



Observing moisture and energy exchange of urban soils and the impact on local climate

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Soil as a storage and transmitter for water and thermal energy is able to influence and modify the local climate. The aim of this research project Hamburg Urban Soil Climate Observatory (HUSCO) is a more precise understanding of the interactions between pedosphere and atmosphere in urban environments. HUSCO focuses on the impact of soil hydrology in typical urban structural units. The local effect of groundwater and soil properties on meteorological variables in the urban environment will be assessed by integrated flux measurements over two urban districts with different groundwater table depth. The results should open up opportunities to make more tangible predictions about the impacts of climate change in urban areas and to develop adaptation strategies to climate change for urban planning.

Long-term measurements started in early summer 2010 in the city of Hamburg, Germany. To detect the local climate effects, namely the heterogeneity of temperature and humidity in urban areas, "Meteo-stations" have been set up at reference sites to analyze core atmospheric parameters. In addition, data of a 250 m high meteorological measurement tower in Hamburg will be used to evaluate the greater meteorological conditions. To quantify the climate-controlling processes, like fluxes of energy and water, two Eddy covariance systems will be deployed in early 2011. In addition, various soil-measurement-stations have been installed at the reference sites to analyze processes and seasonal variations in soil water balance and soil thermal properties.

The reference sites were selected with regard to the local groundwater table, the type of housing estate, size and vegetation of the green space, as well as soil properties. Two sites – i.e. two urban districts – with different groundwater table depths were chosen: a low groundwater table depth of < 2.5 m and a high groundwater table depth of > 5 m. Each site features two measurement stations, one located in a housing estate and one in a green space. Another station is located inside a sealed courtyard. The two Eddy covariance stations will be mounted at heights of about 30 – 40 m located in the housing estates. In addition to the pedological sensors located directly at the Meteo-stations, further soil-measurement-stations supplement these measurements to give information about the heterogeneity of the soil water balance within the green spaces and the housing estates. Furthermore, data of existing observational networks throughout Hamburg will be integrated.

We will present objectives of the project, the design of experiments and the selection of investigation sites as well as first data of the mounted measurement stations.

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