

Table S1. An overview of the field-measured soil moisture sites, including top-layer soil moisture r for TRMM open loop (OL) and assimilation experiments (L, C, X)

Site ID	Latitude	Longitude	Top sensor (m)	Modified Köppen class	IGBP land cover	r			
						OL	L	C	X
Y1	-34.63	145.85	0.05	Grassland	GRA	0.60	0.76	0.65	0.68
Y2	-34.65	146.11	0.05	Grassland	GRA	0.70	0.79	0.73	0.74
Y5	-34.73	146.29	0.05	Grassland	GRA	0.57	0.80	0.66	0.70
Y6	-34.84	145.87	0.05	Grassland	GRA	0.59	0.65	0.62	0.63
Y7	-34.85	146.12	0.05	Grassland	GRA	0.28	0.47	0.36	0.35
Y8	-34.85	146.41	0.05	Grassland	GRA	0.57	0.80	0.63	0.70
Y9	-34.97	146.02	0.05	Grassland	GRA	0.72	0.78	0.76	0.76
Y11	-35.11	145.94	0.05	Grassland	GRA	0.45	0.70	0.54	0.58
Y12	-35.07	146.17	0.05	Grassland	GRA	0.72	0.81	0.75	0.77
Y13	-35.09	146.31	0.05	Grassland	GRA	0.68	0.77	0.71	0.72
K7	-35.39	147.57	0.05	Temperate	GRA	0.35	0.57	0.37	0.52
K13	-35.24	147.53	0.05	Temperate	GRA	0.63	0.77	0.73	0.71
AU-Cpr*	-34.00	140.59	0.10	Grassland	SAV	0.58	0.69	0.61	0.59
AU-DaP	-14.06	131.32	0.05	Tropical	GRA	0.77	0.83	0.76	0.78
AU-DaS	-14.16	131.39	0.05	Tropical	SAV	0.80	0.84	0.80	0.82
AU-Dry	-15.26	132.37	0.15	Grassland	SAV	0.80	0.85	0.81	0.84
AU-Gin	-31.38	115.65	0.10	Subtropical	WSA	0.64	0.60	0.60	0.80
AU-GWW	-30.19	120.65	0.05	Grassland	SAV	0.64	0.70	0.66	0.64
AU-Rig*	-36.65	145.58	0.05	Temperate	GRA	0.51	0.62	0.61	0.68
AU-Rob*	-17.12	145.63	0.06	Subtropical	EBF	0.52	0.55	0.54	0.58
AU-Stp	-17.15	133.35	0.05	Grassland	GRA	0.62	0.64	0.65	0.64
AU-Tum*	-35.66	148.15	0.07	Temperate	EBF	0.60	0.63	0.58	0.68
AU-Whr*	-36.67	145.03	0.10	Temperate	EBF	0.34	0.49	0.41	0.57
AU-Ync	-35.01	146.30	0.03	Temperate	GRA	0.73	0.86	0.76	0.80

*No root-zone soil moisture data available