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The use of satellite data to improve land surface model simulations in soil moisture stressed conditions

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Soil moisture has been shown to amplify European summer temperature anomalies during heatwave events such as in 2003 due to land surface-atmosphere feedbacks. Climate simulations have shown that temperature extremes such as these could be amplified in future decades in response to increased greenhouse gas forcing. The probability of future heatwave events may therefore be rather sensitive to feedbacks with soil moisture.

There is considerable uncertainty in the simulation of soil moisture and its control on summertime fluxes in land surface models. Inaccuracies in land surface representation therefore provide a significant cause of uncertainty in climate change predictions. Developments will be presented using the Joint UK Land Environment Simulator (JULES), a third generation land surface scheme derived from the UK Met Office Unified Model. A combination of satellite and FLUXNET data have been used to drive and improve model simulations of surface fluxes with the aim to improve the land surface representation overall. JULES has been run for a selection of European sites including those in the Netherlands and Italy. The modelled evaporative fraction has been compared with tower observations to assess how well JULES can simulate the flux partition using information available at well-instrumented sites. To explore whether remote sensing data can be used to assess model performance in the absence of local data, the modelled land surface temperatures have been compared with observations from MODIS TERRA and AQUA. The model-observation biases for land surface temperatures and evaporative fractions have been assessed for consistency. The utility of land surface temperature data for inferring model biases at the regional

scale will be presented.