

## **Are winds in cities always slower than in the countryside? Modelling the Urban Wind Island Effect**

Arjan Droste and Gert-Jan Steeneveld

Wageningen University & Research, Meteorology & Air Quality, Wageningen, Netherlands (arjan.droste@wur.nl)

Though the Urban Heat Island has been extensively studied, relatively little has been documented about differences in wind between the city as a whole and the countryside. Urban winds are difficult to capture in both observations and modelling, due to the complex urban canyon and neighbourhood geometry. This study uses a straightforward mixed-layer model (Tennekes & Driedonks, 1981) to investigate the contrast between the diurnal cycle of wind in the urban and the rural environment. The model contains one urban and one rural column, to identify differences in wind patterns between city and countryside under equal geostrophic forcing. The model has been evaluated against rural observations from the 213 m. Cabauw tower (the Netherlands), and the urban observations from the BUBBLE campaign (Basel, Rotach et al., 2005). The influence of the urban fabric on the wind is investigated by varying the surface underneath the column model using the 10 urban Local Climate Zones, thereby altering building height, fraction of impervious surface, and initial boundary-layer depth.

First results show that for high initial urban boundary-layer depths compared to the rural boundary-layer depth, the urban column can be much windier than its rural counterpart: i.e. the urban Wind Island Effect. The effect appears to be most prominent in the morning and the late afternoon (up to 1 m/s), for Local Climate Zones with lower buildings (3 or 7). BUBBLE observations confirm the timing of the Wind Island Effect, though with weaker magnitude.