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# What's the impact of improved soil representations in the ECMWF land surface model and how does it affect the extremes?

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With increasingly higher spatial resolution and a broader applications, the importance of soil representation (e.g. soil depth, vertical discretisation, vegetation rooting) within land surface models is enhanced. Those modelling choices actually affects the way land surfaces store and regulate water, energy and also carbon fluxes. Heat and water vapour fluxes towards the atmosphere and deeper soil, exhibit variations spanning a range of time scales from minutes to months in the coupled land-atmosphere system. This is further modulated by the vertical roots' distribution, and soil moisture stress function, which control evapotranspiration under soil moisture stress conditions. Currently in the ECMWF land Surface Scheme the soil column is represented by a fixed 4 layers configuration with a total of approximately 3m depth.

In the present study we explore new configurations with increased soil depth (up to 8m) and higher vertical discretisation (up to 10 layers) including a dissociation between the treatment of water and heat fluxes. Associated with the soil vertical resolution, the vertical distribution of roots is also investigated. A new scheme that assumes a uniform root distribution with an associated maximum rooting depth is explored. The impact of these new configurations is assessed through surface offline simulations driven by the ERA5 meteorological forcing against in-situ and global products of energy, water and carbon fluxes with a particular focus on the diurnal cycle and extreme events in recent years.