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The sensitivity of global soil moisture distribution to soil and vegetation parameters

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Our understanding of the role of the land surface in climate has developed through the use of climate models. Such models require an accurate depiction of surface-atmosphere fluxes and their controls by, amongst other factors, vegetation and soil moisture. However, different models produce rather different land-atmosphere coupling, and the mechanisms controlling land-atmosphere exchange in a complex climate model are often obscure.

To better understand the mechanisms whereby soil moisture might impact surface fluxes (and simulated climate), we analysed global simulations of the Joint UK Land Environment Simulator (JULES) land-surface model, an offline version of the scheme used in the Hadley Centre Global Atmospheric Model (HadGAM).

A number of sensitivity experiments were undertaken to identify the key soil and vegetation parameters controlling soil moisture distribution, surface moisture and energy fluxes, and runoff. The model was driven with Global Soil Wetness Project (GSWP2) meteorology, at one degree resolution, over ten years. In addition to the standard vegetation and soil parameters, experiments were run with satellite (FASIR) derived Leaf Area Index (LAI) (fixed and with inter-annual variability) and alternative soil parameters.

A second group of experiments was undertaken, this time with the surface scheme coupled to HadGAM. The results of both offline and online sensitivity experiments will be presented.