Supplement

Text S1: Soil texture classes characteristics

Figure S1 presents the soil hydraulic parameters used in ORCHIDEE LSM: K_s, α (inverse of air entry suction, corresponding to the capillary forces close to saturation, at the top of the capillary fringe), n (Van Genuchten scale parameter), θ_r and θ_s. Their values for each USDA texture class are taken in Carsel and Parrish (1988). Water contents corresponding to the wilting point and the field capacity, noted θ_w and θ_{fc}, are derived from the Van Genuchten water retention curve: θ_w is the water content corresponding to a water potential of -150m, and θ_{fc} corresponds to a potential of -3.3 m except for the texture sand which corresponds to -1m. *AWC* is the available water capacity of the 2-meter soil column, it is calculated in mm as *AWC* (2m) = 2000 (θ_{fc} - θ_w).
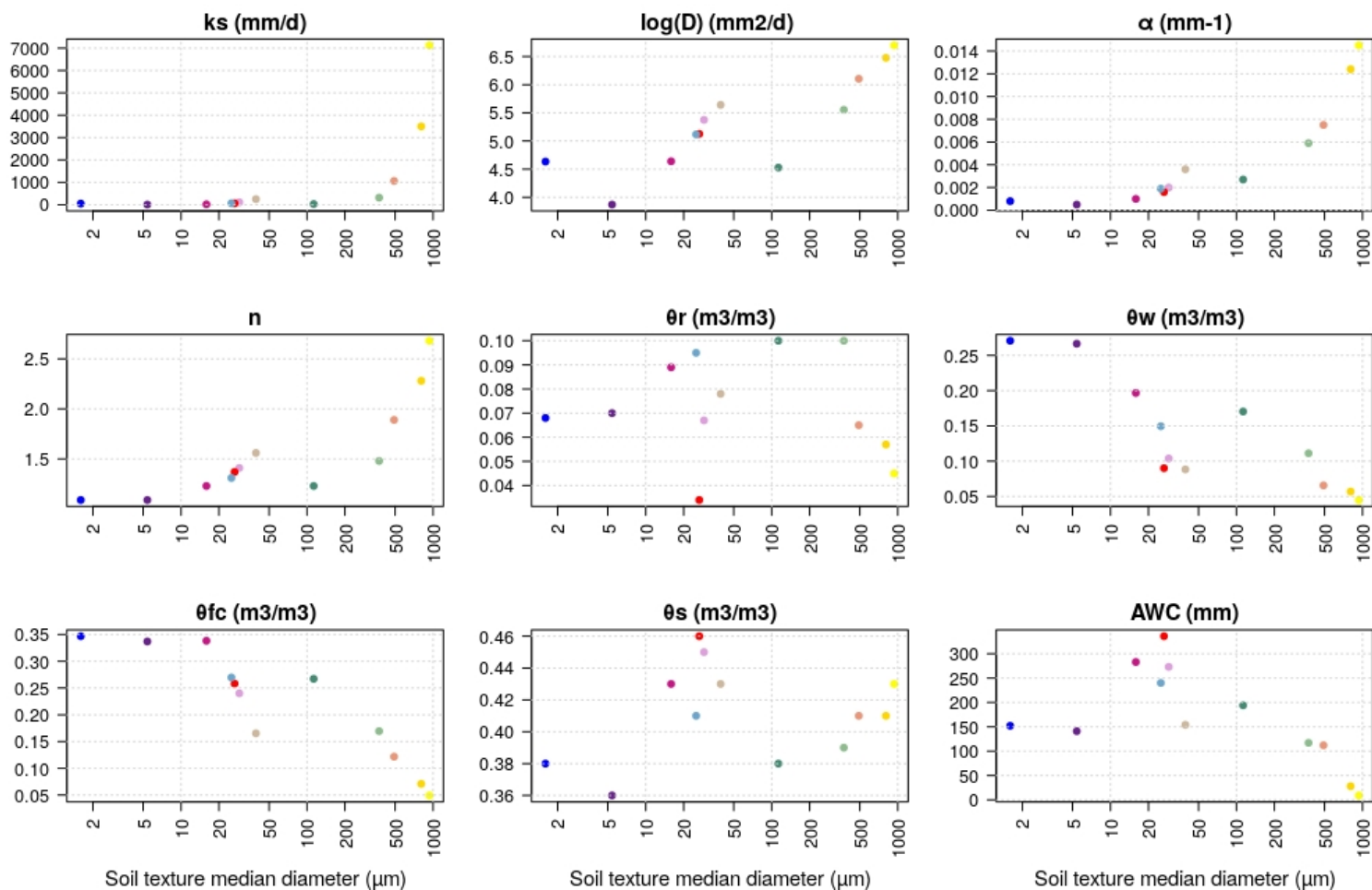
Figure S1. Soil parameters of the 12 USDA texture classes, for color codes see Figure 1.
D: maximum hydraulic diffusivity, α: inverse of air entry suction, n: Van Genuchten
parameter, θ_r: residual water content, θ_w: wilting point, θ_{fc}: field capacity, θ_s: saturated
water content, AWC: available water content.
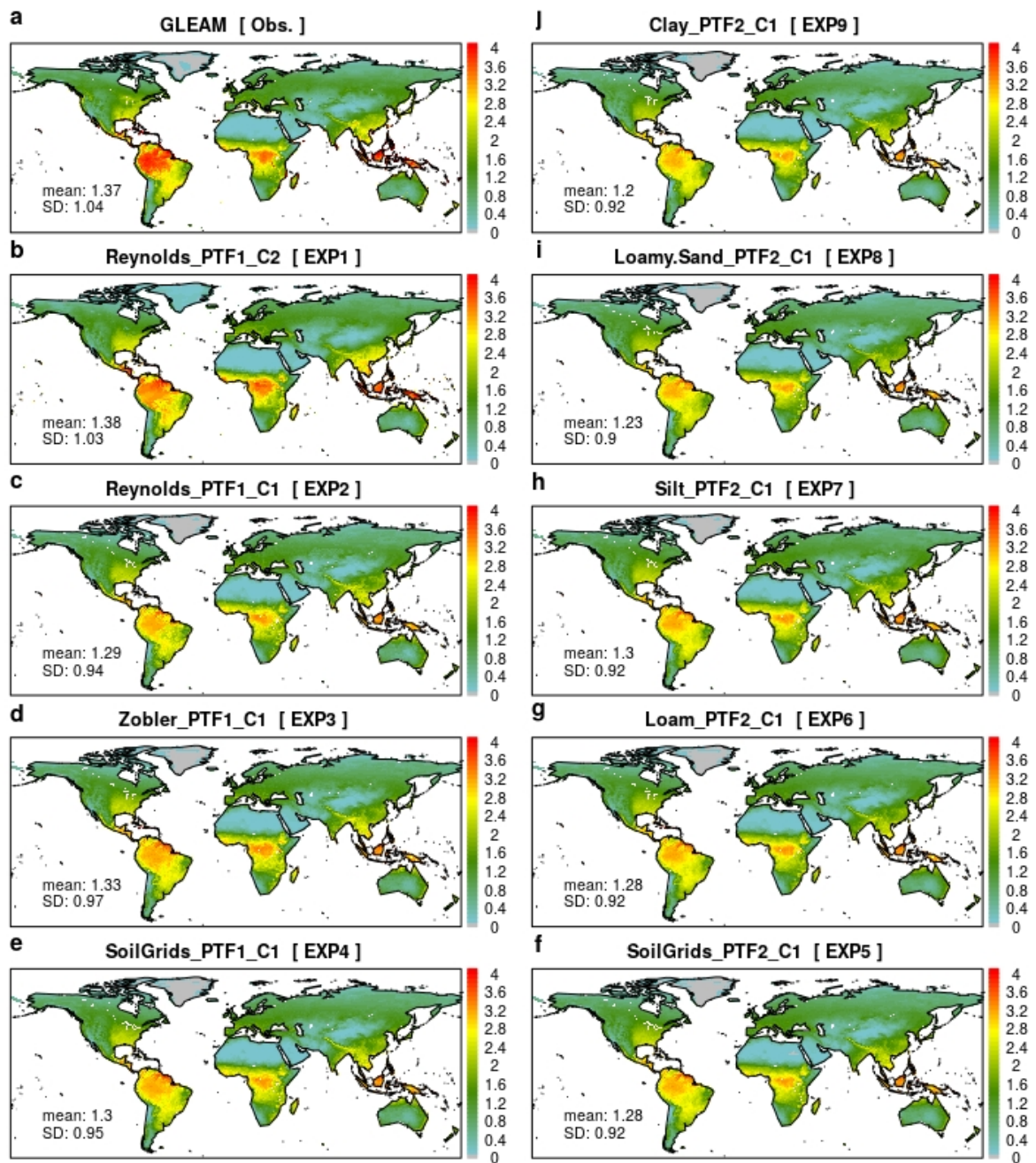
Figure S2. Maps of evapotranspiration averaged over 1980-2010 (a) estimated by Martens et al. (2017) and (b-j) for the nine experiments. **PTF1** is the default PTF in ORCHIDEE found in Carsel and Parrish (1988), **PTF2** is the PTF of Schaap et al. (2001), **C1** is the climate forcing GSWP3, **C2** is the climate forcing CRU-NCEP.
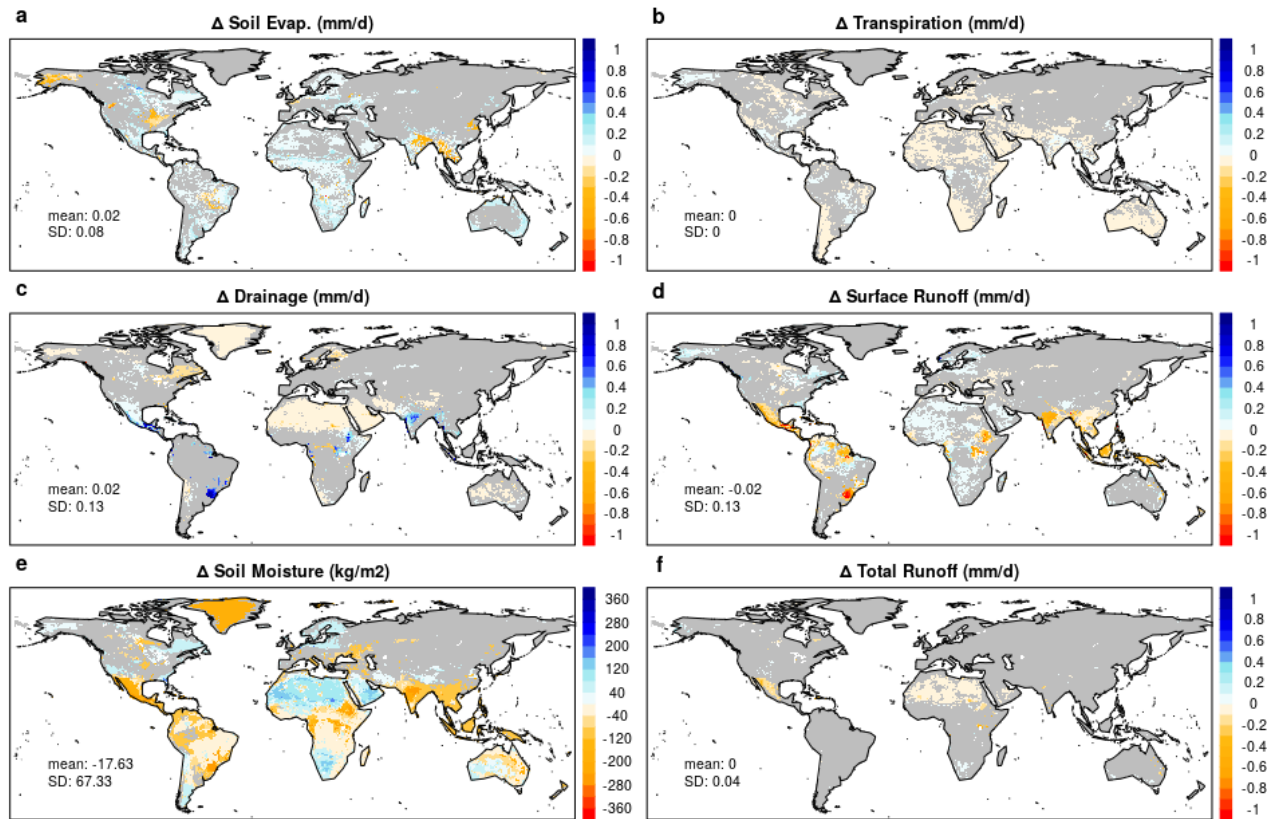
Figure S3. Difference in simulated variables when SoilGrids map is replaced by a uniform Loamy map (EXP6 - EXP5), averaged over the period 1980-2010. The corresponding difference for evapotranspiration is shown in Fig. 4a. Grey color indicates that the difference is not statistically significant based on Student's t-test (with a p-value of 5%). Mean and standard deviation are averaged over the globe excluding Antarctica.
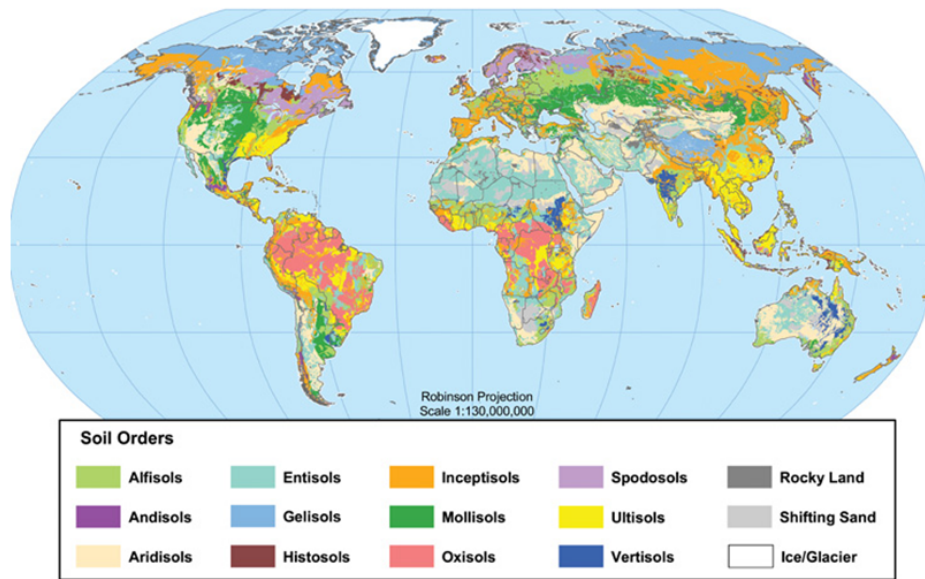
Figure S4. FAO Soil Order Map. This map is a simplification of the FAO/UNESCO Soil Map of the World (Eswaran et al., 2012), accessible on https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/use/?cid=nrcs142p2_054013.