



Hamburg Urban Soil Climate Observatory (HUSCO): A concept to assess the impact of moisture and energy fluxes of urban soils on local climate

S. Sandoval (1), F. Ament (2), L. Kutzbach (3), and A. Eschenbach (4)

(1) KlimaCampus, University of Hamburg, Hamburg, Germany (sarah.sandoval@zmaw.de), (2) Meteorological Institute, University of Hamburg, Hamburg, Germany (felix.ament@zmaw.de), (3) Institute of Soil Science, University of Hamburg, Hamburg, Germany (lars.kutzbach@zmaw.de), (4) Institute of Soil Science, University of Hamburg, Hamburg, Germany (a.eschenbach@ifb.uni-hamburg.de)

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 is a more precise understanding of the interactions between pedosphere and atmosphere in urban environments. HUSCO focuses on the impact of the modified soil hydrology by different 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 urban districts with different groundwater table depth and urban land-uses.

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 will start in early summer 2010 in the city of Hamburg, Germany. To quantify the climate-controlling processes, like fluxes of energy and water, two stationary and one temporary and mobile Eddy covariance system will be used, and various soil measurement stations will be mounted to analyze seasonal variations in soil water balance, ground water table and soil thermal properties. To detect the resulting climate effects, namely the heterogeneity of temperature and humidity in urban areas, coupled "Meteo-stations" will be set up to analyze core atmospheric parameters. In addition, data of the weather mast of Hamburg will be used to evaluate the greater meteorological conditions.

The measurement sites were selected with regard to the local groundwater table, the type of housing estate, and size and vegetation of the green space. Two measurement 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 two stations will be located inside a sealed courtyard, and in a perimeter block development district. The two Eddy covariance stations will be mounted at heights of about 30 – 40 m located in the housing estates, with a supplementary Meteo-station and soil measurement stations. Temporarily, a mobile Eddy covariance station will be set up inside the green spaces to determine the local occurring fluxes. 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 and the analyzed data of an existing observational network.

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