atmosphere

Evaluation of Ten Fresh Snow Density Parameterization Schemes for Simulating Snow Depth and Surface Energy Fluxes on the Eastern Tibetan Plateau

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1.1 Supplementary Figures

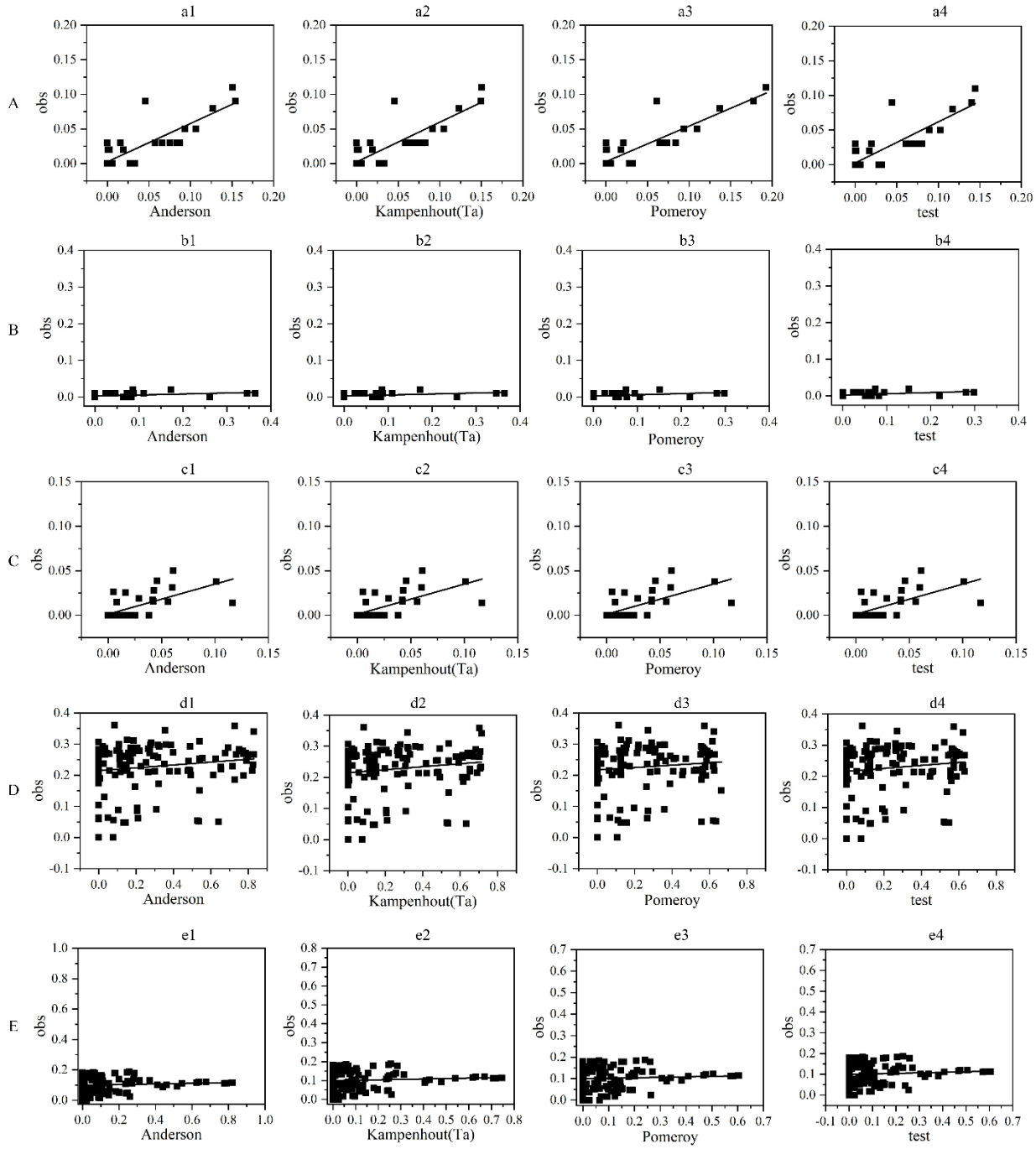

Figure S1. Scatter diagram of snow depth between simulated and observed values using the parameterized schemes related to temperature.

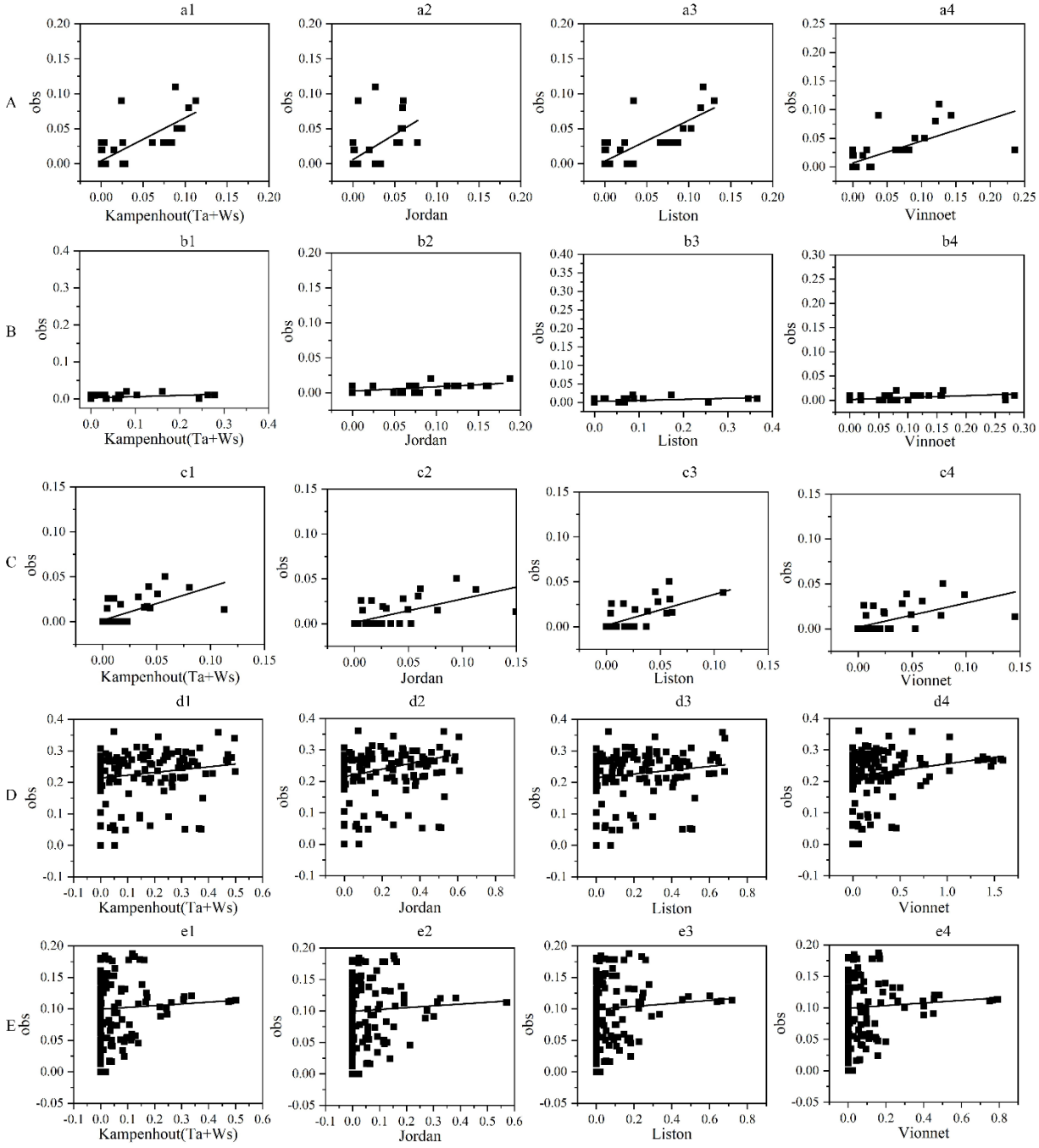

Figure S2. Scatter diagram of snow depth between simulated and observed values using the parameterized schemes related to temperature and wind speed.

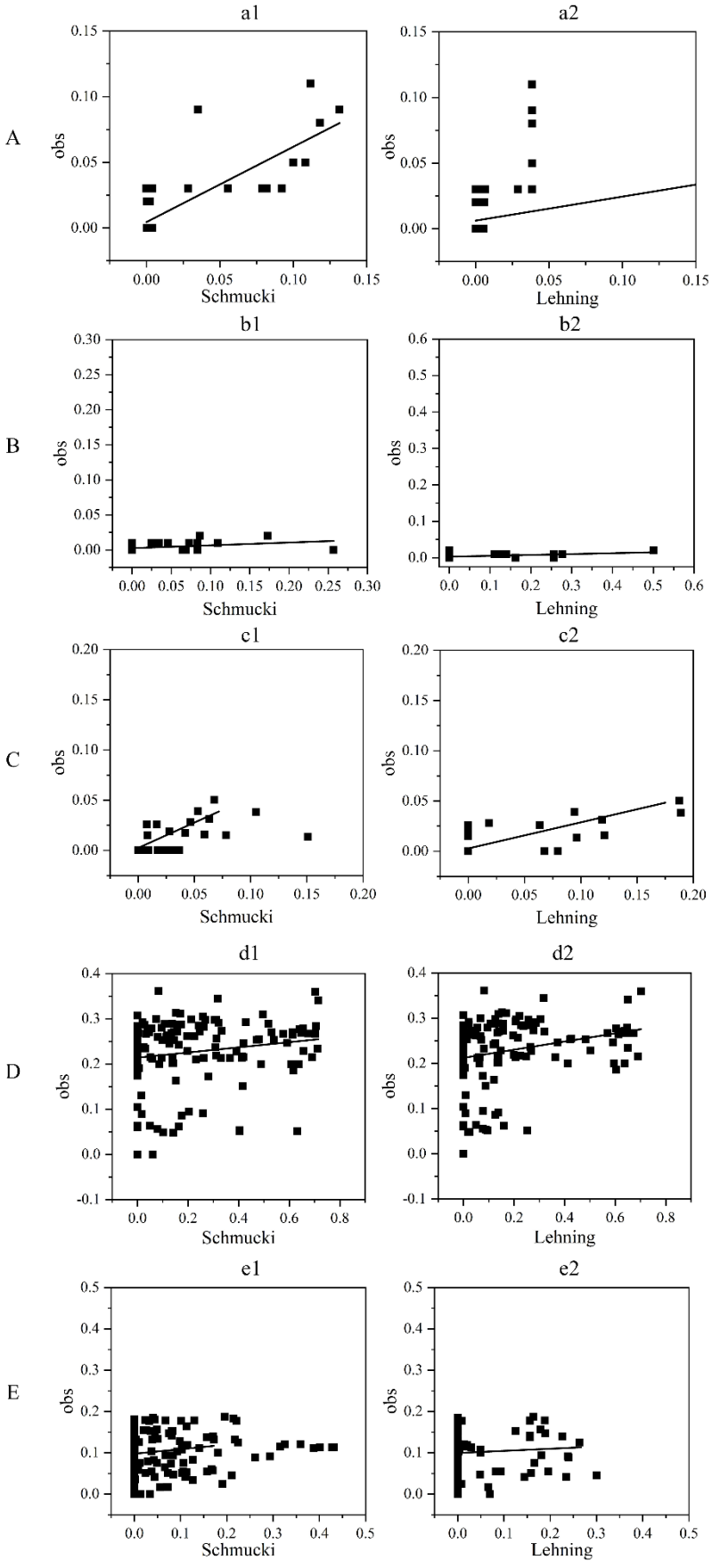
A
a1
a2
B
b1
b2
C
c1
c2
D
d1
d2
E
e1
e2
obs
Schmucki
Lehning

Figure S3. Comparison of snow depth between simulated and observed values using four parameterized schemes related to temperature, wind speed and relative humidity.

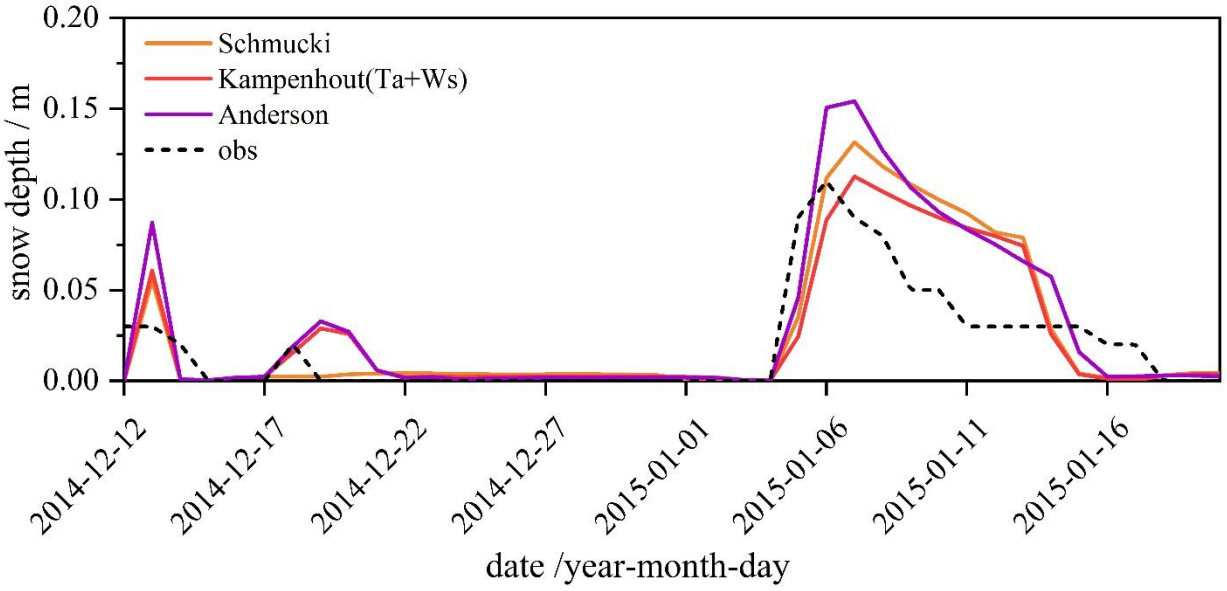

Figure S4. Comparison of snow depth between simulated and observed values using three schemes at Maqu.

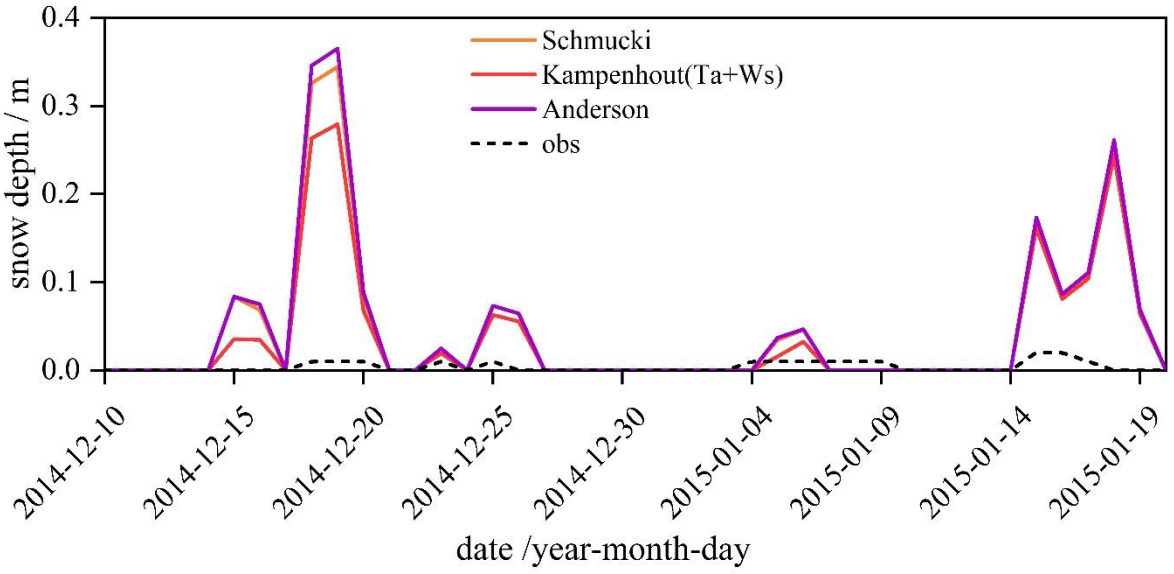

Figure S5. Comparison of snow depth between simulated and observed values using three schemes over short periods at Madoi.

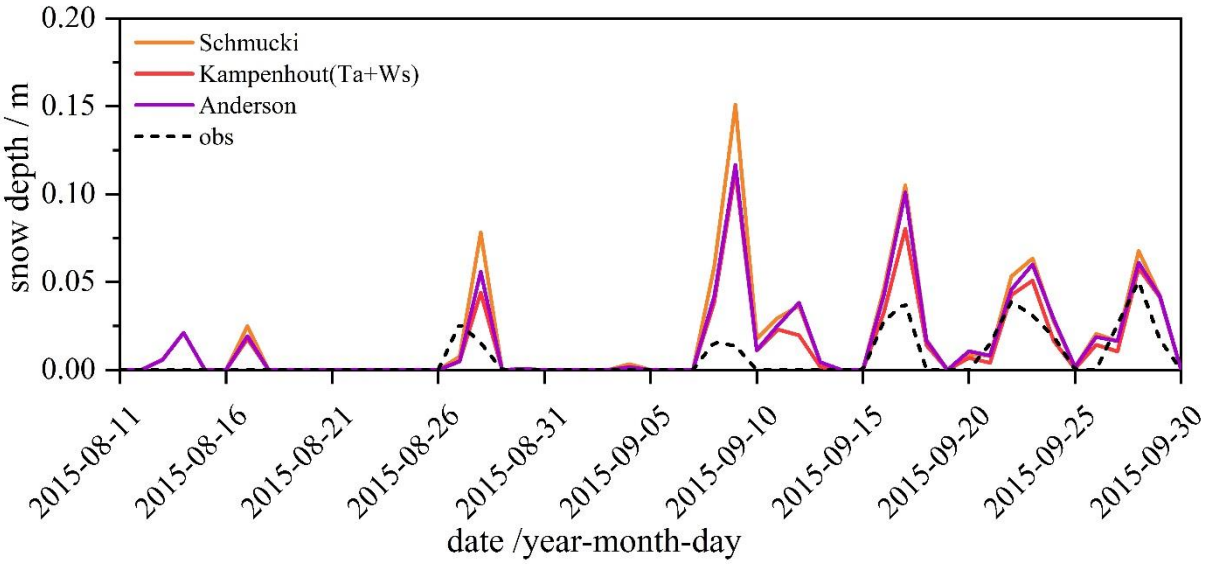

Figure S6. Comparison of snow depth between simulated and observed values using schemes over short periods of time at Yakou.

1.2 Supplementary Tables

Table S1. The observation items and instruments' heights at stations.

Stations	Items	Instruments	Height
Maqu	Air temperature	CR3000	3 m
	Wind speed/direction	CSAT3	3.2 m
	Radiation flux	CNR-1	1.5 m
	Soil heat flux	HFP01	-5 cm
	Soil temperature	107L	-2.5,-5,-10,-20,-40,-80,-160 cm
	Soil moisture content	CS616	-2.5,-5,-10,-20,-40,-80,-160 cm
Madoi	Air temperature	CR3000	3.2 m
	Wind speed/direction	CSAT3	3.2 m
	Radiation flux	CNR-1	1.5 cm
	Soil heat flux	HFP01	-5 cm
	Infrared surface temperature	SI-111	0 cm
	Soil temperature	109L	-5,-10,-20,-40,-80,-160,-320 cm
	Soil moisture content	CS616	-5,-10,-20,-40,-80,-160,-320 cm
	Snow depth	SR50A ultrasonic	
Yakou	Air temperature	HMP45C	5 m
	Wind speed/direction	CSAT3	10 m
	Radiation flux	CNR4；CNR1	6 m(10 min)；1.5 m(30 min)

Soil heat flux	HFP01	-6 cm
Soil temperature	109L	0,-4,-10,-20,-40,-80,-160 cm
Soil moisture content	CS616	-4,-10,-20,-40,-80,-160 cm
Snow depth	SR50A ultrasonic	

Table S2. Comparison of annual average snow-cover days and mean daily snow depth on the TP.

Area	The period of time	Annual average snow- covered days	Mean daily snow depth	References
TP	1961-2014	23.78 d	0.26 cm	Jiang et al., 2020
	1961-2010	24.65 d	0.25 cm	Xu et al., 2017
Maqu	2014-2017	24.75 d	0.18 cm	Li et al., 2021
Madoi	2014-2017	49.25 d	0.24 cm	Li et al., 2021
Yakou	2014-2017	211 d	4.05 cm	Li et al., 2021

Table S3. Initial values of soil temperature, moisture and soil composition at Maqu.

Layer	z_h (m)	Δz (m)	Depth z_h (m)	Temp-erature (°C)	Moistu-re (m^3/m^3)	Ice content (m^3/m^3)	Sand (%)	Clay (%)	Organic (kg/m^3)
1	0.0071	0.0175	0.0175	-7.48	0.09	5.14	32.1	10.84	50.4
2	0.0279	0.0276	0.0451	-4.48	0.09	6.58	32.55	10.64	46.85
3	0.0623	0.0455	0.0906	-2.71	0.09	9.18	33.06	10.35	41.04
4	0.1189	0.0750	0.1655	-1.30	0.095	8.94	33.27	9.98	31.56
5	0.2122	0.1236	0.2891	-0.03	0.2	1.13	31.91	9.63	16.22
6	0.3661	0.2038	0.4929	1.17	0.21	0	24.98	9.79	16.22
7	0.6198	0.3360	0.8289	2.33	0.15	0	24.98	9.79	16.22
8	1.0380	0.5539	1.3828	3.46	0.095	0	24.98	9.79	16.22
9	1.7276	0.9133	2.2961	4.57	0.06	0	24.98	9.79	0
10	2.8646	1.5058	3.8019	5.68	0.05	0	24.98	9.79	0

Table S4. Initial values of soil temperature, moisture and soil composition at Madoi.

Layer	z_h(m)	Δz(m)	Depth z_h(m)	Temperature (°C)	Moisture (m^3/m^3)	Sand (%)	Clay (%)	Organic (kg/m^3)
1	0.0071	0.0175	0.0175	-3.26	0.19	38.64	26.96	85.00
2	0.0279	0.0276	0.0451	-1.55	0.15	38.64	26.96	75.12
3	0.0623	0.0455	0.0906	-0.54	0.12	68.60	14.21	40.14
4	0.1189	0.0750	0.1655	0.27	0.11	65.41	21.28	31.37
5	0.2122	0.1236	0.2891	0.99	0.09	65.41	21.28	18.14
6	0.3661	0.2038	0.4929	1.67	0.07	94.03	3.44	1.92

7	0.6198	0.3360	0.8289	2.33	0.06	93.42	2.69	1.18
8	1.0380	0.5539	1.3828	2.98	0.0	94.17	3.97	1.10
9	1.7276	0.9133	2.2961	3.62	0.02	94.17	3.97	0.00
10	2.8646	1.5058	3.8019	4.25	0.01	91.52	4.32	0.00

Table S5. Soil mechanical composition of the soil at Yakou.

Layer	z_h(m)	Δz(m)	Depth z_h(m)	Sand (%)	Clay (%)
1	0.0071	0.0175	0.0175	48.93	5.54
2	0.0279	0.0276	0.0451	48.93	5.54
3	0.0623	0.0455	0.0906	61.33	6.52
4	0.1189	0.0750	0.1655	73.60	8.28
5	0.2122	0.1236	0.2891	72.52	8.29
6	0.3661	0.2038	0.4929	13.57	1.47
7	0.6198	0.3360	0.8289	14.15	1.76
8	1.0380	0.5539	1.3828	14.97	2.03
9	1.7276	0.9133	2.2961	15.00	2.00
10	2.8646	1.5058	3.8019	15.00	2.00