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CSE or SIE Project, 2019-2020

8 or 4 credits

Start: 15/11/2019

End: 21/02/2020

Title **How crucial can it be? Partitioning of AET to assess evaporation rates**

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Description

Actual evapotranspiration rates (AET) can be measured directly from weighing lysimeters. However, the essence of partitioning AET to evaporation (E) and transpiration (T) and the potential uncertainty that its inaccurate estimation bears into a model needs to be investigated further. In this project, evaporation rates are estimated with high reliability using Penman Monteith (P-M) equation and measured data in a site with two (vegetated and non-vegetated) lysimeters.

Alternative one These reliable estimations are used in HYDRUS-1D software for inverse modelling of soil hydraulic and solute transport parameters. The calibrated parameters are compared against other scenarios in which AET is partitioned arbitrarily but realistically into E and T to assess the uncertainty that inaccurate estimation of AET may bear into the calibration of a model.

Alternative two The estimated evaporation rates are incorporated into Craig-Gordon (C-G) model and the stable isotope signature in soil is compared against other scenarios in which part/all of measurements to use Penman Monteith are unavailable.

Tasks

1. Estimating evapotranspiration (ET) rate from the vegetated lysimeter using P-M equation and measured data
2. Comparing estimation of ET versus measured ET (and potentially tuning parameters to find the right match)
3. Estimating E rate from the non-vegetated lysimeter using P-M equation and validated parameters
4. Integrating estimated evaporation rates in C-G model (an already published code from **Benettin et al 2018** [**1**]) or HYDRUS-1D simulation to implement the inverse modelling
5. Assessing the impact of uncertainty associated with AET partitioning on model results.

Required MATLAB or Python programming skills

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References

[1] Benettin, P., Volkmann, T. H. M., von Freyberg, J., Frentress, J., Penna, D.,Dawson, T. E., & Kirchner, J. W. (2018). Effects of climatic seasonality on the isotopic composition of evaporating soil waters. Hydrology and Earth Systems Science,22, 2881–2890. https://doi.org/10.5194/hess-22-2881-2018