



*Supplement of*

## **Improving soil moisture prediction of a high-resolution land surface model by parameterising pedotransfer functions through assimilation of SMAP satellite data**

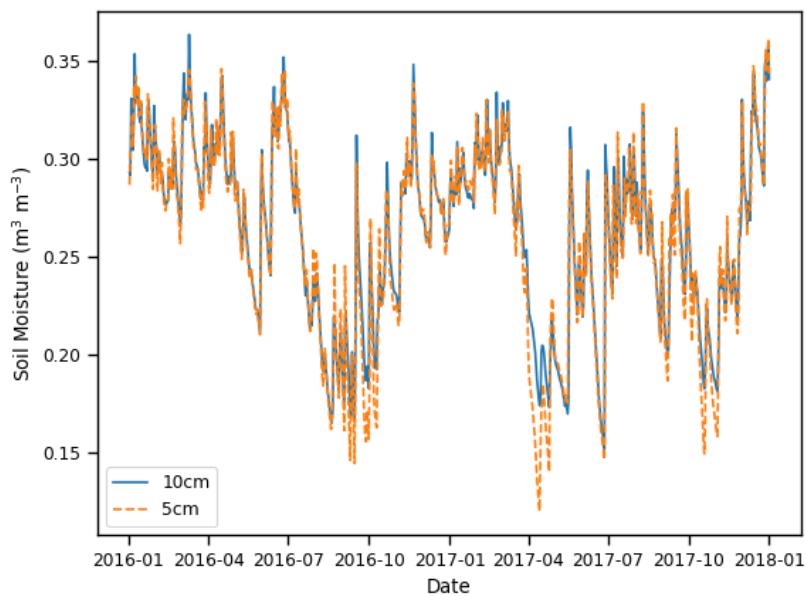
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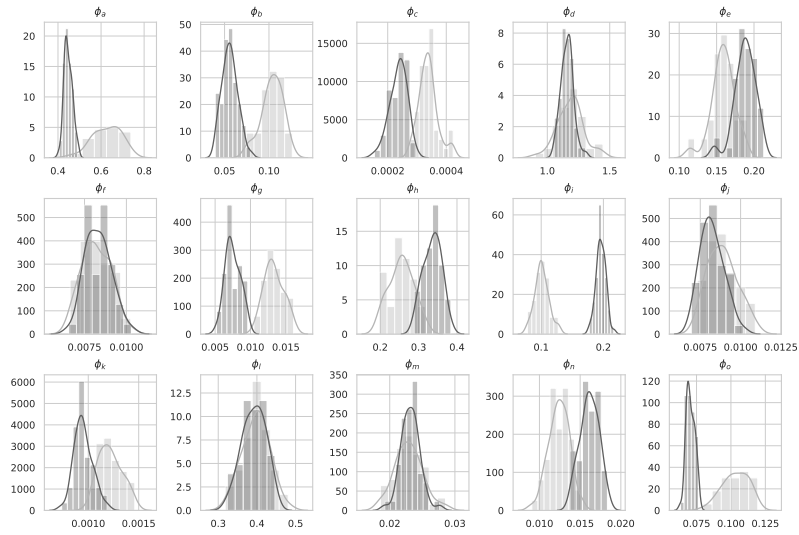
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## S1 Supplementary material

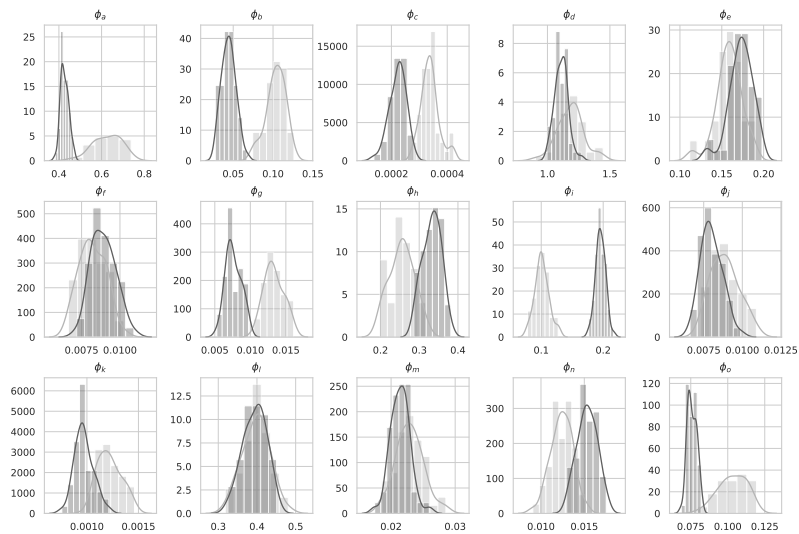
For the supplementary material we include additional plots comparing JULES soil moisture values when the model is run with a 5 cm and 10 cm top soil layer thickness in Figure S1, The output of the data assimilation experiment when JULES is run with a 5 cm top layer in Figure S2 and a 10 cm top layer in Figure S3 and a visualisation of the effect the model spin-up period has on the initial soil moisture state for three unique pedotransfer function parameter sets at the Cardington COSMOS site in Figure S4.



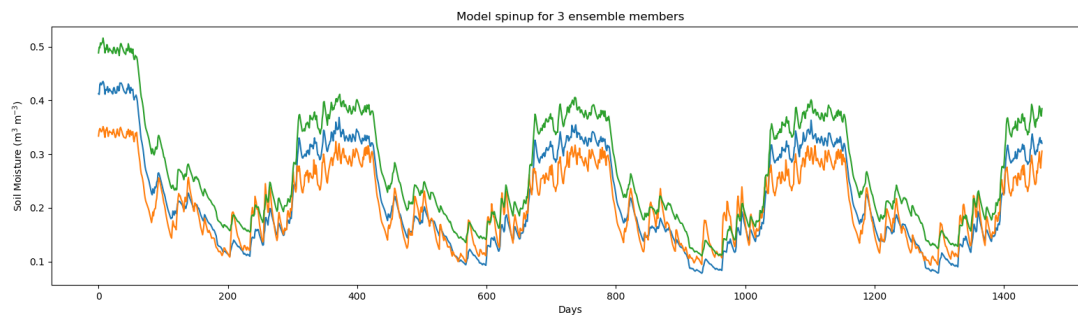
**Figure S1.** Comparison of top layer soil moisture values for JULES when the model is run with either a 10 cm top layer (blue solid line) or a 5 cm top layer (orange dashed line).



**Figure S2.** Optimized parameter distributions for DA experiment when using a JULES model with a 5 cm top soil layer. Light grey: prior parameter distributions, dark grey: posterior parameter distributions.



**Figure S3.** Optimized parameter distributions for DA experiment when using a JULES model with a 10 cm top soil layer. Light grey: prior parameter distributions, dark grey: posterior parameter distributions.



**Figure S4.** Effect of model spin-up on soil moisture state at Cardington COSMOS site. Different colour lines correspond to unique soil moisture trajectories defined by different sets of soil parameters (these are constant in time). The spin-up is performed using 2015 driving data.