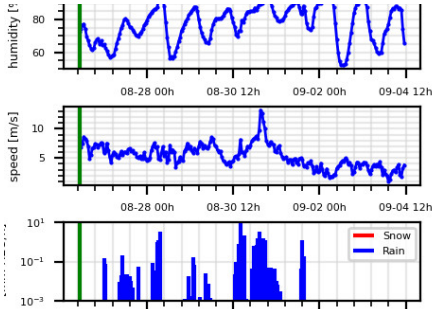
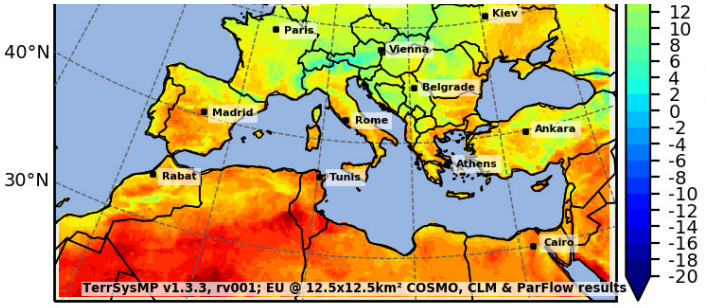




Evaluation of daily forecasts by the coupled Terrestrial Systems Modelling Platform over a small convection-permitting model domain in Central Europe

2021-09-08 | Maksim Iakunin[1,2],N. Wagner[1,2], A. Graf[1], K. Goergen[1,2], S. Kollet[1,2] | [1]FZJ/IBG-3, [2]Centre for High-Performance Scientific Computing in Terrestrial Systems (HPSC TerrSys), Geoverbund ABC/J, Juelich, Germany

A B C / J geoverbund aachen bonn köln jülich

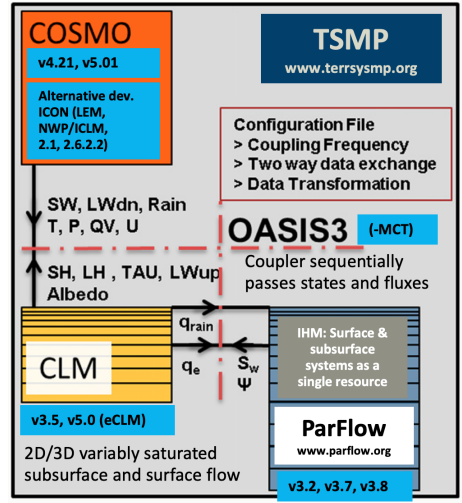
HPSC TerrSys

JÜLICH Forschungszentrum

Terrestrial System Modelling Platform

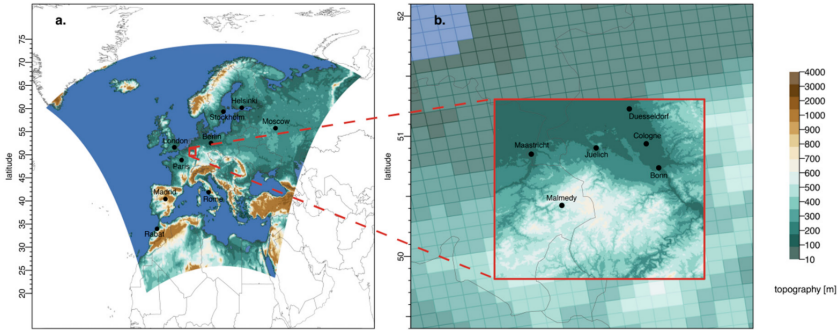
Components

- A scale-consistent highly modular fully integrated soil-vegetation-atmosphere numerical modelling system using COSMO, Community Land Model and ParFlow;
- Physically-based representation of transport processes of mass, energy and momentum across scales down to sub-km resolutions, explicit feedbacks between compartments;
- to exchange fluxes and states across the individual component models of TSMP and close the terrestial water and energy cycle, the Ocean-Atmospheric-Sea-Ice-Soil coupler interfaces with the Model Coupling Toolkit (OASIS-MCT) is used.



TSMP-M — a system for monitoring and forecasting

Domains



- **Domain a.:** Cordex11 EU, $dx = dy = 12.5km$; $nx = 436$ $ny = 424$. EU simulation is basically driven by ECMWF forecast data.
- **Domain b.:** NRW, $dx = dy = 0.5$ km; $nx = ny = 300$. Is a nesting to the EU domain.

TSMP-M

Implementation

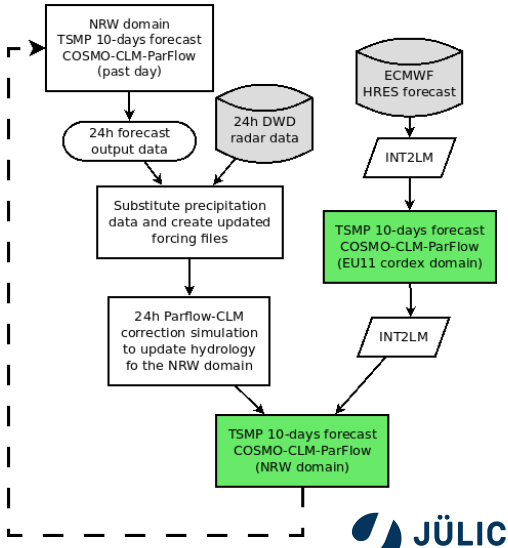
- Everyday model runs in the Juelich Supercomputer Center (Juelich, Germany) on the JURECA-DC machine (rank 44 in Europe).

TSMP-M

Workchain scheme

1. 10-days European forecast driven by ECMWF-forecast;
2. DWD (German Meteorological Service) precipitation radar data used for a short 24 hours TSMP simulation that is aimed on updating soil moisture data in the model ("correction" simulation);
3. 10-days forecast over NRW domain based on EU-forecast and correction simulation.

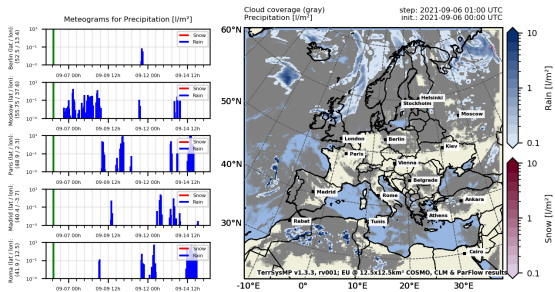
Outputs available at:
`www.terrsysmp.org/forecast/index.html`

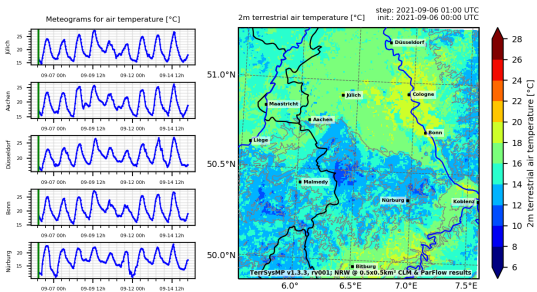


TSMP-M website

Everyday forecasts available at

`www.terrsysmp.org/forecast/index.html`

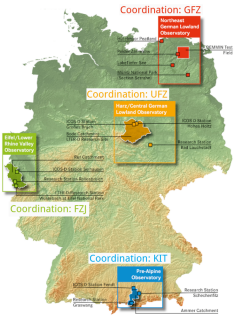


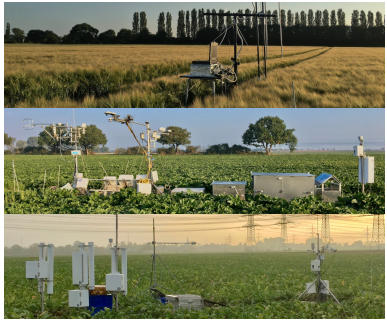


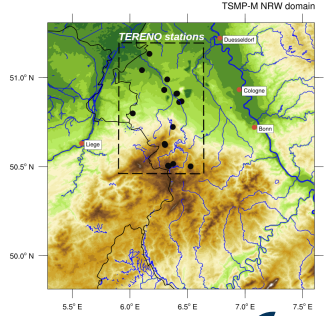
TSMP-M evaluation

TERENO database

- TERENO — Terrestrial Environmental Observatories;
- Climate and Eddycovariance stations, cosmic-ray neutron soil moisture stations, streamflow observations, weather radars;
- time range taken for evaluation: July 2019 - October 2020.

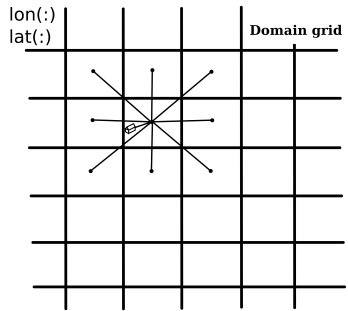




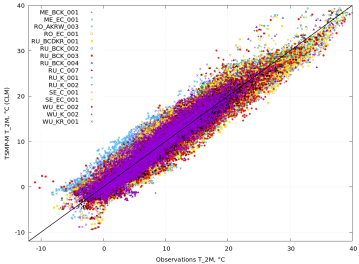


Grid cell picking

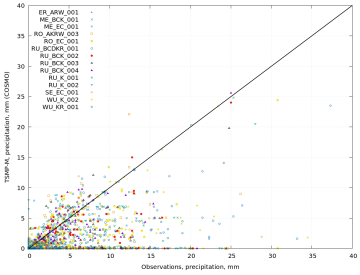
1. Find the grid cell where the station is located (best match);
2. calculate 9 "distances" from station location to the center points of neighbouring grid cells (in lats and lons);
3. convert "distances" into weights ($w = 1/r^2$) and normalize to one;
4. use the value of $\sum_{i=1}^{9} model\_value_i * w_i$



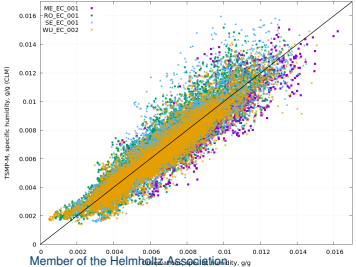
Evaluation results



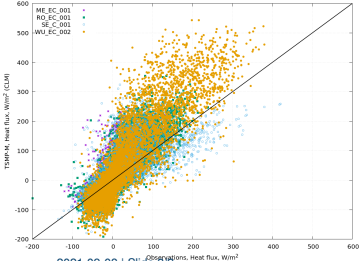
Mean bias	0.22
RMSE	1.66
Correlation	0.96



Mean bias	-1.08
RMSE	2.67
Correlation	0.57



Mean bias	-0.0000977
RMSE	0.0007428
Correlation	0.93



Mean bias	-10.35
RMSE	44.75
Correlation	0.80