

Review of “**Evaluation of the coupling of EMACv2.55 and the land surface and vegetation model JSBACHv4**” by Martin et al.

**General comments:**

This paper examines the performance of the ECHAM/MESSy Atmospheric Chemistry (EMAC) model (v2.55) after implementing the Jena Scheme for Biosphere-Atmosphere Coupling in Hamburg (JSBACH) land surface model (v4). Several key variables affecting water, carbon, and energy fluxes at the land-atmosphere interface are assessed in comparison with observational and reanalysis datasets. The performance of the new EMAC/JSBACH model is also compared with the default version of the model (EMAC/SURFACE). It is found that the newly added features did not degrade the overall performance of the model while greatly improving the representation of land hydrology. Overall, the paper is quite well-written, and I enjoyed reading it. I have a few suggestions for the authors to consider.

**Specific comments:**

1. Section 3.1.1 introduces the reference datasets (e.g., Table 5). It would be informative to also include a brief discussion about the uncertainties associated with these datasets/variables, if possible.
2. While terrestrial water storage (TWS) reflects the performance of land hydrology, I wonder if it's also helpful to examine surface soil moisture and evapotranspiration in the model.
3. For land surface temperature (LST), it would be interesting to include a discussion about why the latent heat fluxes in EMAC/JSBACH are somewhat overestimated (lines 264-269). For instance, does the overestimated TWS partially contribute to this? Also, latent heat alone may not be sufficient to explain LST. I wonder if other energy fluxes, such as surface shortwave and longwave radiative fluxes, and sensible heat are examined as well.
4. Section 2.1, consider adding information about soil layers and their depths.
5. Line 97-108, I wonder if it's possible to include a schematic to demonstrate these processes.
6. Line 161, no values in Table 3 are shown in bold...
7. Line 175, are aerosol concentrations prescribed?
8. Line 291, the soil depth in the ERA5 is much shallower than the EMAC/JSBACH, 2.89 m vs 9.8 m. How does this affect the comparison of TWS?
9. Line 372, “cloud occurrence... remain the same”, the differences in LST and latent heat may affect cloud distribution.

10. In terms of TOA fluxes, have you considered using CERES? Or are ERA5 TOA fluxes assimilated with observations?

11. Line 408, are the prescribed SSTs the same in the EMAC/JSBACH and EMAC/SURFACE runs?

**Technical corrections:**

1. Line 240,  $0.1^\circ$  by  $0.1^\circ$ ?

2. Fig. 3 captions, "LST trend" is somewhat misleading as no trends are calculated. Maybe "LST time series"?