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A high resolution calculation of the equilibrium water table depth and the equilibrium soil moisture profile for the Iberian Peninsula

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Using a 2-d groundwater flow model at 30-arcsecond resolution we construct an estimate of Equilibrium Water Depth for the Iberian Peninsula, defined as the long-term hydrological balance between the vertical atmospheric-induced flux (recharge) and the lateral, geologic and topographically induced flow below and parallel to the water table (drainage). The result is a smooth, undulating surface beneath the land topography, occasionally appearing at the land surface as wetlands, rivers, and lakes. We then solve numerically Richard's equations for vertical water flux in the unsaturated zone and calculate an equilibrium soil moisture profile with the water table as lower boundary condition and the estimated atmospheric mean recharge as the upper boundary flux. We find that the soil moisture pattern reflects the spatial structure in water table depth, more so in the top-2m; in general the soil is wet where the water table is shallow, like in flat river valleys, even in semiarid climates, and it is dry where the water table is deep. We recognize the fact that the equilibrium soil moisture profile lacks the effect of individual wetting events on the top and only reflects the capillarity rise of groundwater from the bottom and the effect of different soil textures. We consider however that the imprint of the water table on soil moisture may have important climatic implications, due to an increase in root zone water storage and persistence in relatively shallow water table regions, effects that are mostly absent in present climate simulations.