Julius-Maximilians-UNIVERSITÄT WÜRZBURG

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Model runs (0.11° x 0.11°, 29 vertical layers, year 2001)

Simulation	Details	Soil scheme	Vegetation	Reference
REMO	v2015	Bucket (Fig. 1)	Static, monthly prescribed	Jacob et al. (2012)
imove	-	Bucket	Interactive	Wilhelm et al. (2014)
5L	-	5 Layer (Fig. 1)	Static, monthly prescribed	Hagemann & Stacke (2015), Abel (2023)
5L2	-	5 Layer, improved input data	Static, monthly prescribed	Abel (2023)
5L2_imove_com	Combining new soil and interactive vegetation the schemes	5 Layer, improved input data	Interactive	-
5L2_imove2	Advanced coupling of the schemes, currently not working (Fig.3)	5 Layer, improved input data	Interactive	_

Soil hydrological schemes



Fig. 1: Soil hydrological schemes in REMO: Bucket scheme (Manabe 1969, left) and 5-Layer-scheme (Hagemann & Stacke 2015, Abel 2023, **right**).

.913 m ot zone 2.902 m 5.866 m Bedrock

Bucket scheme:

- \blacktriangleright Root depth = depth of bucket
- > Soil moisture is equally distributed
- cm

5-Layer scheme:

- equation)
- \succ Depth of appr. 10 m or depth to bedrock
- ➤ Water below root zone
- ➢ Water for transpiration from root zone
- ➢ EBSOIL from top layer

Validation data

Dataset	Variable(s)	Resolution	Referen
MODIS v6.1	LAI	0.5°, 8-daily	Myneni
GLEAM v3.5a	EVAP	0.25°, daily	Martens
ERA5Land	T2M, T2MX	0.09°, hourly	Muñoz-S

Comparison of LAI – time series



 \succ imove underlies spin-up which is reduced in 5L_imove_com

- > Improvement of LAI due to interactive instead of static vegetation and consideration of PFTs
- \triangleright Overestimation in 5L_imove_com but better representation of annual cycle \rightarrow Deeper roots might provide more water
- \rightarrow Reason for overall higher TSS



Multilayer soil and interactive vegetation – A case study using REMO in Mainland Southeast Asia



Fig. 3:



Right: Taylor Skill Score (TSS) of LAI for different simulations and different subregions over the gray period where MODIS data is available (n=42).



- by topography





Conclusion

- to deeper roots?
- Orographic dependency of LAI bias
- representation 1move
- Improved spatial representation





Fig. 6: Top: Spatial differences of T2M over MSEA in comparison with ERA5Land. Bottom: Same as top but for T2MX.

 \blacktriangleright Better representation of LAI in imove, improved temporal behavior in 5L2_imove_com \rightarrow increase due

> EVAP is strongly underestimated, multilayer soil and interactive vegetation show improved spatial

> T2M decrease with multilayer soil and imove, T2MX decrease with multilayer soil but increase with

 \rightarrow Combining both schemes leads to promising results and adds value due to the inclusion of further processes compared to REMO or the usage of a single scheme and more spatial details

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