Effects of improved land surface processes in the regional climate model REMO on climate means and extremes in Mainland Southeast Asia

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Model development

1) Soil hydrology: Single- to multilayer

2) Land surface data
   - FAO to SoilGrids
   - Discrete to continuous PTFs
   - Layered soil information
   - Deeper roots

3) Vegetation: Static to interactive
Simulations:

- Simulations: warm start, 2001-2018, 0.11°, Mainland Southeast Asia
- Validation data: MODIS, ERA5Land, GLEAM

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<thead>
<tr>
<th>Simulation</th>
<th>Soil layers</th>
<th>Soil data / PTF</th>
<th>Vegetation</th>
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<td>Static, monthly prescribed</td>
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Results - LAI

- LAI strongly overestimated when prescribed
- Interactive approach closer to MODIS
- Temporal lag in iMOVE-versions
- Spatial heterogeneity of differences
Results - Evapotranspiration

➢ EVAP is mostly underestimated
➢ FAO-fragments of 5L are removed in 5L2, but further EVAP reduction
➢ LAI reduction by iMOVE leads to EVAP reduction in flat lands but improved representation in mountains
➢ Improvement of annual cycle during dry months
Results – Temperature and anomalies of further variables

- 5L and 5L2 increase warm bias (lower EVAP)
- iMOVE results in general cooling → good fit in dry months (cp. EVAP)

Temporal correlations are good for EVAP and TEMP but heat fluxes get worse? → contradicting to results from Central Europe
Results – Heatwave April 2016 (daily data)

➢ TEMP2 reduction lowers bias of heatwave (TEMP2, T2MAX)
➢ Reduction causes sign change for T2MIN
➢ Overall lower MAEs
Higher information content (soil moisture in different layers, vegetation parameters)

LAI is clearly improved and depends on atmospheric conditions but spatial discrepancies (mountains)

EVAP gets reduced → good seasonality in dry months

Improvement of TEMP2, also true for heatwave in April 2016 and T2MIN and T2MAX

Surface flux correlation decreases → contradicting to results from Europe

Strong potential, but better understanding of the processes necessary
Thanks for your attention


