

Geosci. Model Dev. Discuss., referee comment RC4  
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## **Comment on gmd-2022-173**

Stefano Ferraris (Referee)

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Referee comment on "Continental-scale evaluation of a fully distributed coupled land surface and groundwater model, ParFlow-CLM (v3.6.0), over Europe" by Bibi S. Naz et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2022-173-RC4>, 2022

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The paper address a urgent need, the modeling of spatial and temporal water balance at the continental scale. Continental droughts like the one is occurring now make this need even more urgent. I fully agree that only streamflow fitting is not meaningful, and we need also hydrologic states and fluxes with available observations such as SM, evapotranspiration (ET), water table depth (WTD), snow water equivalent (SWE) and total water storage,

The paper is very detailed and well written, but some part of the process modeling make it necessary to be better explained.

One first problem is overland flow:

I wonder about the sense of overland flow modeling with kinematic wave at 3 km spatial scale. It is also mentioned a "two-way overland flow routing" what is it?

Are Manning's coefficient or hydraulic conductivity you mention possible to be defined at the 3km scale?

Vegetation is almost absent in the text. It is modeled with a single layer, but no more is detailed.

I have seen that an area intensively irrigated in summer shows quite low ET fluxes. Only the rice part of it have high fluxes, therefore I wonder if irrigation is taken into account in ET fluxes.

Snow has a very detailed coding, with up to 5 layers, how can be given such a description at the continental scale?

The paper speaks in more details of soil moisture, but the first 3 centimeters say nothing about subsurface water flow. Field data are "from 19 stations from four networks and In case that more than 1 station is located within one 3 km grid cell, the average of those stations was used for comparison". Does it mean that less than 19 pixel in all Europe has a SM ground validation?

You mention "consistently higher mean SM": I think that are much more important the dynamics of SM. I agree to perform a montly average anomalies comparison, but the dynamics is partly lost.

Also, I know that having information about soil structure is impossible at the continental scale, but it has to be remarked that only texture cannot give enough information.

Less important, a figure has no number, but only ?? at line 417.