

# Land-climate interactions and soil moisture memory

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# Simple Model

- Model solves water balance equation:

$$w_{n+\Delta t} = w_n + (P_n - E_n - Q_n) \Delta t$$

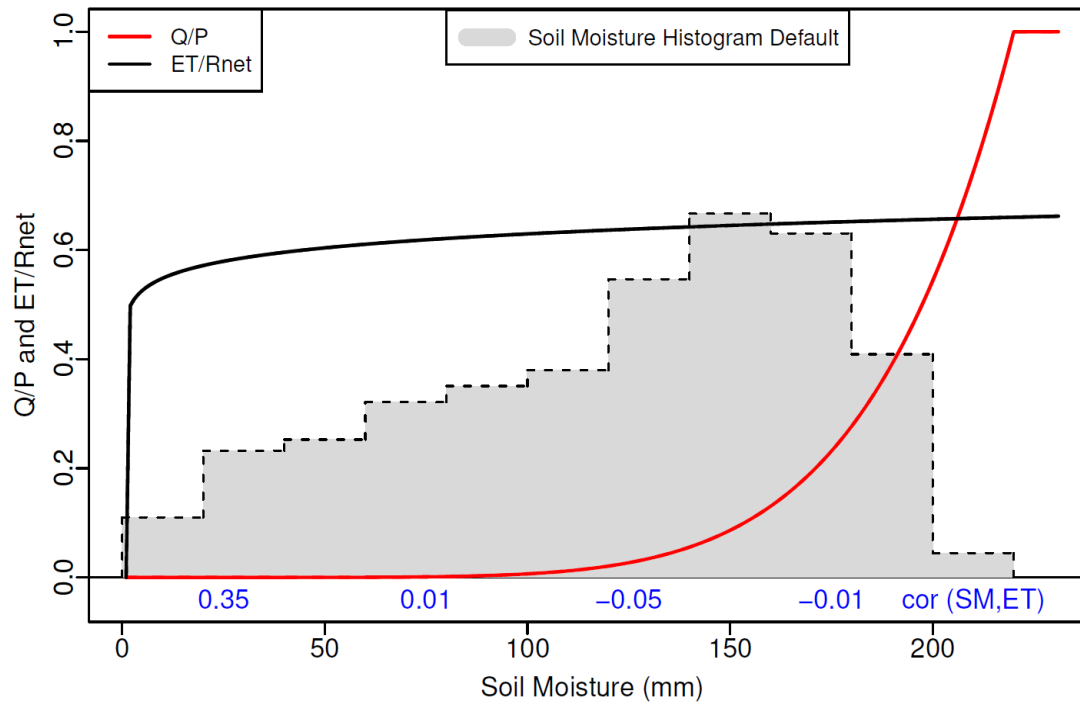
- with  $\Delta t = 1$  day. It is further assumed that:

$$\frac{Q_n}{P_n} = \left( \frac{w_n}{c_s} \right)^\alpha \text{ with } \alpha \geq 0$$

$$\frac{\lambda \rho_w E_n}{R_n} = \beta_0 \left( \frac{w_n}{c_s} \right)^\gamma \text{ with } \gamma > 0 \text{ and } \beta_0 \leq 1$$

- the parameter set  $(c_s, \alpha, \beta, \gamma)$  is fitted to maximize the correlation between modeled and observed streamflow

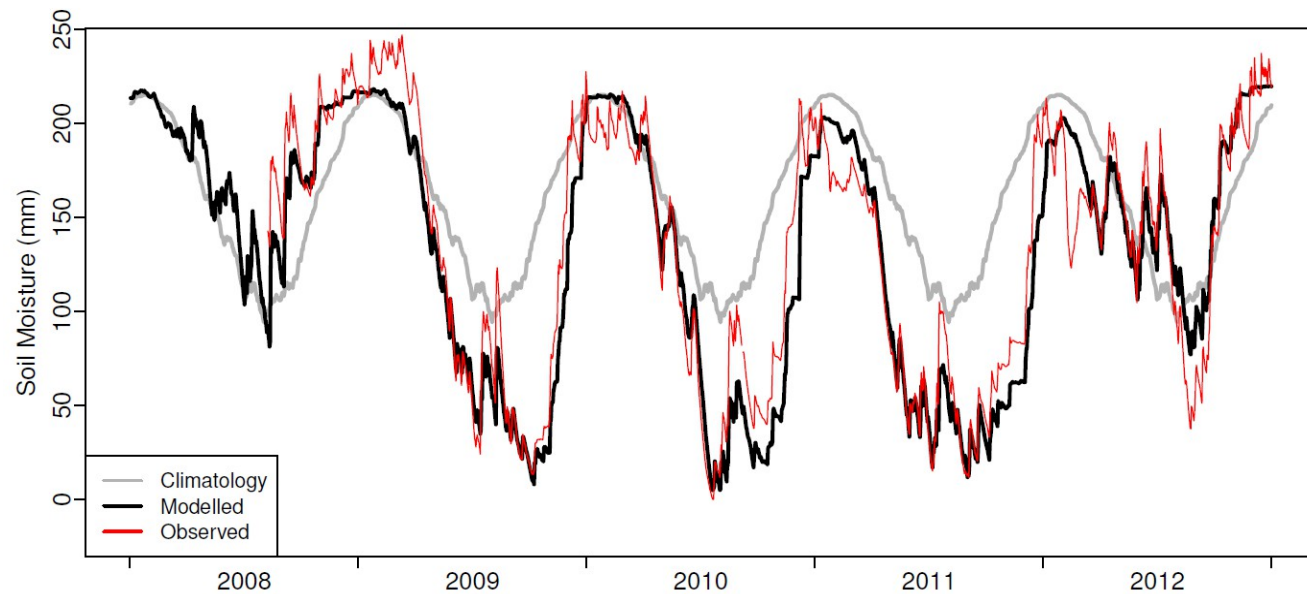
## Fitted functions, SM-histogram and coupling strength



$$\frac{Q_n}{P_n} = \left(\frac{w_n}{c_s}\right)^\alpha \text{ with } \alpha \geq 0$$

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## Modeled vs. observed soil moisture time series



# Soil Moisture Memory

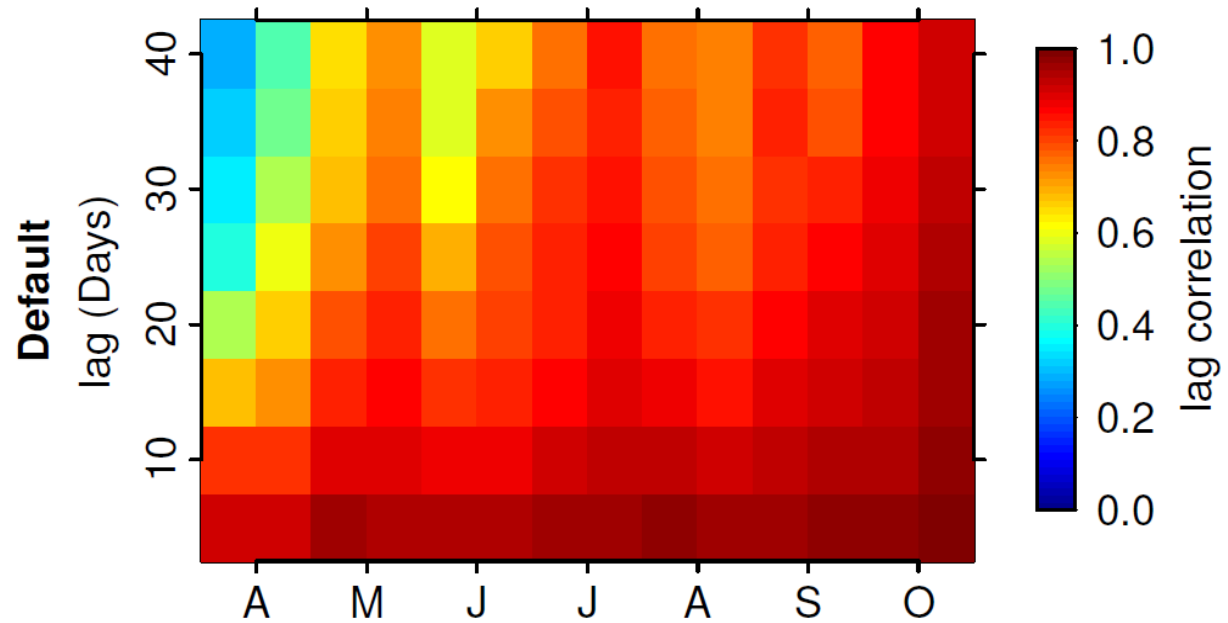
- Soil moisture storage integrates anomalies of the meteorological forcing
- Hence, soil moisture anomalies are represented longer in the soil

➔ Soil moisture memory

Can be used for forecasting!



## Soil Moisture Memory



# Getting started

- Copy folder “landclim\_exercise” to your home with **`cp -r /home/nfs1/smr2595/landclim_exercise .`**
- open R
- load the model code with **`source('landclim_exercise/simplemodel.R')`**
- run the model for site Payerne with: **`simplemodel(exp_runoff=6.4,exp_et=0.06,beta=0.66)`**