

## ***Interactive comment on “The effect of chalk representation in land surface modelling” by M. Rahman and R. Rosolem***

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We would like to thank the reviewer for thoroughly reviewing the manuscript. Here we initially address the three main issues highlighted by the reviewer:

### 1. Calibration of default JULES

The reviewer has suggested to calibrate the parameters of the default model configuration as it performs poorly. The default JULES configuration is consistent to its operational application and represents “a completely naive model that might be used in routine large scale model applications” as mentioned by Reviewer #2. The macro configuration, on the other hand, explicitly represents chalk hydrology in this model. A prior calibration of the default model would undermine the impact of proposed implementation aimed for large-scale application, in comparison to the more common

C1

use of land surface models (i.e., without excessive calibration of individual grid cells or catchments). Hence, we believe the uncalibrated JULES configuration is the true representation of the default model used as the reference/control case in our study.

### 2. Sensitivity analysis of the proposed Bulk Conductivity (BC) model

We thank the reviewer for suggesting the use of sensitivity analysis in order to better understand the BC model. This is an important aspect also suggested by Reviewer #2. We will carry out sensitivity analysis of key parameters while also expanding our analysis to evaluate potential recharge in the model (also pointed out by the reviewer).

### 3. Simplicity of the Bulk Conductivity (BC) model

The reviewer has suggested to emphasize on the simplicity of the Bulk Conductivity (BC) model that is used in this study to simulate hydrology through chalk unsaturated zone. Note that reviewer #2 has also highlighted this point, which will be addressed in the revised manuscript. However, we would like to emphasize that our main focus is to quantify the impacts on soil moisture – evapotranspiration interactions from a land surface modelling perspective, when explicitly representing the soil-chalk layering system within the catchment in JULES. This is our first step for a more comprehensive analysis of hydrological processes in the region.

We would like to thank the reviewer again for this comments and suggestions, which will be addressed carefully in the revised manuscript.

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C2