

Assessing the model performance of snow water resources simulated by a coupled mesoscale atmospheric and hydrologic model

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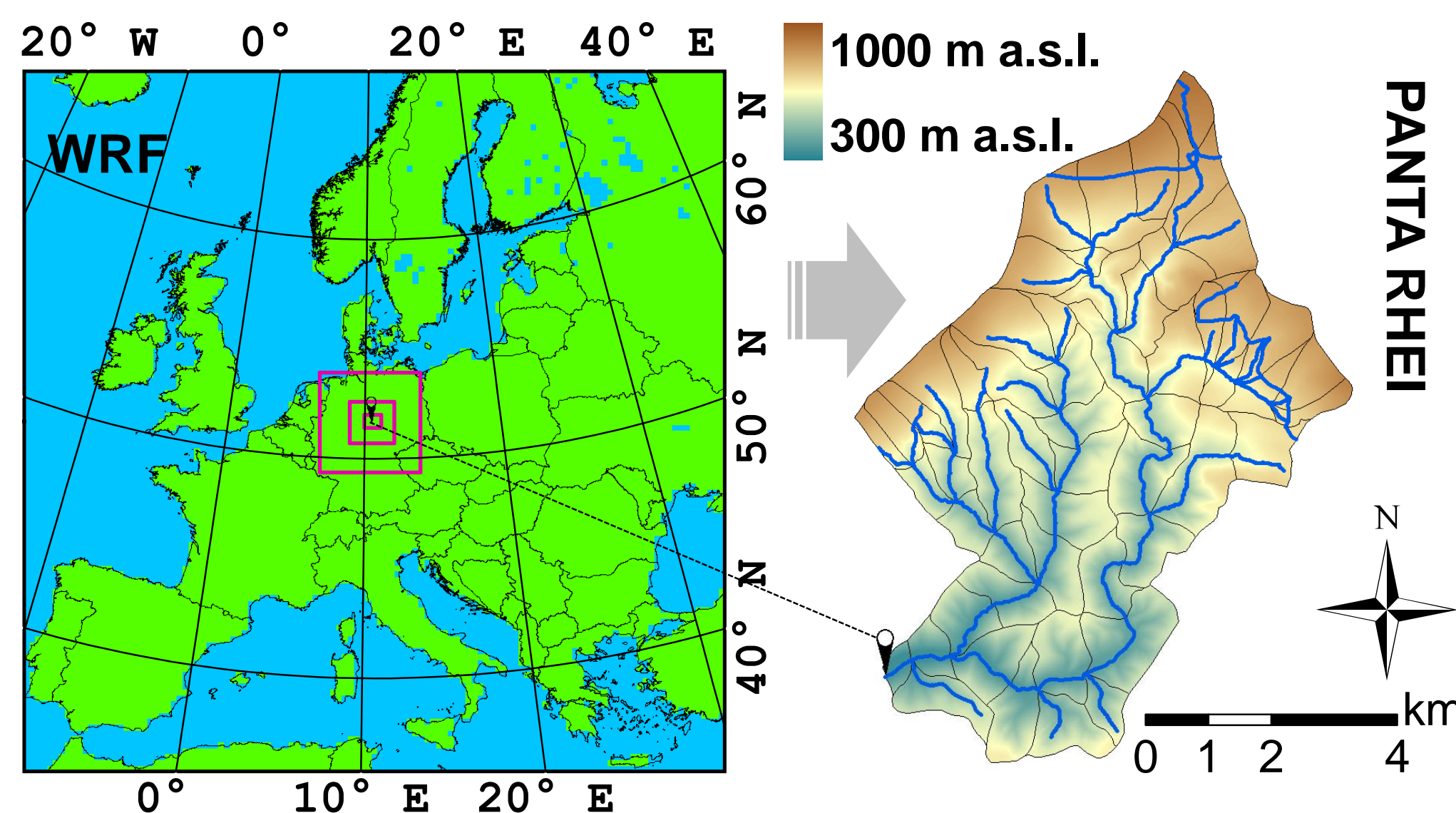
Objectives

- atmospheric and hydrologic models can predict snow water resources on the mesoscale
- atmospheric models enable reliable modeling of snow water resources in remote areas where meteorological observations are not available
- comparing simulated and observed stream flow is restricted to hydrologic models

→ Approach

using snow cover depletion from the atmospheric model WRF as distributed input for the hydrologic model PANTA RHEI

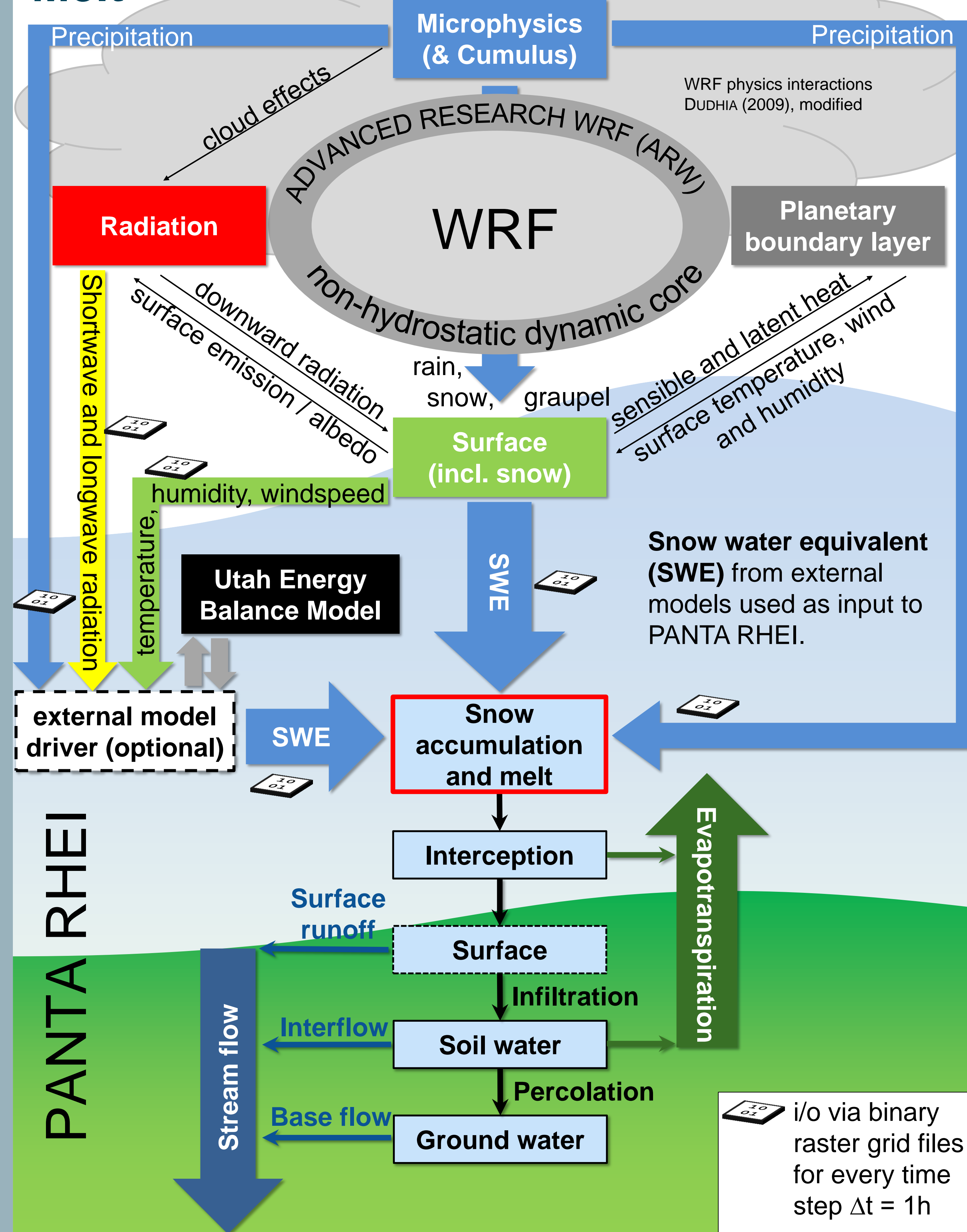
Study Area: Model Domains and the Sieber Catchment (44 km²)



The Weather Research and Forecast Model (WRF)

- state-of-the-art atmospheric simulation system (Skamarock et al., 2008)
- public domain software, freely available
- non-hydrostatic version (ARW)
- numerous options for physics parameterizations
- revised snow representation in Noah-LSM (Wang et al., 2010) is used
- 4 domains with spatial resolution of 30 km, 10 km, 3.3 km, and 1.1 km, respectively
- input data: NCEP FNL Operational Model Global Tropospheric Analyses (ds083.2), real-time, global sea surface temperature analysis (RTG_SST)

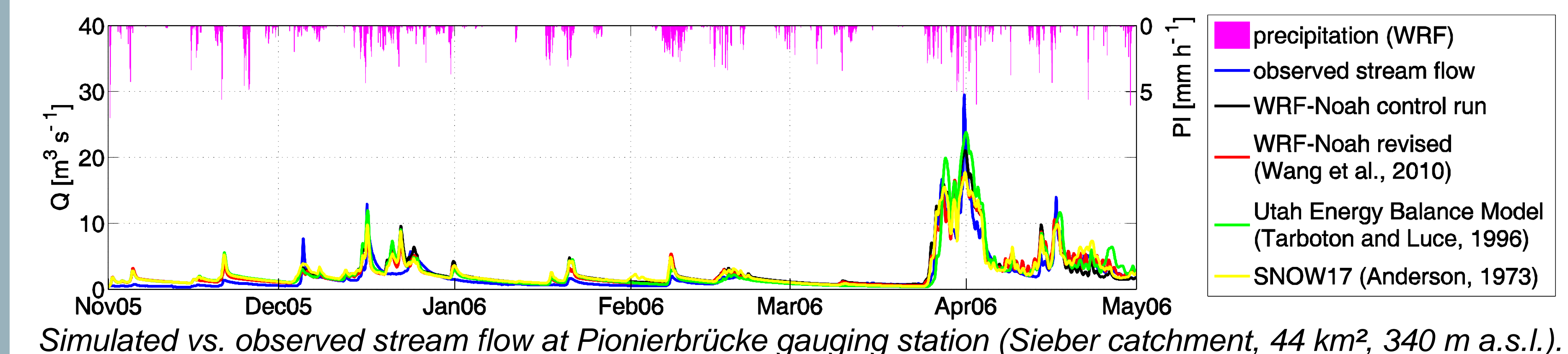
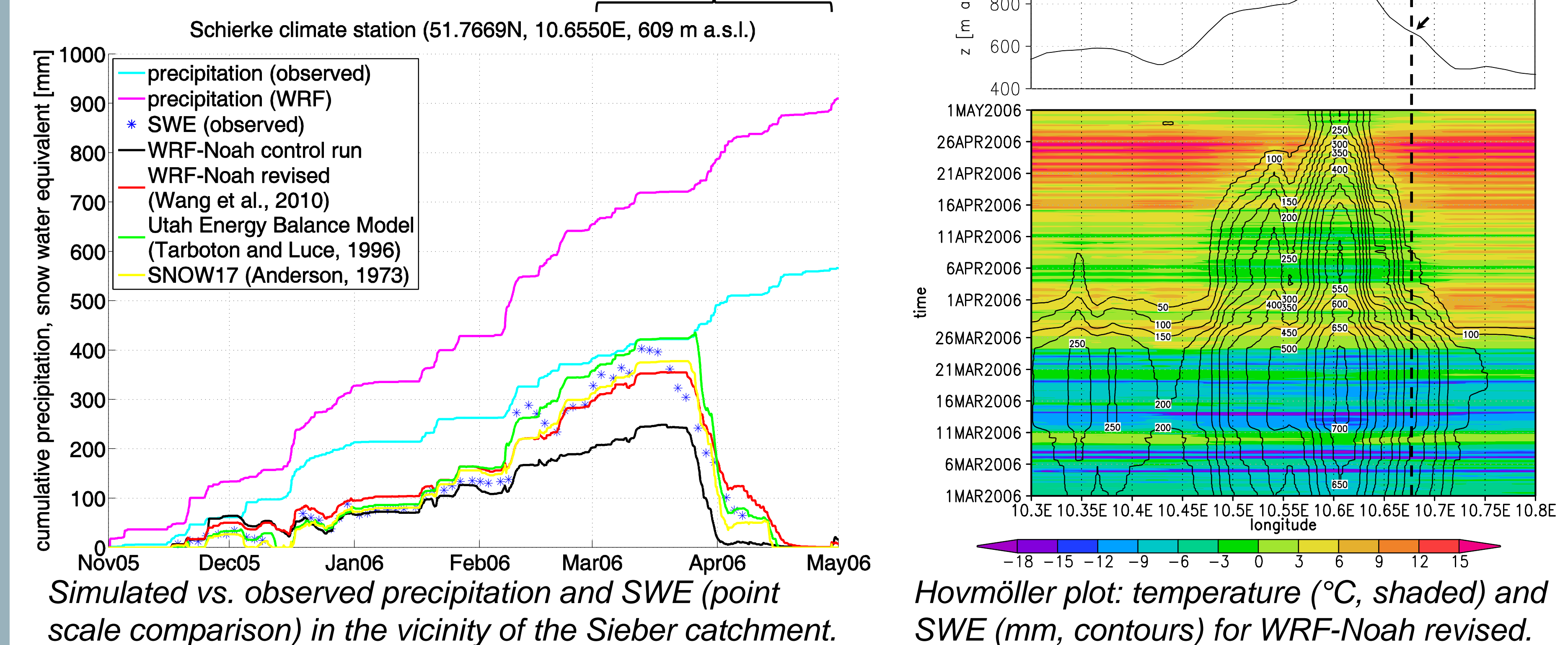
Model interface: Snow Accumulation and Melt



The Hydrologic Model PANTA RHEI

- deterministic, semi-distributed, hydrologic model (RIEDEL et al., 2011) with vector based GIS-interface, developed at the University of Braunschweig
- numerous options for hydrologic processes, reservoirs, culverts, etc.
- Applications: hydrologic design, climate impact studies and flood forecasting, e.g. in the state of Lower Saxony, Germany

Results



Conclusion and Outlook

- snow cover depletion and, hence, the stream flow as simulated by WRF and PANTA RHEI using different snow parameterizations coincides well with observations ($E = 0.82$, $r = 0.92$)
- the coupled modeling system is suitable for the prediction of snow water resources, flooding and reservoir inflow in remote areas

References

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Acknowledgements

The revised Noah-LSM source code files were kindly provided by Zhuo Wang, Department of Atmospheric Sciences, University of Arizona, Tucson. The dataset ds083.2 is published by the National Center for Atmospheric Research (NCAR), available online at: <http://dss.ucar.edu/datasets/ds083.2/>. Sea surface temperature datasets (RTG_SST) were obtained from: <http://polar.ncep.noaa.gov/sst/oper/Welcom.html>.