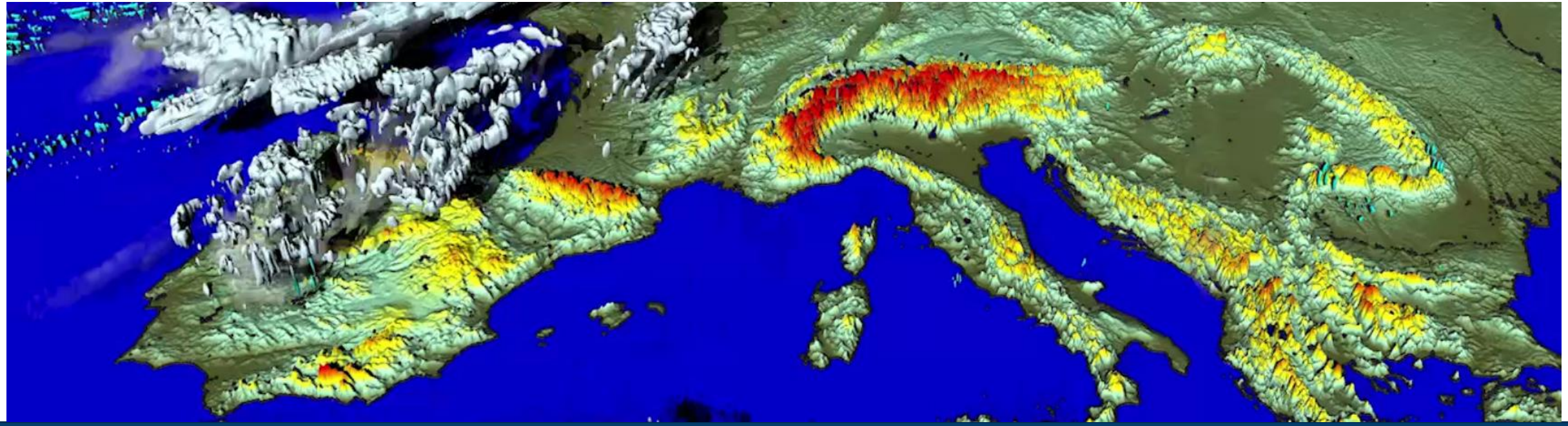
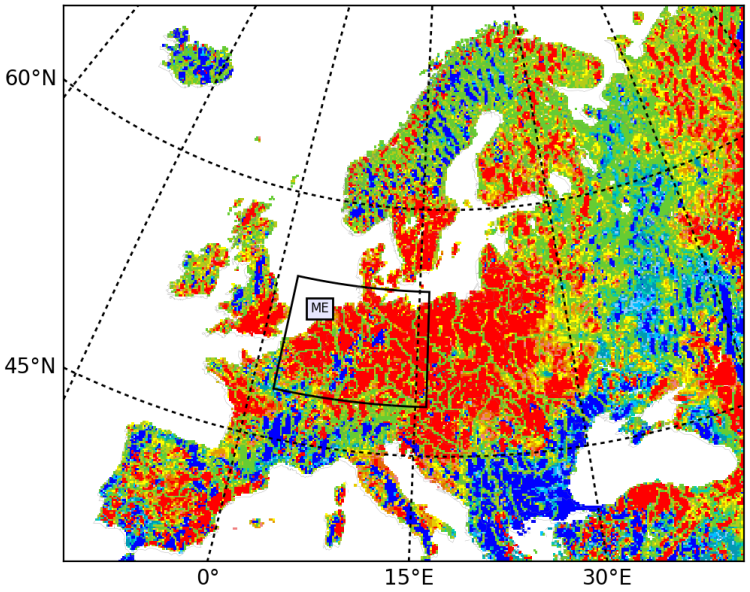


Assessment of the interannual evolution of water resources with an ensemble of fully coupled terrestrial model simulations

Carl Hartick, Carina Furusho-Percot, Klaus Goergen and Stefan Kollet

Motivation and domain

- 2018 was an exceptionally hot and dry year in central Europe.
- New methods are needed to assess probabilities for the evolution of water resources after such extreme events.
- We propose an assessment with a fully coupled ensemble using past meteorological information.
- Study area: EURO-CORDEX domain with 0.11° resolution; focus domain Mid-Europe (ME)

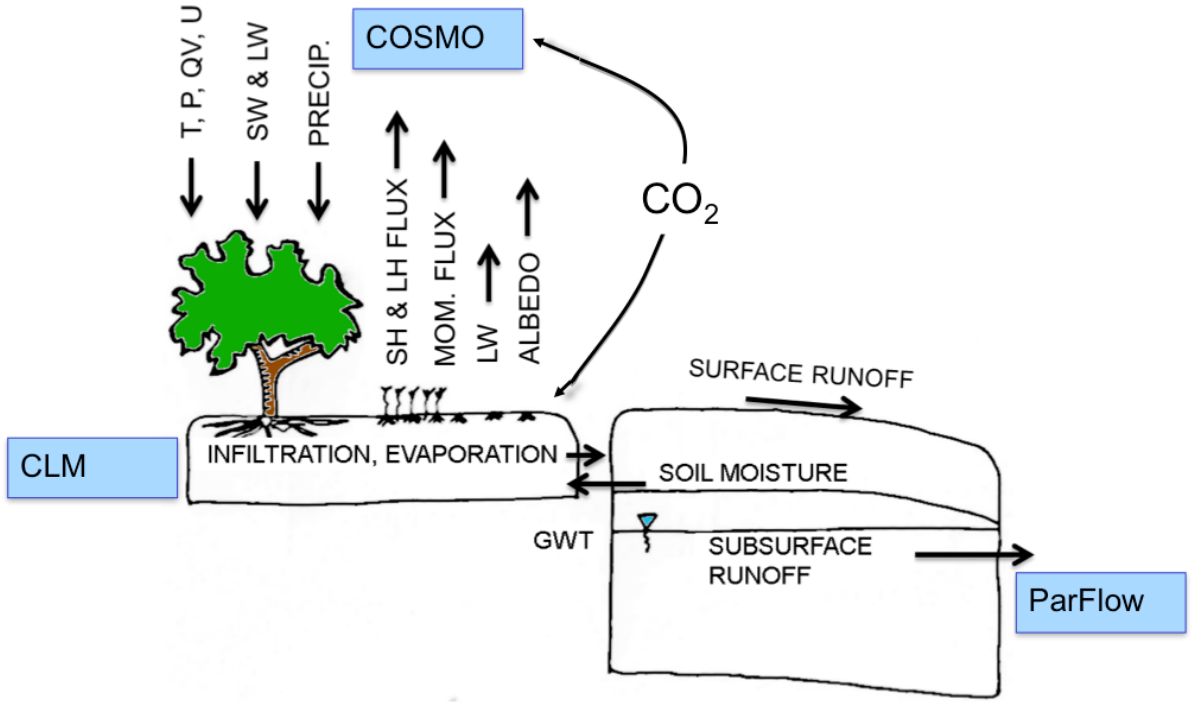


Water storage anomalies in August 2018 in TSMP

Terrestrial Systems Modeling Platform, TSMP

https://www.terrsysmp.org

- Scale consistent modelling platform consisting of: COSMO, CLM and ParFlow
- Aim: modelling the whole water cycle from the top of the atmosphere to the water table
- Transport processes and feedback between the different systems are included.



F. Gasper et al. (2014)

Gasper, F., Goergen, K., Shrestha, P., Sulis, M., Rihani, J., Geimer, M., and Kollet, S.: Implementation and scaling of the fully coupled Terrestrial Systems Modeling Platform (TerrSysMP v1.0) in a massively parallel supercomputing environment – a case study on JUQUEEN (IBM Blue Gene/Q), Geosci. Model Dev., 7, 2531–2543, https://doi.org/10.5194/gmd-7-2531-2014, 2014.

Assessment of total water resources: Methodology

Climatologic simulation with TSMP

Forward ensemble (fully coupled) of ensuing water year

State of surface and subsurface

TSMP(year 1)

TSMP(year 2)

TSMP(year n-1)

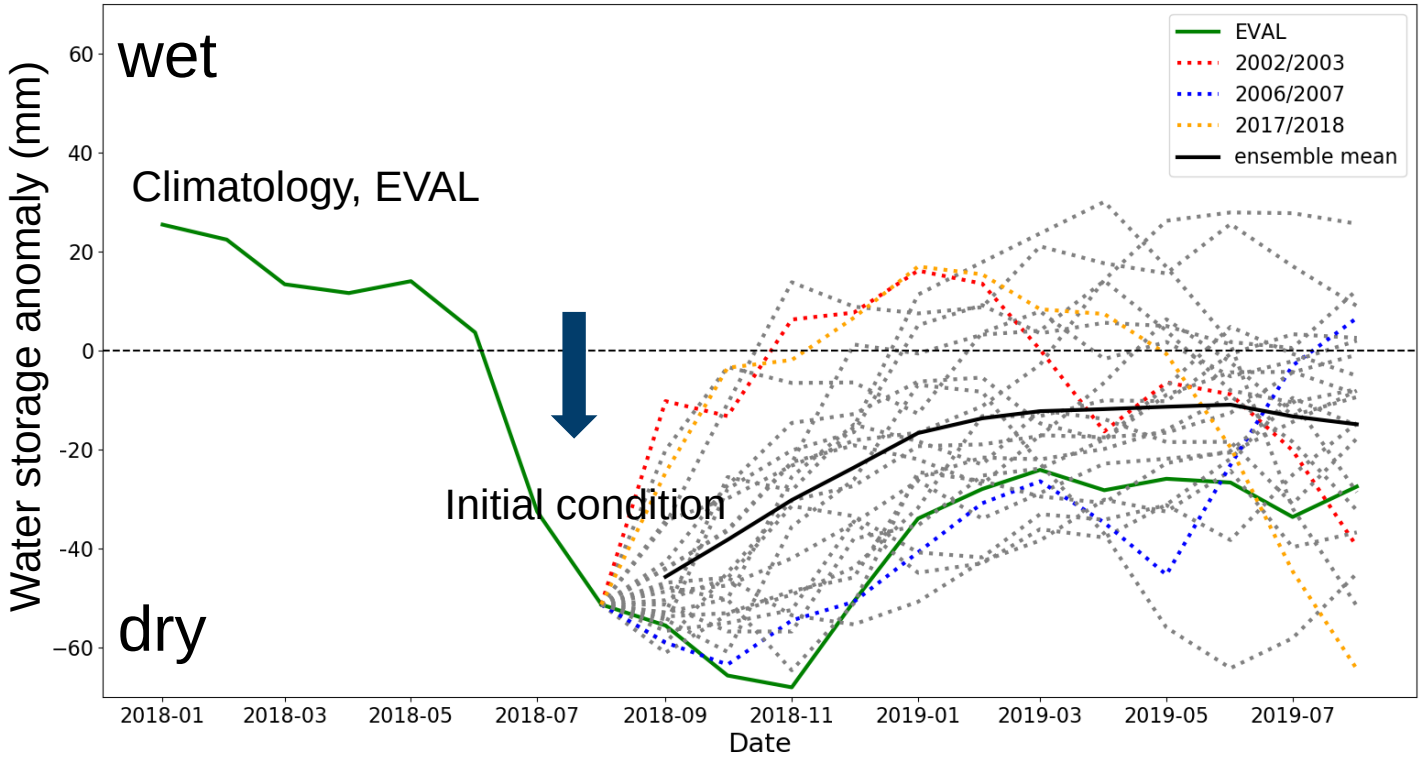
TSMP(year n)

calculation of monthly storage anomalies to the climatology

Combine state at certain point in time with all past evolutions of the atmosphere

Assessment of the total water storage 2019 (hindsight)

Averages over Mid-Europe, initialized in August 2018

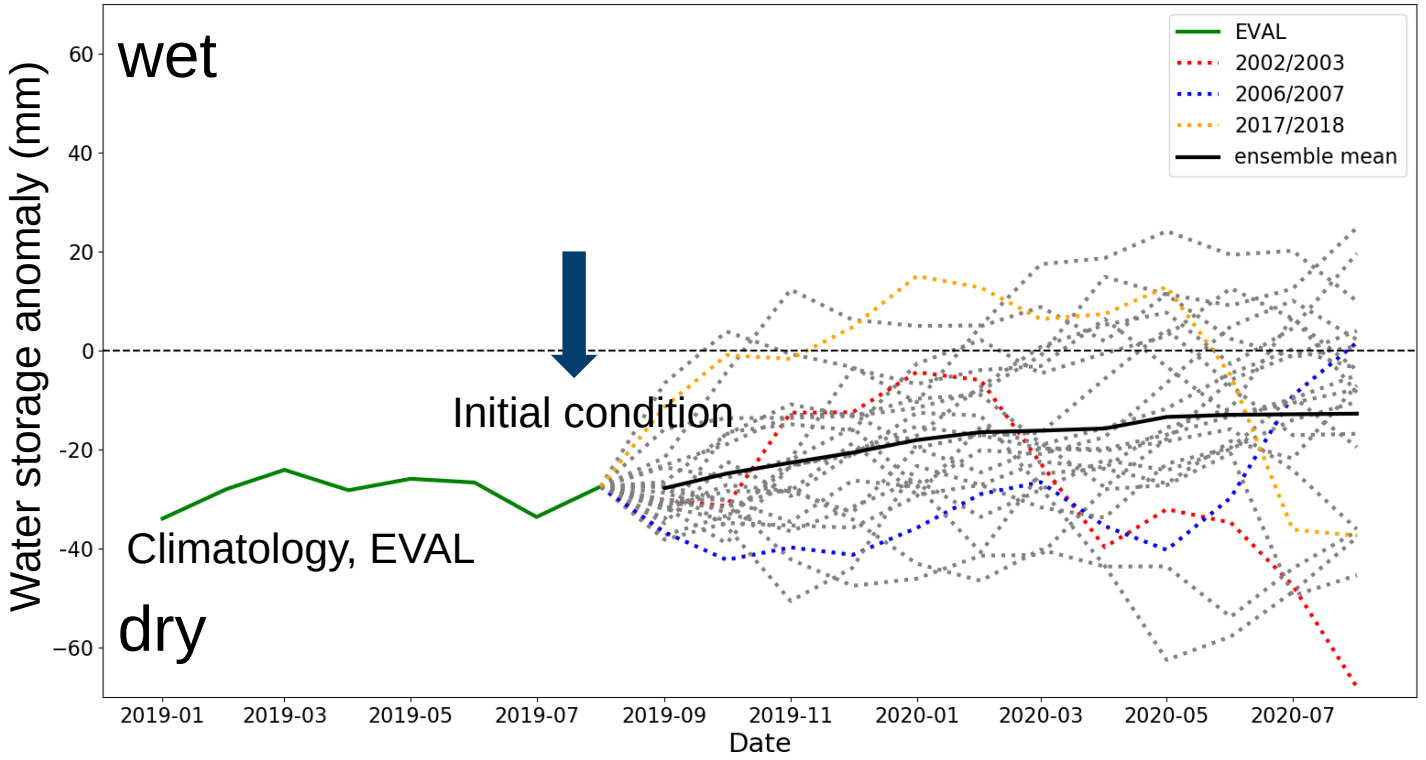


Most ensemble members are in the dry range.

“Real” situation is at the lower extreme of the ensemble.
Ensemble gave a good indication that a water deficit is likely.

Assessment of the total water storage 2020

Averages over Mid-Europe, initialized in August 2019



A water deficit is still likely for the end of 2020.