



Lysimeter Klece: Water balance calculation from two types of lysimeter

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Lysimeters are a useful and reliable tool for the research of the water balance parameters, assessment of the climate change effects on the water cycle as well as evaluation of groundwater pollution prevention measurements. Lysimetry is fundamental for complex systems studies, i.e. the interaction of atmosphere – plant – soil – unsaturated zone and groundwater system.

The lysimeter station in Ljubljana Klece, Slovenia, was built at the beginning of the nineties for water balance studies. One large (1.8 m diameter and 2 m depth) non-weighable lysimeter with artificially filled soil determines seepage water. The main technical facilities contain concrete lysimeter vessels, a sampling shaft and tipping buckets. Water balance is determined by means of evapotranspiration calculated after Penman-Monteith method based on meteorological data and daily outflow measurements. On the premises no additional fertilizers are used, therefore the research was expanded to study nitrate natural background, such as mineralization from the soil and wet deposits. In years 2003 – 2006 it was determined that the highest N-NO₃ wet deposits were in year 2004, 4,9 kg/ha N-NO₃, the lowest in year 2006, which was 2,7 kg/ha N-NO₃. Monthly N-NO₃ wet deposits of the considered period did not show a seasonal pattern. The amount of N-NO₃ leached from the lysimeter was increasing in the period 2003 – 2006. From the lysimeter 1,25 kg/ha N-NO₃ have been leached in 2003, 1,9 kg/ha in 2004, 7,9 kg/ha in 2005 and 13,6 kg/ha in 2006.

However, more detailed research was not possible due to the technical characteristics, furthermore, the long term measurements of percolating water indicated that the southern lysimeter was damaged, the part of percolating water was lost through the bottom of the concrete vessel. For that reason the southern lysimeter was removed and replaced with hydro-lysimeter, which will also enable a more thorough and detailed measurements needed for the nitrate natural background studies.

In 2010 new and technically advanced weighing lysimeter was installed in Kleče that enables state of the art measurements of the water balance parameters. The monolith of 2 m height and 1 m diameter was cut from sandy gravel sediments on the area of the water pumping station. Inside the monolith tensiometers, TDR probes and suction cups were installed in three levels on depths of 50 cm, 100 cm and 150 cm. Additionally two tensiometers for temperature and water suction measurements on the depths of 190 cm to transfer field matrix potential were installed. Objective of this paper is the presentation of data and methods of data management for the two different Lysimeter types and evaluation of the water balance and nitrate natural background measurements to date.