



University of Stuttgart

Institut für Wasser- und Umweltsystemmodellierung

Can fully satellite products driven simple models account for snow processes in data scarce regions?

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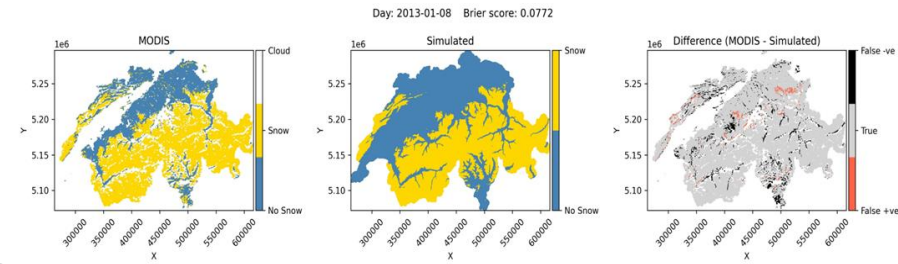
Motivation

- A plausible alternative to ground- based data
- resolution and availability do not depend on the terrain.
- crucial information on areal extent of snow
 - a highly imperative proxy for the precipitation accumulations
- Accurate representation of seasonal snow processes
 - Higher relevance in mountains
 - Inherent data scarcity

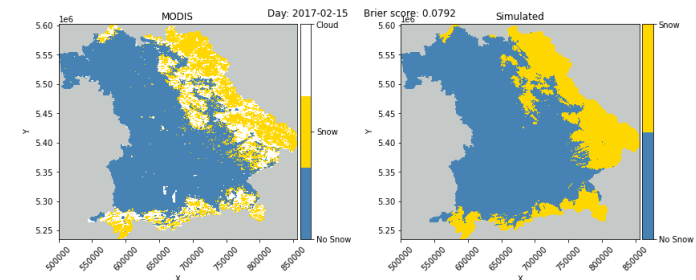
Continuation from..

- MODIS snow-cover pattern-based calibration
 - Adeptly simulates the snow-melt and accumulation
 - Robust data for calibration, no over-calibration
 - Hydrological estimation improved
 - parameter compensation
- Data scarce scenario: Bavaria (EGU 2021)

Catchment	NSE performance (Daily)	
	Basic HBV	Modified HBV
Amper @ Stegen, Elev: 530 to 1800 masl	0.635	0.652
Isar @Plattling Elev: 319 to 2700 masl	0.669	0.679

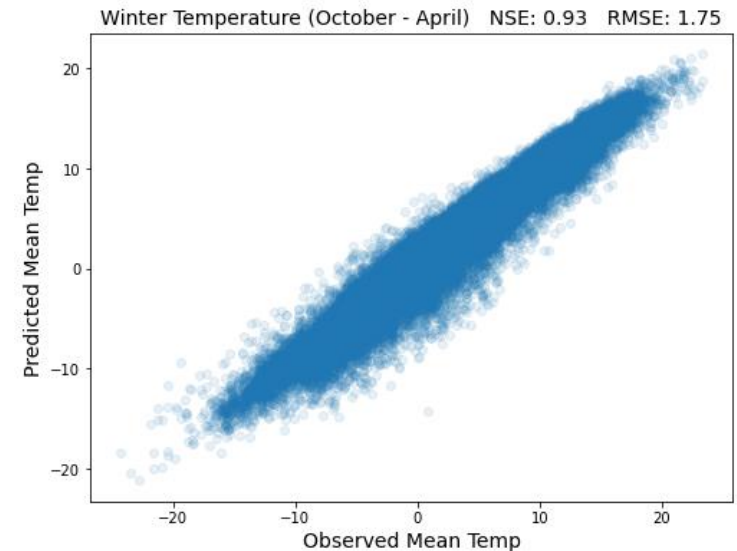


Gyawali and Bardossy, 2022



Methodology

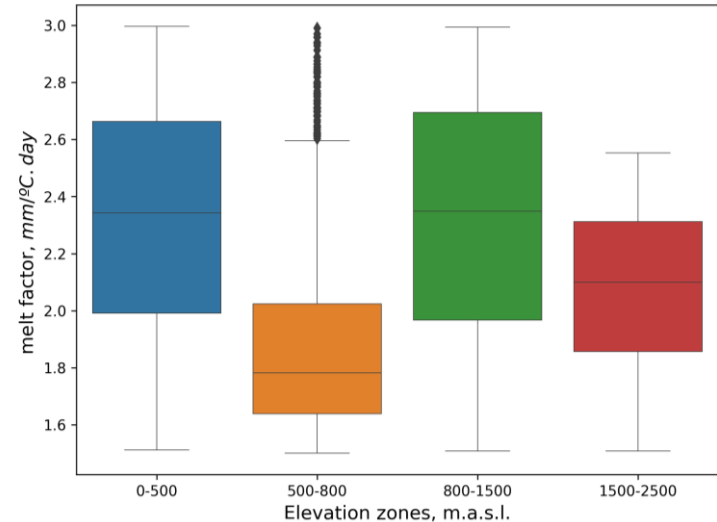
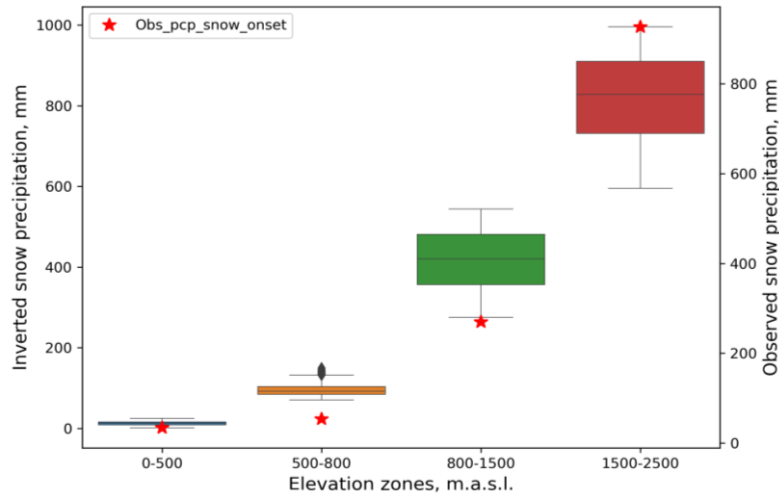
- Land surface temperature:
 - Globally available, reasonable temporal/spatial detail
 - Higher Correlation with air temperature
 - Proxy in the mountains
- Mean observed temperature vs. LSTs
 - Goal: Exploit this relationship
- Binary calibration against snow-cover depletion curve



Model Inversion

Thur@Andelfingen catchment in Switzerland

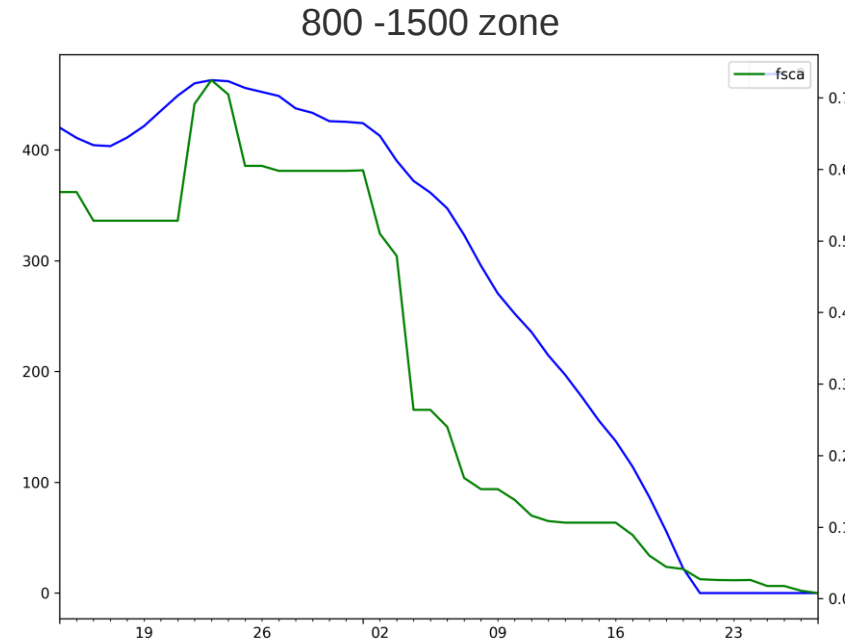
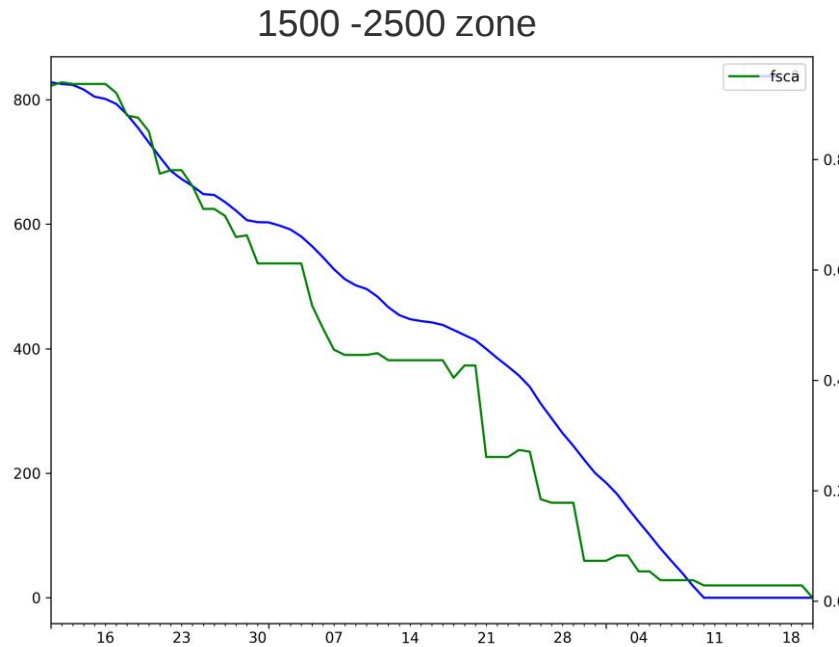
- Identification and simulation of the snow-cover depletion curve
 - Temperature used as inputs to and MODIS fsca to calibrate a basic degree-day melt model; No precipitation inputs
- Estimates of total accumulated snow precipitation for the season



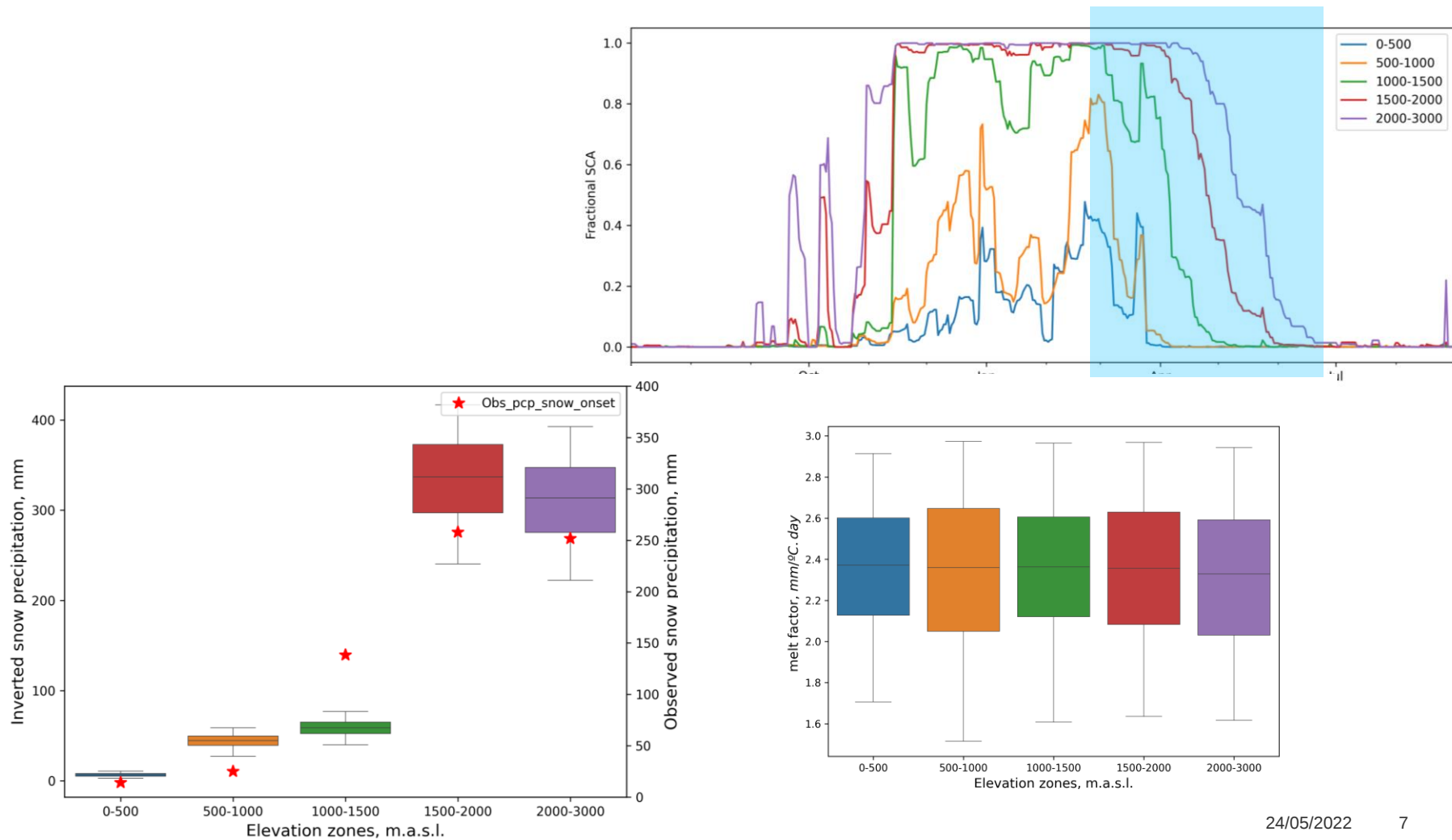
Simulated SWE vs observed fcsa depletion

Thur@Andelfingen catchment in Switzerland

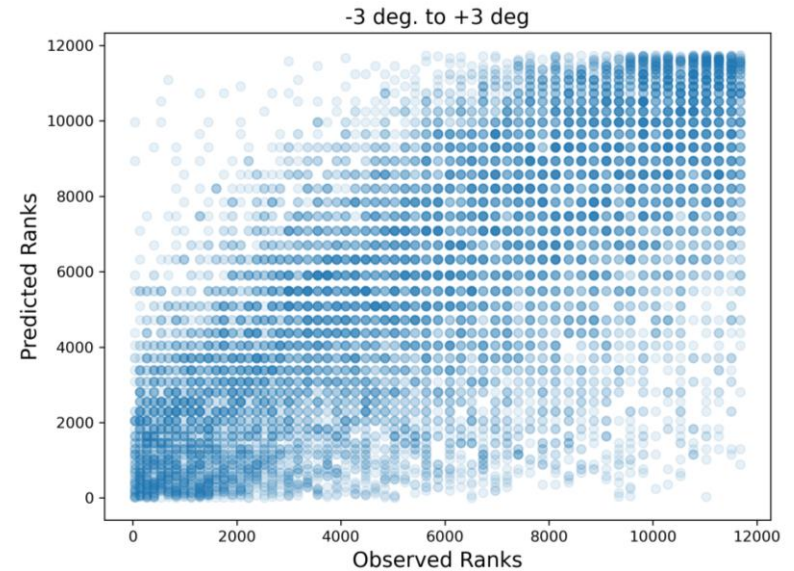
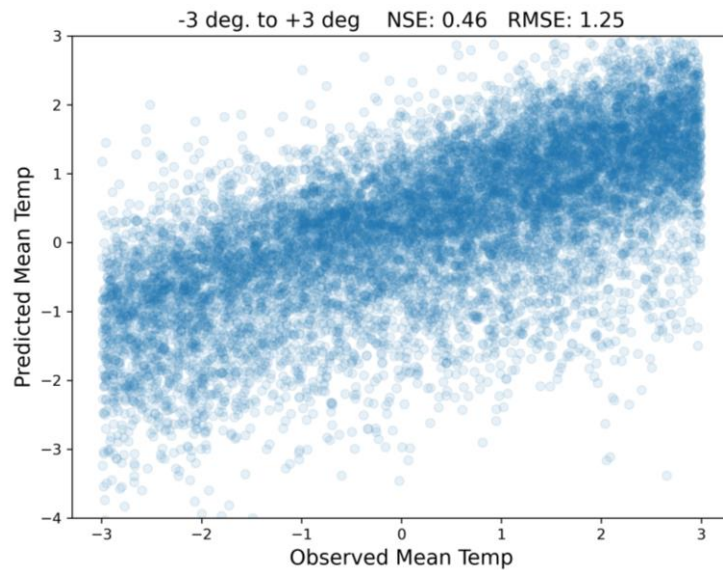
- Time series can be generated



Inversion results in Bavaria



Scrutiny w.r.t. relevance in melt-modeling



Concluding remarks

- Reasonable snow accumulation estimates (w/o precipitation inputs)
 - Crucial for mountain regions, esp. time-series of accumulated snow
- LST-air temperature relationship enhancement
- Relatively more complex models
- Spring discharge prediction



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Thank you!



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