Geophysical Research Abstracts
Vol. 21, EGU2019-16116, 2019
EGU General Assembly 2019

Water and thermal regime of extensive green roof test beds planted with Sedum cuttings and Sedum carpets

Jitka Hanzlíková (1,2), Vladimíra Jelínková (2), Petra Hečková (1,2), Michal Sněhota (1,2)

(1) Faculty of Civil Engineering, Czech Technical University in Prague, Czech Republic (jitka.hanzlikova@cvut.cz), (2) University Centre for Energy Efficient Buildings, Czech Technical University in Prague, Czech Republic

The aim of the study is to assess the water and temperature regime of four experimental green roof test beds that differs in growing material and plant coverage during the vegetation season 2018. Implementation of green roofs into cities could help to reduce rainfall outflow from the roofs and help the city to mitigate heat islands by reducing the extreme temperatures.
Experiments were conducted at four test beds (1x1 m) established on a flat roof. Two types of growing media were used to build the extensive green roofs. The first growing medium is a commercially available substrate for extensive green roofs ACRE that is composed of crushed spongolite, crushed expanded clay and peat. The second growing medium is a coarser substrate for extensive green roofs BBcom composed of crushed expanded clay, crushed bricks, peat and compost. The test beds ACu (ACRE substrate) a BCu (BBcom substrate) were planted by a mixture of Sedum spp. Cuttings (approx. 10% plant cover). The substrate thickness was 6 cm. The test beds ACa (ACRE substrate) and BCa (BBcom substrate) were planted with commercially available Sedum spp. Carpet (approx. 100% plant cover) with the thickness of the substrate 4 cm.
The experiment has been evaluated for the time interval corresponding to a vegetation season from April 2018 to November 2018. To evaluate the water retention and thermal behavior of the extensive green roofs test beds, substrate moisture, outflow and substrate temperature were continually monitored on each test bed. Time-domain reflectometry (TDR) probes measuring the moisture of substrates were specifically calibrated for each growing medium. The weather and solar radiation data were acquired by a meteorological station placed on the same roof.
Runoff coefficients for entire time interval from each test bed has been determined. The lowest runoff coefficient for the entire season was observed for the ACu whereas the highest runoff occurred in the BCu with a twice higher amount of the outflow. This is probably due to the larger grain size of BBcom substrate and thus its lower retention. The runoff coefficient of ACa was by more than one third higher if compared to the ACu. The hydraulic behavior was also evaluated for each rain episode.
Thermal regime observation showed differences in temperature regime for different growing media. The highest air temperatures (7 cm above the surface) occurred on the turn of July and August 2018 and reached 40.9°C. The lowest maximal temperatures of the substrate were observed on ACa with temperatures 40.6°C whereas BCu temperature was 7.9°C higher due to darker color of the substrate BBcom and lower vegetation cover. The test beds of the same growing media and Sedum carpet vegetation cover reached lower temperatures compared to the Sedum cuttings. Temperatures of BCa reached 44.9°C which is lower than ACu (46.9°C) and higher than ACa (40.6°C).