies (e.g. for rice fields in Japan and Taiwan) specifically investigated this temperature effect of surrounding landscapes on urban areas. The research project "Cooling Town" (www.coolingtown.at) addresses this little knowledge on temperature regimes of urban areas and their thermal connectivity with surrounding landscapes, focusing on mountain environments.
One major aspect in this research is to assess the summer temperature regime of the city of Bolzano in South Tyrol (northern Italy). The spatial distribution of air and surface temperatures is analyzed to derive rural and urban and regions with specific temperature regimes and climates and their connectivity. Twelve climate stations were placed in and around the city of Bolzano to measure air and surface temperatures together with wind parameters throughout summer 2012. Thermal infrared images were taken from a hill above the city, covering the valley bottom Bolzano is located in. Additionally, remote sensing data from the ASTER sensor were acquired on a monthly basis to gain large-scale information on surface temperatures. The data will be used together with land cover data to build a four-dimensional temperature model for Bolzano and its surroundings.