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Analysis of the Urban Thermal Fingerprint of the City of Trento in the Alps

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The temperature contrasts typically marking urban heat island (UHI) effects in the city of Trento, Italy, located in an Alpine valley and inhabited in its inner urban area by a population of about 56,000, are investigated. Time series of air temperature data, collected at an urban weather station, in the city center, and at five extraurban stations are compared. The latter are representative of rural and suburban areas, both on the valley floor and on the valley sidewalls. It is found that the extraurban weather stations, being affected by different local-scale climatic conditions, display different temperature contrasts with the urban site. However, the diurnal cycle of the UHI is characterized by similar patterns of behavior at all of the extraurban weather stations: the UHI intensity is stronger at night, whereas during the central hours of the day an "urban cool island" is likely to occur. The diurnal maximum UHI intensity turns out to be typically of order 3°C, but under particularly favorable conditions it may be higher than 6°C. An urban cool island effect is also detected, which is probably caused by the compactness of the inner urban area, and displays typical diurnal maximum intensities of order 1.5°C. As to the seasonal dependence, at the extraurban weather stations on the valley floor the UHI intensity tends to be slightly stronger during dry months, whereas on the valley sidewalls it is mainly influenced by the seasonal lapse-rate changes. Further weather factors, such as wind speed and cloud cover, also affect urbanization effects, making them weaker with stronger winds and cloudier skies.