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Forecasting the weather
- ensemble techniques
in probabilistic weather prediction

Measurement and statistical modeling of the urban heat island of the city of Utrecht (the Netherlands)

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Mobile temperature and humidity measurements have been performed along on a 14 km transect through the city of Utrecht (300.000 inhabitants) in the period March 2006 - January 2009. The measurements took place on a bicycle during commuter traffic and resulted in 106 morning profiles (before sunrise) and 77 afternoon profiles. It is shown how the urban heat island depends on wind direction, cloudiness and windspeed. A statistical model is constructed that relates the magnitude of the urban heat island to the local area-averaged sky-view factor and land use. Sky-view-factors are calculated from a 0.5x0.5 m surface elevation database and land use is obtained from a 25x25 m land use database. The model is calibrated using the mobile measurements and provides an estimate of the areal distribution of the mean and maximum night time urban heat island in Utrecht. It explains more than 80% of the variance. The measurements are also used to obtain an estimate of the magnitude of night time urban heat advection to the meteorological station De Bilt, just east of Utrecht. It is shown that for night time conditions and westerly wind, advection causes a mean temperature rise of 0.5°C at that station.