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**A comparison of thermal comfort conditions in four urban spaces by means of  
measurements and modelling techniques**

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## **Abstract**

Microclimatic conditions inside urban areas depend on the result of the interaction of the regional climate with the whole urban area and on the local characteristics of the urban development. Inadequate human thermal comfort conditions can affect quality of life and the use of public open spaces. In this study, outdoor thermal conditions are examined through three field campaigns in Bilbao in the north of the Iberian Peninsula. Climate variables are measured in four different areas of the city in different regional climate conditions. Thermal comfort evaluation is undertaken by means of the thermal index PET (Physiological Equivalent Temperature). Measurements are compared with estimated values derived from ENVI-met model. Results show that the differences between modelled and measured climatic variables can imply a relevant deviation in PET (i.e. difference between modelled and measured values). Regression and correlation analyses account for the importance of the deviation of each climatic variable in the deviation of PET values. Deviation of PET appears to be highly conditioned by the deviation of mean radiant temperature values especially during clear sky days. Under overcast conditions deviation of wind speed also becomes a relevant aspect. Consequently, reliable estimation of these variables is required if modelling techniques are to be used in the assessment of thermal comfort in outdoor urban spaces.

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