

Geosci. Model Dev. Discuss., referee comment RC1  
<https://doi.org/10.5194/gmd-2022-139-RC1>, 2022  
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## **Comment on gmd-2022-139**

Anonymous Referee #1

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Referee comment on "Assessing methods for representing soil heterogeneity through a flexible approach within the Joint UK Land Environment Simulator (JULES) at version 3.4.1" by Heather S. Rumbold et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2022-139-RC1>, 2022

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### **General comments**

The paper looks at how sub-grid scale soil heterogeneity can be added to a complex land-surface model. Using a synthetic example, different configurations are tested, exploring both increased heterogeneity and computational efficiency.

It is an interesting development shown to have an important impact on model vegetation-soil moisture interactions, especially at high resolutions. The paper is well written and a good fit for GMD. My comments are mainly about clarifying parts of the manuscript.

### **Specific comments**

How was the synthetic example created? As in, how were the different fractions of PFTs and soil textures chosen? Is it based on the UK site where the meteorological forcing was chosen?

What resolution is the full grid box meant to represent? 0.5 degrees like the forcing?

For HResTexAgg, how are the interactions distributed? For example, it is mentioned that moisture infiltrating from BLT is distributed between the clay and loam. Is this distribution even, i.e., 50:50? Or is it proportional to the fraction of soil texture? i.e., 16/26 to clay and 10/26 to loam in this case.

L180: Can the authors comment more on the fact that SurfGB and SurfDom match HRExTex in Fig. 3? I realise this is discussed more at the end of this section, but I think a sentence here explaining how they all have a one-to-one mapping would help the reader.

Throughout the plots and analysis, four layers are discussed. However, I don't think the concept of layers is introduced. How many layers total make up the soil column in JULES? How deep and thick is each respective layer?

Since it is a synthetic example, it cannot be evaluated against observations. However, maybe the authors could comment in the conclusion on how future work could use observations. Furthermore, only one climate is tested (mid-latitude temperate). Could the authors comment on how the results would change for a different climate? For example, what does one might expect results to be for an arid site?

### **Technical corrections**

Throughout: change quotes ' to `

Throughout: sub grid vs sub-grid

L18: in **the** last couple

L26: tiled

L30: Do you mean representative parameter values? Or additional parameters on top of the parameter set used in the mosaic approach?

L62: remove extra brackets around the citation

L102|L107|L146|L156: add missing , after i.e. to be consistent with the rest of the text

L126: is not

L184: autumn is not a proper noun

L194: Clay does not need to be capitalised

L204: "\ " missing in the latex maths mode for beta

L225: Is "Fig.'s" the correct shortening for multiple figures?

L266: does not

L293: These results

Fig.s 3&5: superscript is needed for the units

Fg. 4: beta as a symbol?