Supplementary

Table S1. RMSE, ME and *d* (see Eq. 14, 15 and 16) of the soil water content (SWC) and soil water pressure head (SWP) for the Feddes-Jarvis (FJ) and Couvreur (C) models in the three plots (P1: sheltered; P2: rainfed; P3: irrigated) of the stony (F1) and silty (F2) soils.

		SWC						SWP					
		P1		P2		P3		P1		P2		P3	
		FJ	C	FJ	C	FJ	C	FJ	C	FJ	C	FJ	C
		$cm^3 \ cm^{-3}$						$\log_{10}([-cm])$					
	RMSE	0.0241	0.0226	0.0324	0.0301	0.0238	0.0246	0.7315	0.6740	0.4874	0.5159	0.3162	0.3131
F1	ME	-0.0017	-0.0036	-0.0074	-0.0087	-0.0019	0.0012	-0.0014	0.0491	0.0607	0.0994	0.0312	-0.0040
	d	0.9330	0.9440	0.9121	0.9248	0.9398	0.9357	0.8453	0.8770	0.9011	0.8943	0.6530	0.6300
	RMSE	0.0460	0.0471	0.0490	0.0457	0.0654	0.0606	0.5451	0.5354	0.6378	0.6403	0.6656	0.6171
F2	ME	0.0001	0.0058	0.0311	0.0261	0.0476	0.0404	0.1017	0.0262	-0.0397	0.0474	0.0405	0.1712
	d	0.8502	0.8479	0.7843	0.8027	0.6120	0.6329	0.6145	0.6069	0.7630	0.7078	0.5421	0.5073
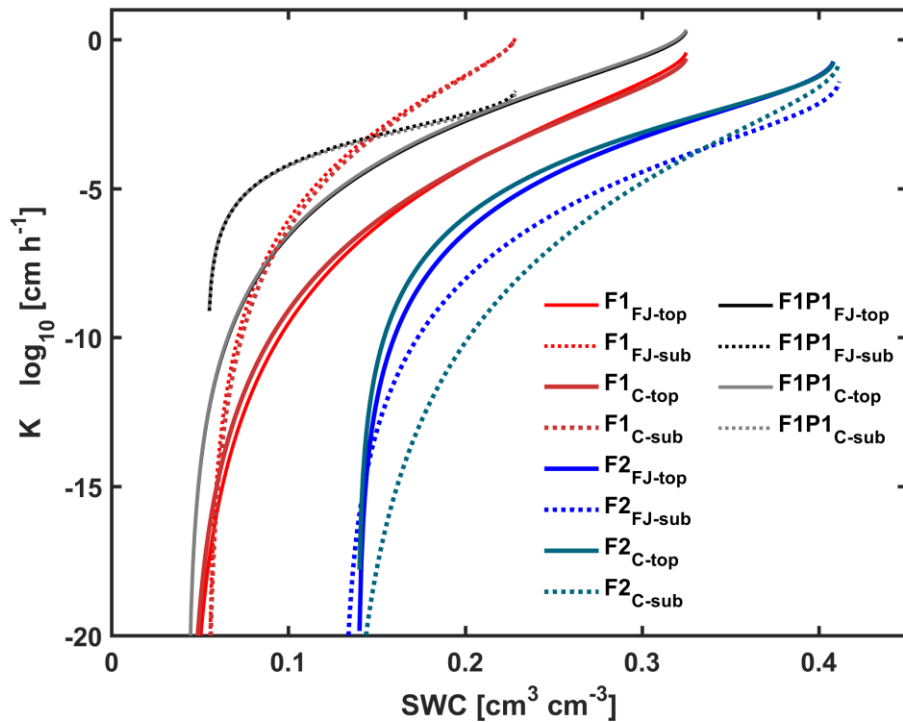
Figure S1. Relation between soil water content (SWC) and soil hydraulic conductivity (K) that was obtained by the Feddes-Jarvis (FJ) and Couvreur (C) models in the top- and subsoil of the stony (F1), the sheltered plot of the stony soil (F1P1), and silty (F2) soils.
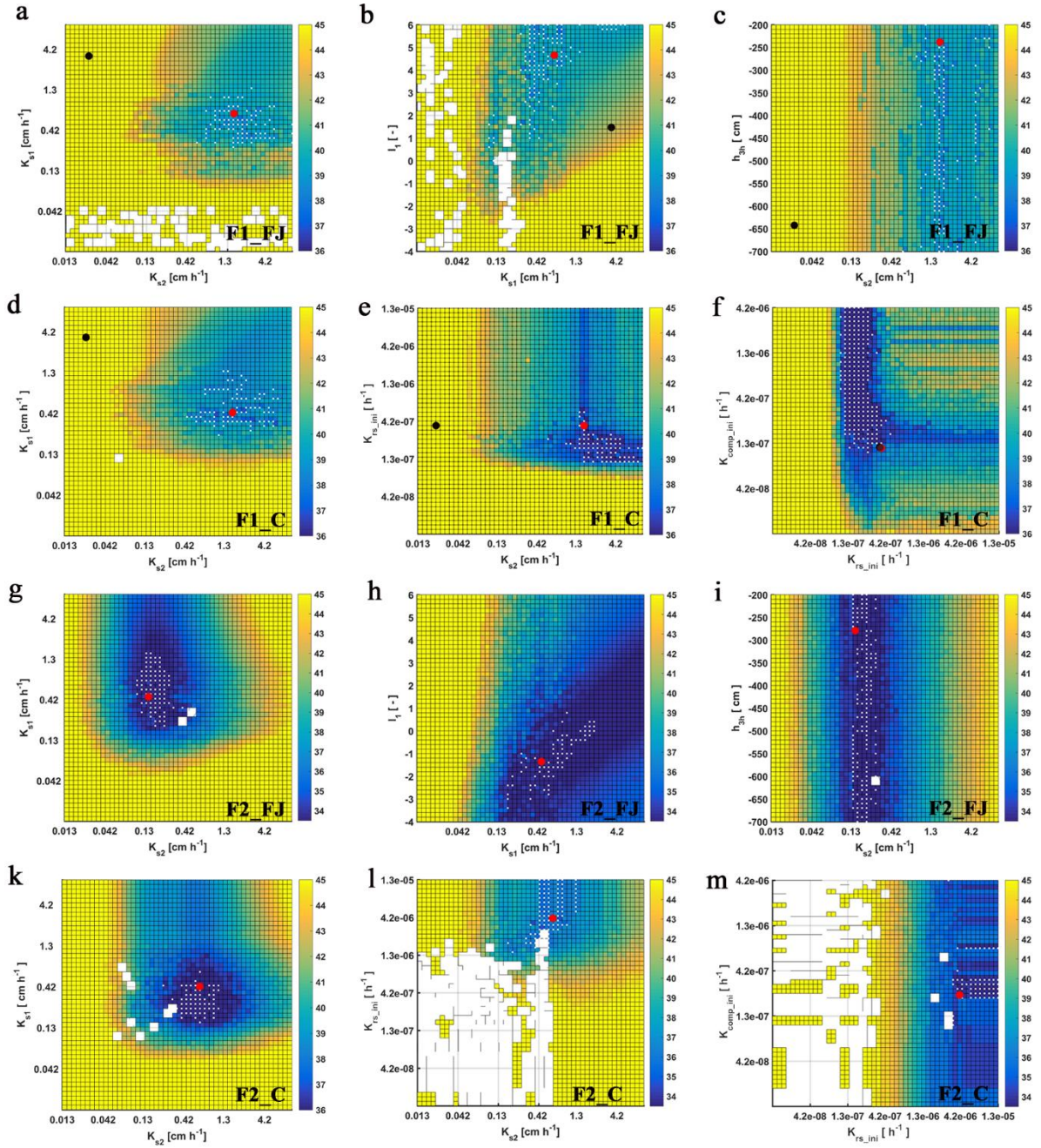
Figure S2. Response surface for $K_{s2} – K_{s1}$ (FJ, Feddes-Jarvis model), $K_{sl} – l_1$ (FJ), $K_{s2} – h_{3h}$ (FJ), $K_{s2} – K_{s1}$ (C, Couvreur model), $K_{s2} – K_{rs\_ini}$ (C), and $K_{rs\_ini} – K_{comp\_ini}$ (C) parameter planes of the stony (F1) and silty (F2) soils. Color bar: range of the objective function; white dot: area within 0.5% range of objective function (OF) minimum; red dot: optimum value obtained from the inverse modeling; black dot: optimum value obtained from the sheltered plot of the stony soil. K_s, saturated conductivity; l, empirical model parameter; 1, 2: top- and subsoil; K_{rs}, root system conductance; K_{comp}, compensatory root water uptake (RWU) conductance; h_{3h}, water potential at high transpiration.
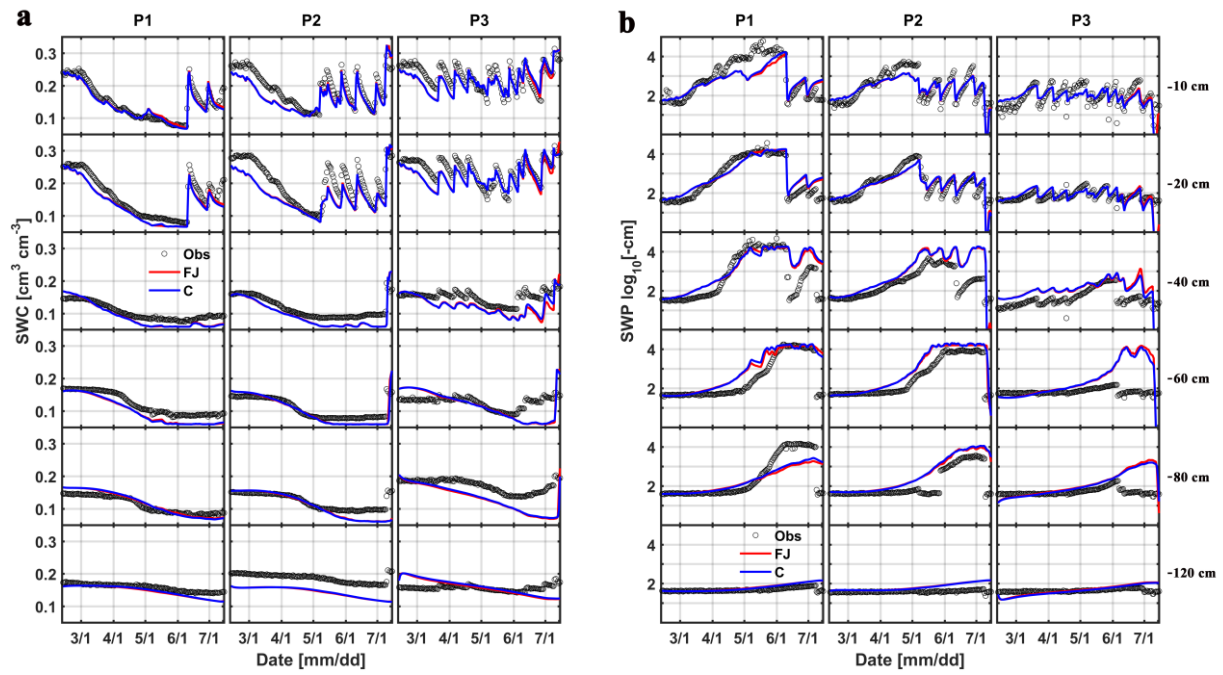
Figure S3. Simulated (**a**) soil water content (SWC) and (**b**) soil water pressure head (SWP) by the Feddes-Jarvis (FJ, blue) and Couvreur (C, red) models at different depths in depths in the three plots (P1: sheltered; P2: rainfed; P3: irrigated) of the stony soil using the parameters that were obtained from the sheltered plot of the stony soil.