Precipitation and Evapotranspiration at the Mountain Lysimeter Station Stoderzinken

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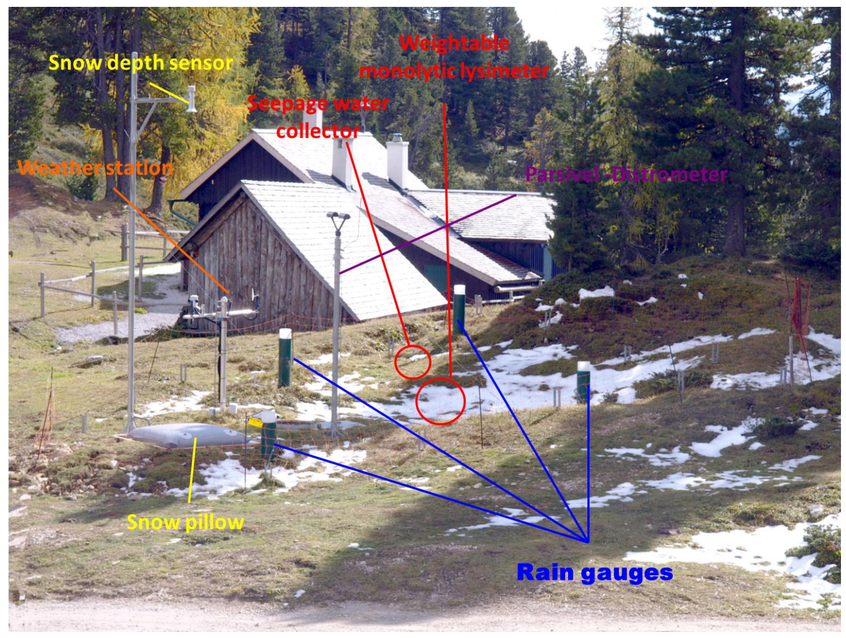
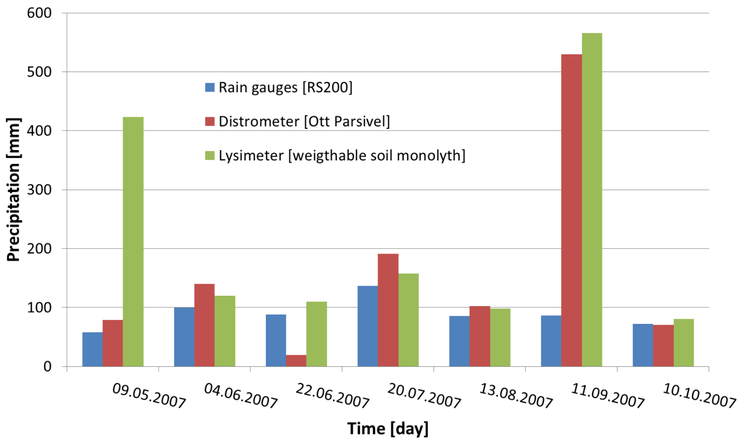
Research Scope

Alpine water resources are highly important for the Austrian water supply. In particular, the Northern Calcareous Alps contribute substantially to both the regional and the national drinking water supply. To analyse water balance, runoff and recharge in a representative mountain pasture area in the Northern Calcareous Alps a lysimeter station was established at the mountain Stoderzinken (1830m a.s.l.) in 2005 (Herndl et al., 2009). To quantify precipitation at the site, data of rain gauges and a distrometer was compared with the precipitation calculated from the water balance of the lysimeter. Furthermore, evapotranspiration was calculated using the HAUDE and PENMAN-MONTEITH equations for comparison (Haude, 1955; Allen et al., 1989)

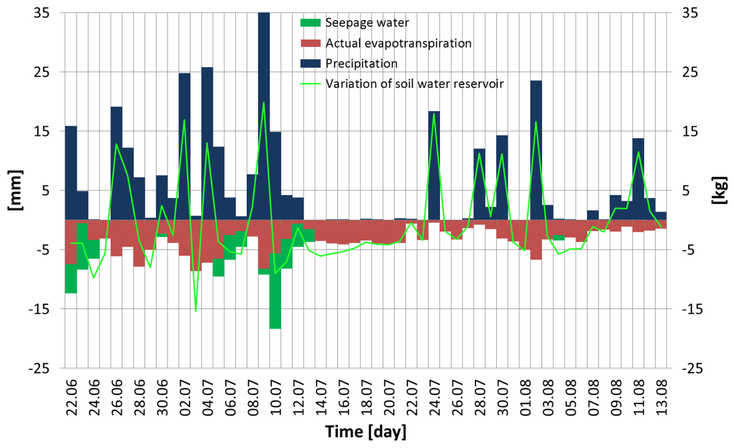


Infrastructure at the mountain lysimeter station Stoderzinken

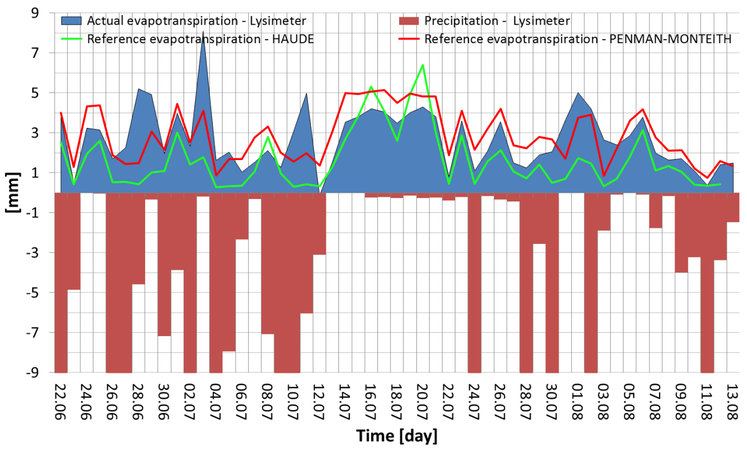
Precipitation and Evapotranspiration at the Stoderzinken Site



Comparison of methods to quantify precipitation (modified after Gritsch, 2010)



Evapotranspiration [Et_a=P-Sw-ΔS] calculated from the lysimeter data (modified after Gritsch, 2010)



Comparison of evapotranspiration data from lysimeter, HAUDE and PENMAN-MONTEITH equation

Already in previous seasons the distrometer was found to be prone to errors, which was confirmed when compared to the rain gauge data. In contrast, precipitation rates calculated from the lysimeter data were found to agree better with the rain gauge data but showed a trend to higher values. However, the approach to calculate precipitation from the lysimeter data turned out to be unsuitable for time periods with significant contribution of snow melt. Evapotranspiration calculated from lysimeter data are in good agreement with the results from the above-mentioned (semi-)empirical equations during dry periods. Furthermore, the differences to the evapotranspiration calculated from the climate data correlate with the amount of precipitation.

Conclusions

These results suggest that in alpine catchments the uncertainty in the precipitation data constitutes the major source of error in the calculation of evapotranspiration from the water balance of the lysimeter. However, it should be noted that these findings are based on a short observation period of one year only. The new installation of additional precipitation measuring devices and the enhancement of the data collection during the next years will permit a more precise quantification of the water balance components and allow a better assessment of the associated uncertainties.

References:

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