Supporting Materials

Figure S1 Spatial distribution of long-term memory differences (a) between the Dual-Permeability model and SMAP; (b) between the Dual-Permeability and Mixed-Richards models; (c) between the Mixed-Richards models using Van-Genuchten and Clapp-Hornberger parameterizations; and (d) between the Mixed-Richards models with zero and 200 mm ponding depths.
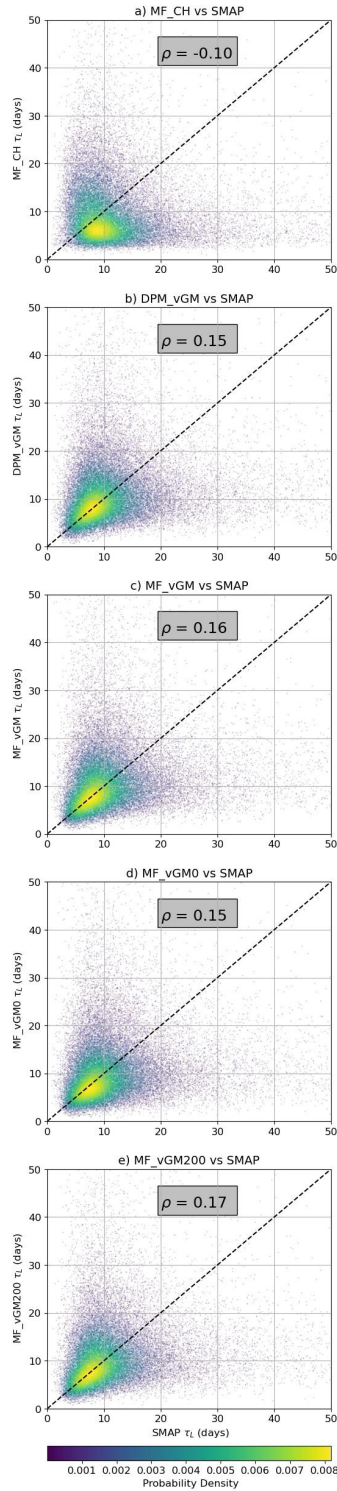
Figure S2 Scatterplot of root zone τ_L estimated from SMAP versus (a) MF_CH; (b) DMP_VGM; (c) MF_VGM; (d) MF_VGM0; and (e) MF_VGM200.
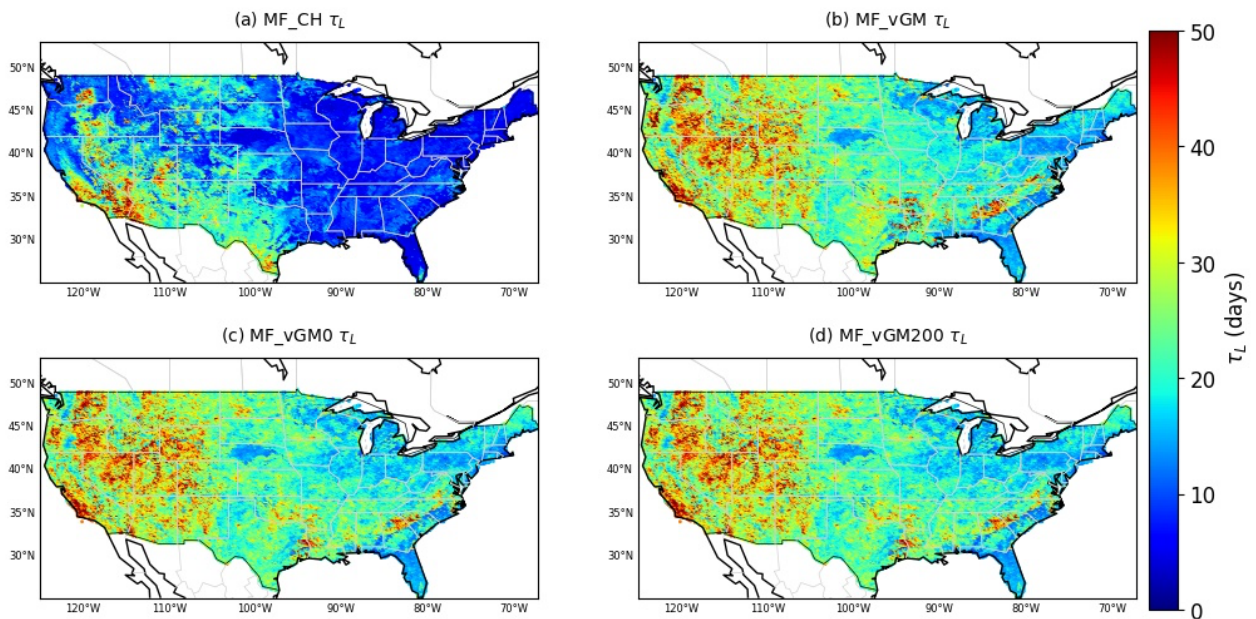
Figure S3 Spatial distribution of root zone τ_L estimated from (a) MF_CH (b) MF_VGM; (c) MF_VGM0; and (d) MF_VGM200.
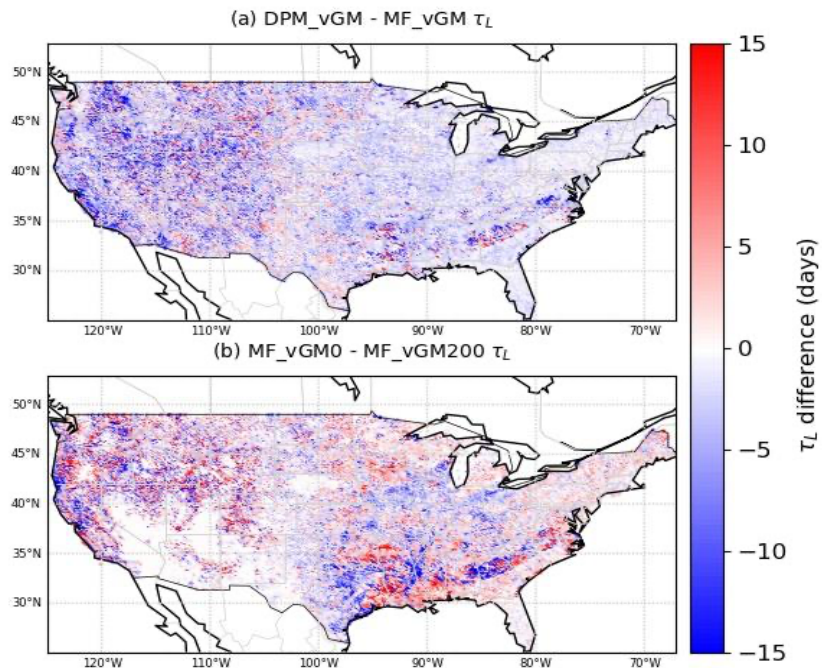
Figure S4 Spatial distribution of root zone long-term memory differences (a) between the Dual-Permeability and Mixed-Richards models; (b) within the Mixed-Richards models contrasting zero ponding depth to a 200 mm ponding depth.
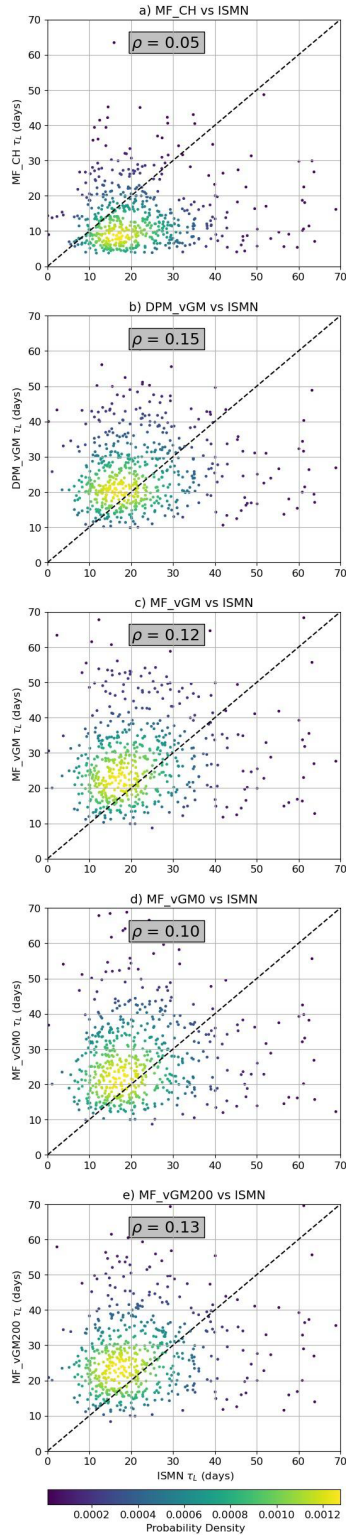
Figure S5 Scatterplot of root zone τ_L estimated from SMAP versus (a) MF_CH; (b) DMP_VGM; (c) MF_VGM; (d) MF_VGM0; and (e) MF_VGM200.
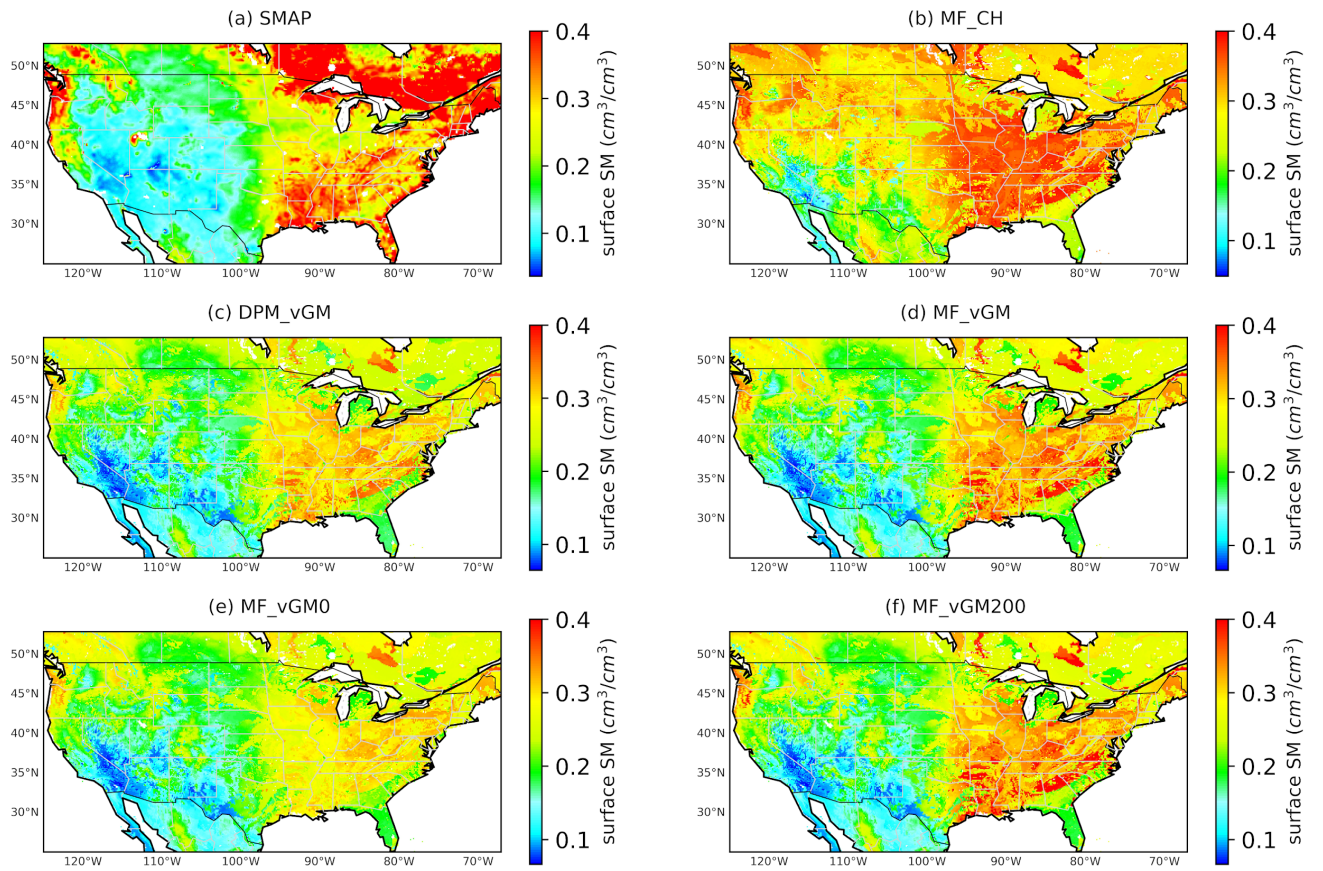
Figure S6 Average surface soil moisture over 2015−2019: (a) SMAP; (b) MF_CH; (c) DMP_VGM; (d) MF_VGM; (e) MF_VGM0; and (f) MF_VGM200
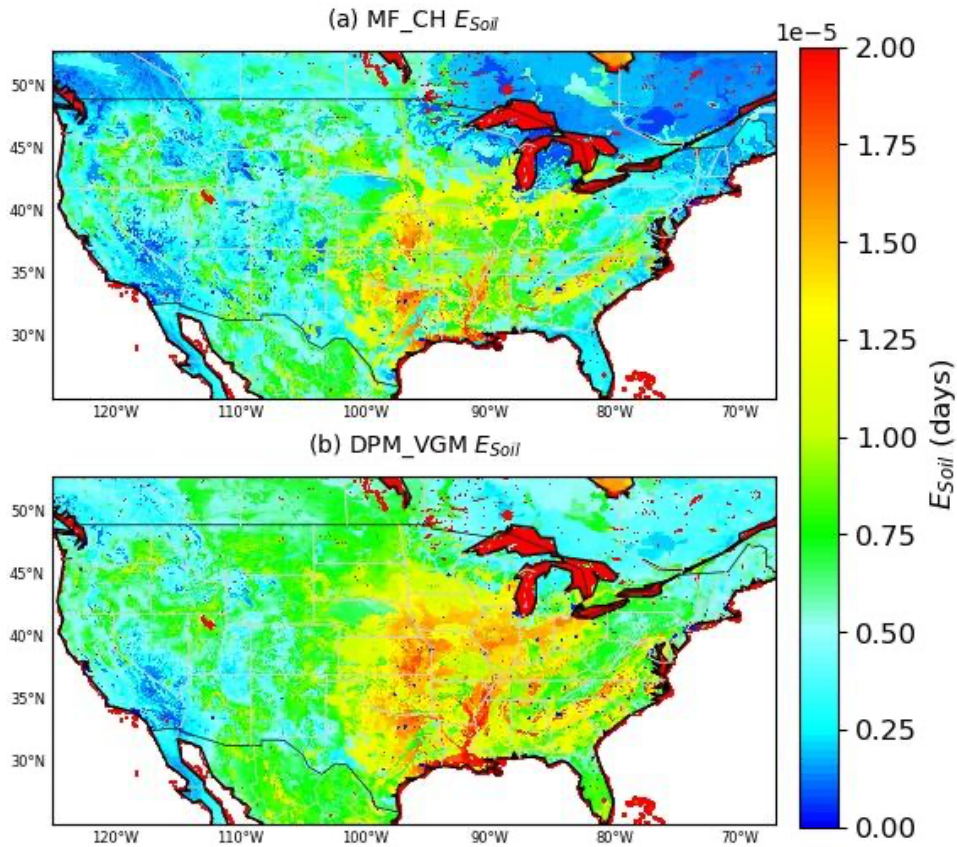
Figure S7 Spatial distribution of surface soil evaporation of (a) MF_CH; and (b) DPM_VGM.
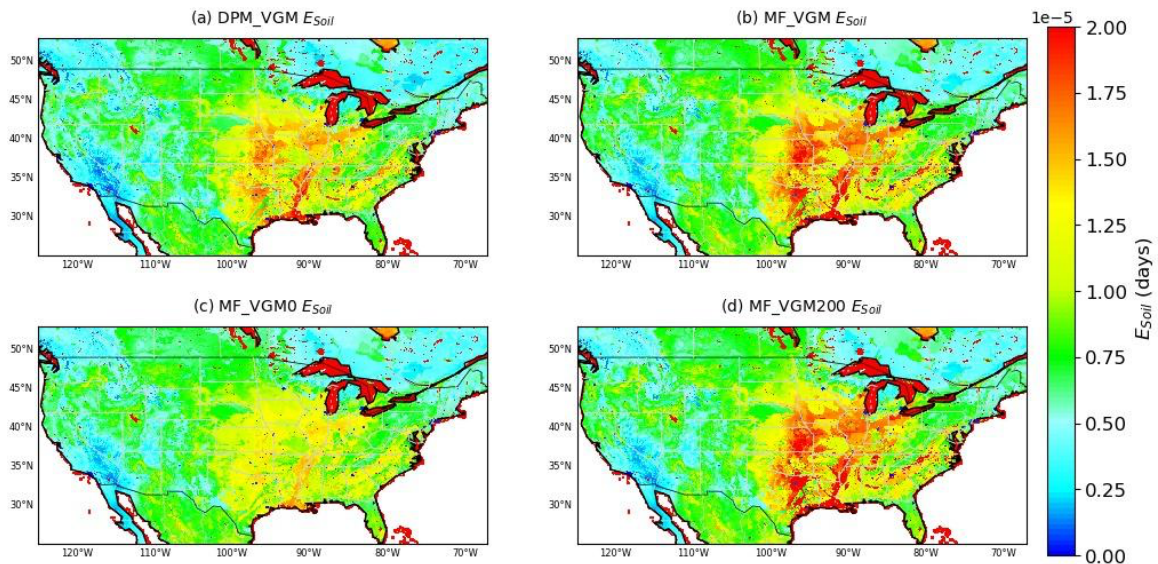
Figure S8: Spatial distribution of surface soil evaporation of (a) DPM_VGM; (b) MF_VGM; (c) MF_VGM0; and (d) MF_VGM200.