Experimental evaluation of the effect of presence of obstacles in the vicinity of sites hosting near surface meteorological measurement. The case of the road.

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4. Abstract of the paper

The accuracy of near surface measurements of meteorological variables is influenced by the environmental characteristics of the site where the instruments are placed. WMO guide #8 establishes a qualitative/quantitative classification, by itemizing different site conditions. In the framework of the MeteoMet2 project, to deliver a validated analysis aiming at possibly improving the WMO siting classification, a one-year lasting experiment has been devised for evaluating the effect of obstacles on near surface air temperature measurements. The experiment consists in a 100 m long array of identical thermometers equipped with aspirated solar shields, placed on a flat grass field at increasing distances from an obstacle, such that the farthest station fulfils current WMO requirements for a Class 1 site. Thermometers are Pt100 calibrated against reference standards and other quantities of influence are also measured: humidity, solar radiation, wind speed and direction. Three identical experimental setups have been designed, built and characterized to separately identify the effect of three different kind of obstacles: asphalt roads (Italy), trees (Czech Republic) and buildings (Spain). The work here presented focuses only on the road siting experiment. A statistical analysis based on Generalized Additive Model (GAM) was performed to understand the effect of each quantity of influence on the temperature measurements. The model was instrumental in understanding the best combination of environmental factor that would boost the effect. The largest temperature biases (extremes) have been then modelled through Extreme Values Analysis (EVA), which allowed for an evaluation of the asymptotic behaviour of these biases, and an estimation of the road siting effect. Results show that the roads influence temperature readings more intensely during nights and when wind is absent. The magnitude of the effect has been evaluated at 1.7±0.4 °C for a return period of 100 years.