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THE IMPACT OF TEMPORAL INPUT DATA RESOLUTION ON PARTITIONING OF WATER FLUXES IN THE JULES LAND SURFACE MODEL

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PROBLEM

Land surface models, traditionally used to estimate the lower boundary condition in General Circulation Models (GCMs), have recently been applied widely to estimate the separation of surface fluxes and recharge to the subsurface flow. The model used in UK is the Joint UK Land Environment Simulator (JULES). Although JULES exhibits an excellent performance in satisfying the water balance of vertical fluxes, it shows a significant sensitivity to the temporal resolution of the input data. The effect of two precipitation disaggregation methods used in JULES with respect to the value of the vertical soil moisture flux on a point scale was assessed in this project.

METHODOLOGY

Disaggregation was used to construct hourly precipitation series from daily precipitation. Then hourly precipitation series were used as input and the simulated soil moisture flux was compared with the observed soil moisture content from field measurements.

Moreover disaggregation method 2 (IMOGEN method, Figure 1) was compared with precipitation disaggregation method 1 which basically causes uniform rainfall distribution (Figure 2) on the effect they have on the value of the simulated soil moisture content.

Figure 1

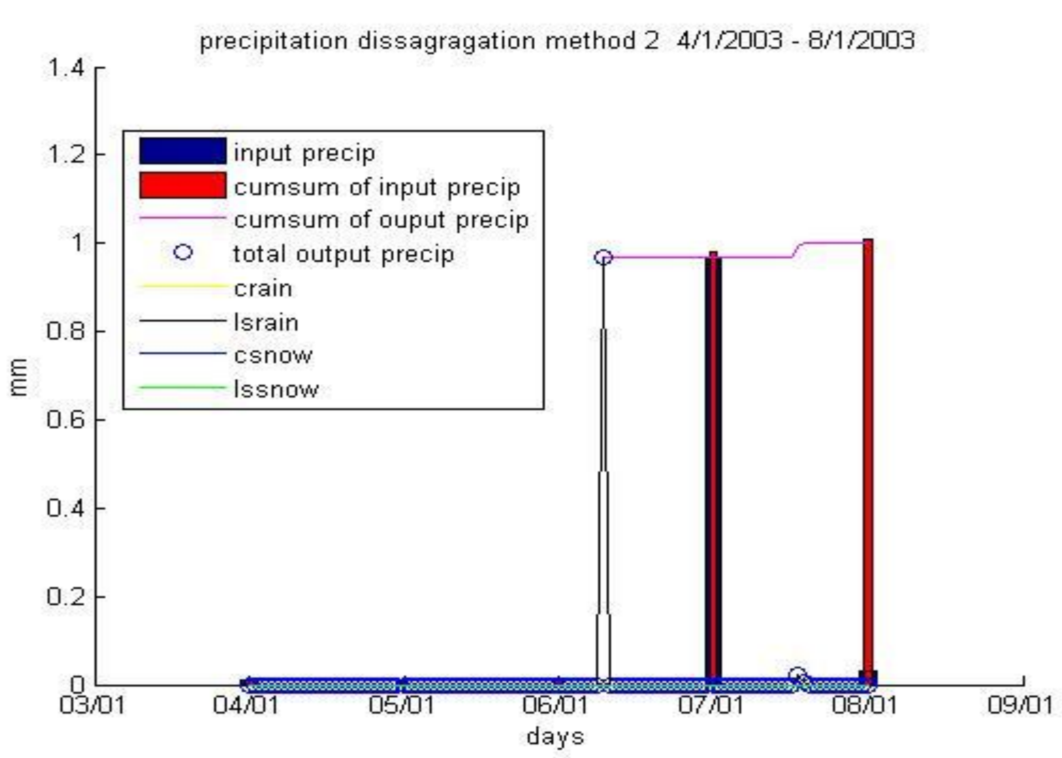
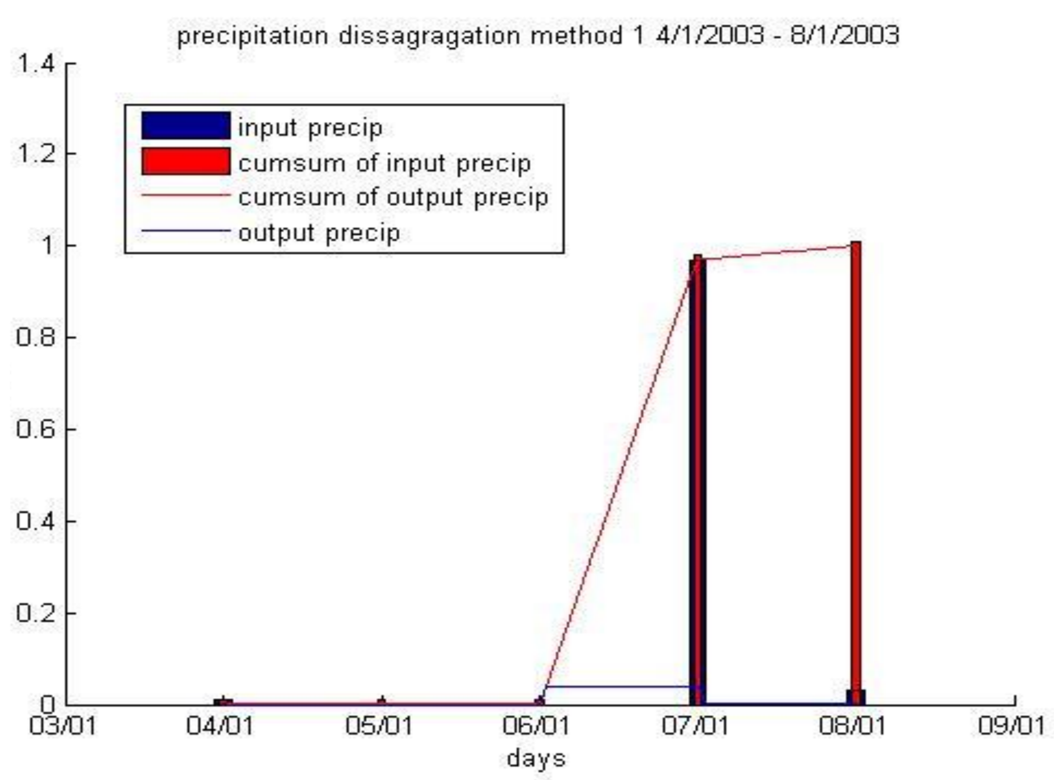


Figure 2



RESULTS

Figure 3 to Figure 7 show the soil moisture content variation within the six year period for each layer and the aggregate sum of the soil layers for both simulated and observed values.
Figure 8 shows the output fluxes for both precipitation disaggregation methods for the six year period whereas Figure 9 shows the total of the output fluxes at the end of the six year period. Figure 10 shows output fluxes differences between precipitation disaggregation methods 1 and 2 for throughfall flux and sum of all other fluxes. Figure 11 shows the difference in soil moisture content using the two methods and the difference of the water retained in the soil calculated by the other output fluxes using the two disaggregation methods.

Acknowledgements

I would like to express my sincere thanks and appreciation to my supervisor Dr Ana Mijic who gave me the opportunity to undertake such an interesting project and Dr Barbara Orellana Bobadilla for her continuous support and guidance.

Figure 3

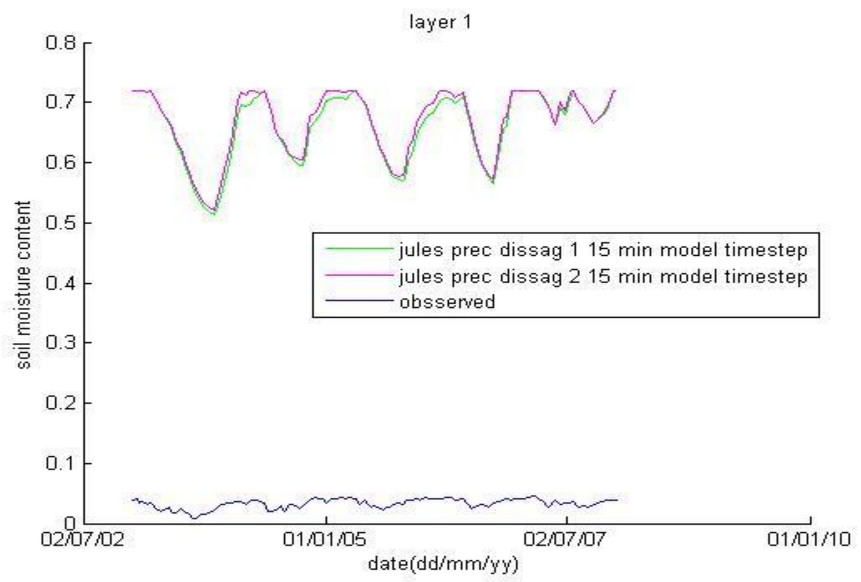


Figure 4

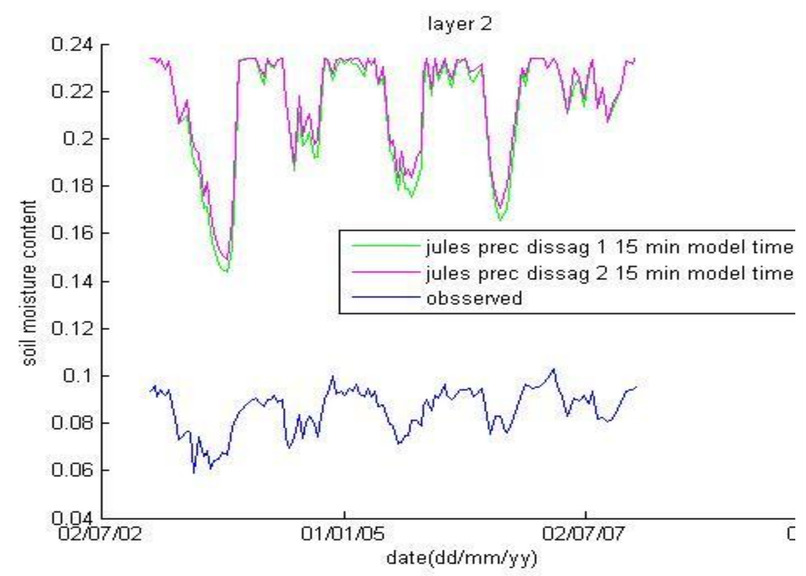


Figure 7

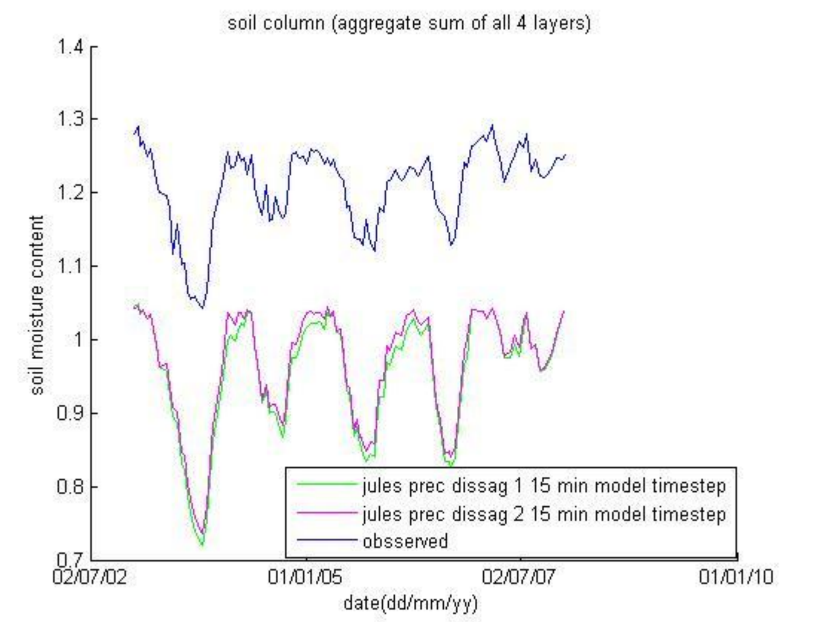


Figure 5

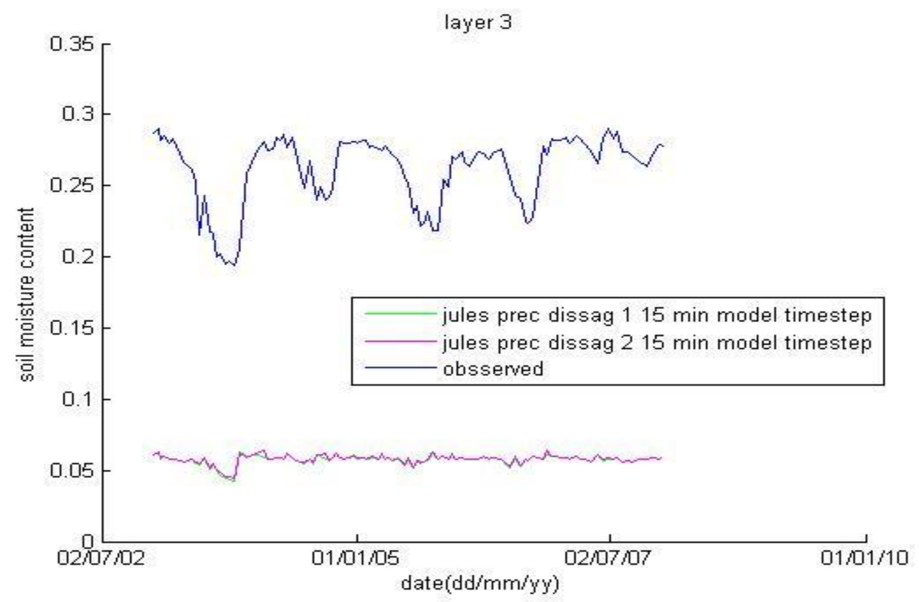


Figure 6

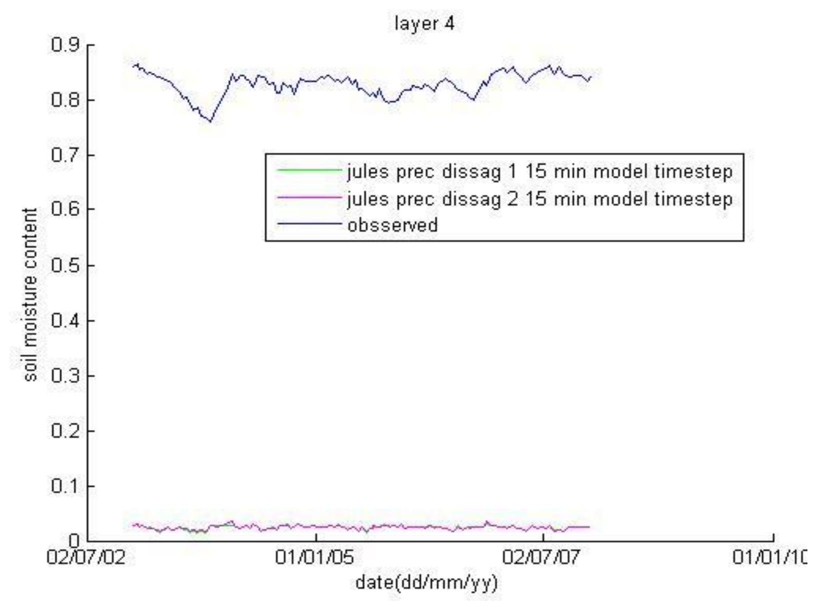


Figure 8

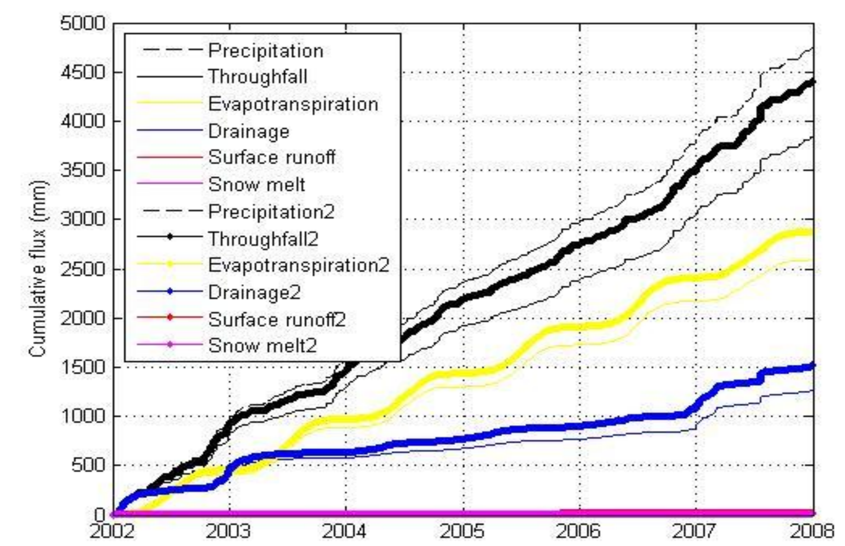


Figure 9

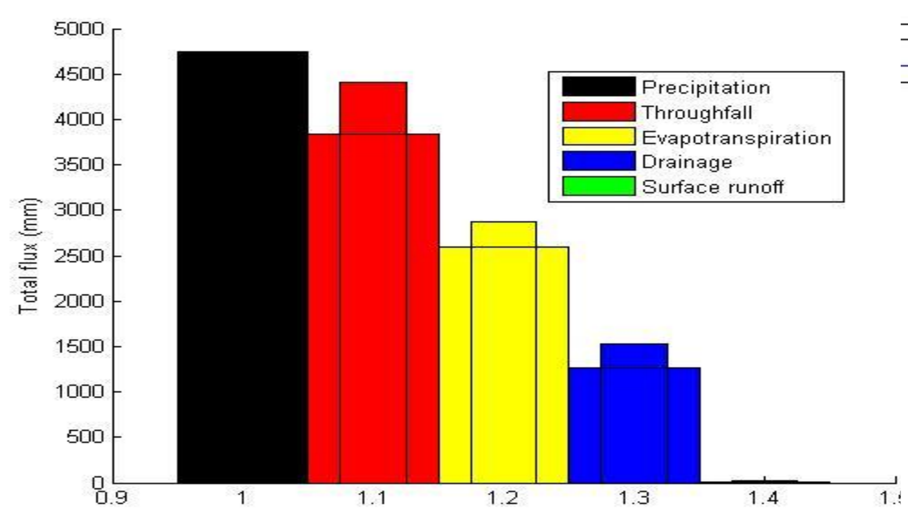


Figure 10

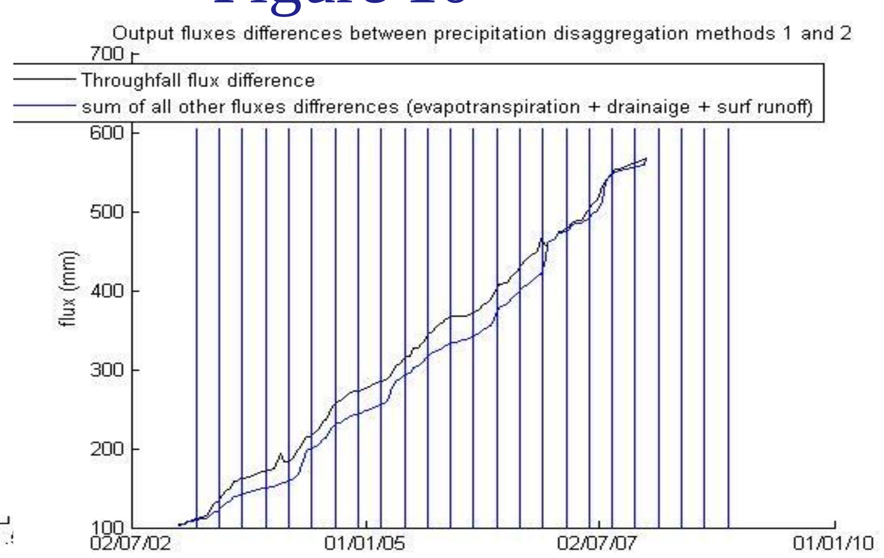
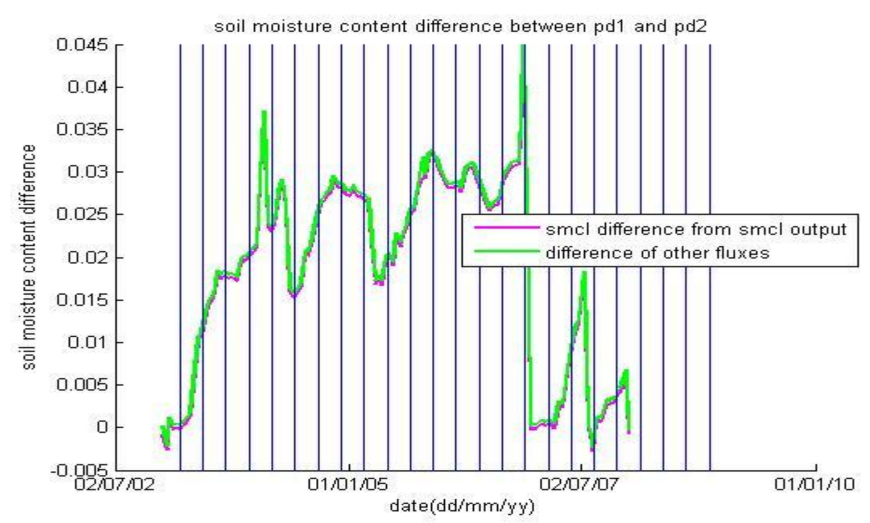


Figure 11



CONCLUSIONS

Results showed that when layers 1-4 are considered individually, neither the dynamic nor the simulated values match the observed ones. Although in layer 2 the model performs much better compare to the other three layers, the results are still not satisfactory. Despite that results showed that JULES performs well on the aggregate sum of the 4 layers (soil column) when it comes to dynamics representation of the soil moisture, although the soil moisture values are off due to spatial collection of data.

Between precipitation disaggregation methods 1 and 2, both the values and the dynamics match almost perfectly although soil is always wetter using method 2 due to the relative difference of the output fluxes (throughfall, evapotranspiration, drainage and surface runoff).