



*Supplement of*

## **Modelling evapotranspiration during precipitation deficits: identifying critical processes in a land surface model**

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**Table S1.** Study flux tower sites. PFT stands for plant functional type.

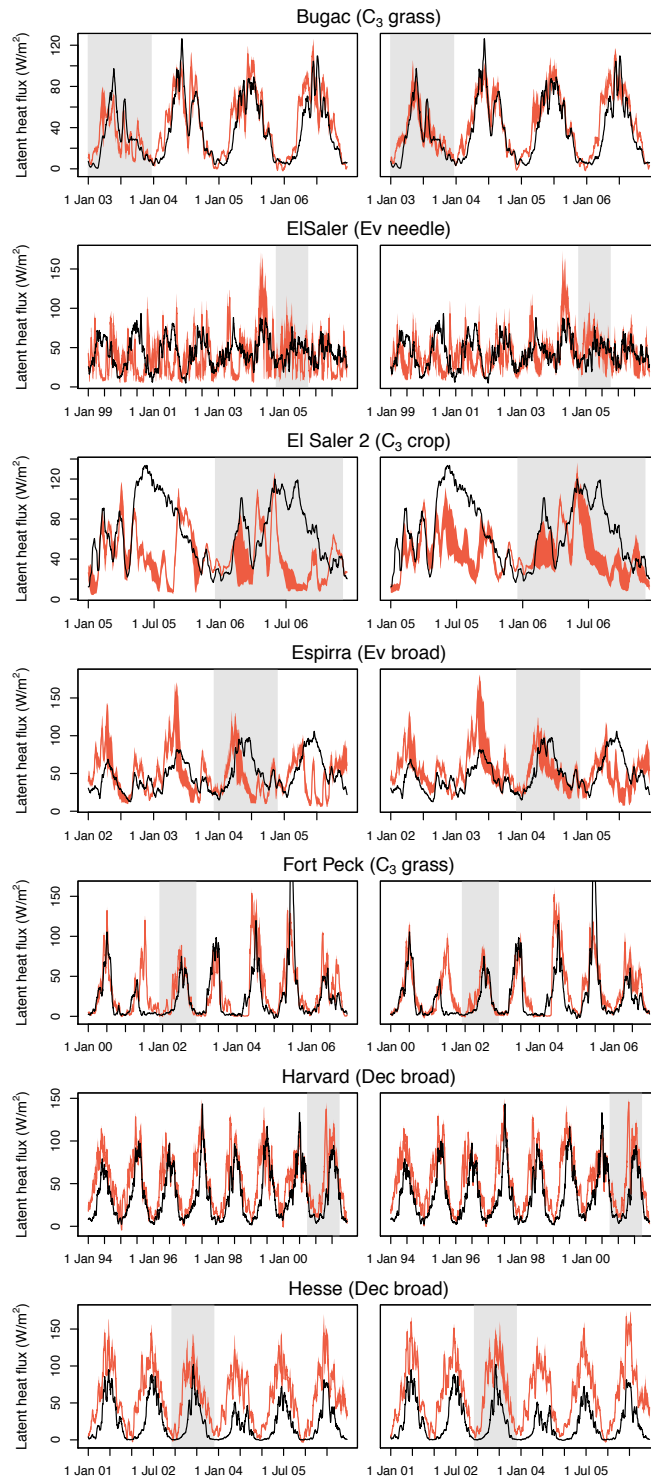
<b>Site name</b>	<b>Country</b>	<b>Lat.</b>	<b>Long.</b>	<b>CABLE PFT</b>	<b>Record length</b>
Amplero*	Italy	41.90	13.61	C <sub>3</sub> grass	2003-2006
Blodgett*	USA	38.90	-120.63	Evergreen needleleaf	2000-2006
Bugac	Hungary	46.69	19.60	C <sub>3</sub> grass	2002-2006
El Saler	Spain	39.35	-0.32	Evergreen needleleaf	2003-2005
El Saler 2	Spain	39.28	-0.32	C <sub>3</sub> crop	2005-2006
Espirra	Portugal	38.64	-8.60	Evergreen broadleaf	2001-2006
Fort Peck	USA	48.31	-105.10	C <sub>3</sub> grass	2000-2006
Harvard	USA	42.54	-72.17	Deciduous broadleaf	1994-2001
Hesse	France	48.67	7.06	Deciduous broadleaf	1999-2006
Howard Springs*	Australia	-12.49	131.15	C <sub>4</sub> grass	2002-2005
Howland main	USA	45.20	-68.74	Evergreen needleleaf	1996-2004
Hyytiälä	Finland	61.85	24.29	Evergreen needleleaf	2001-2004
Kruger	South Africa	-25.02	31.50	C <sub>4</sub> grass	2002-2003
Loobos	Netherlands	52.17	5.74	Evergreen needleleaf	1997-2006
Merbleue	Canada	45.41	-75.52	Wetland	1999-2005
Mopane	Botswana	-19.92	23.56	C <sub>4</sub> grass	1999-2001
Palang*	Indonesia	2.35	111.04	Evergreen broadleaf	2002-2003
Sylvania	USA	46.24	-89.35	Deciduous broadleaf	2002-2005
Tumbarumba*	Australia	-35.66	148.15	Evergreen broadleaf	2002-2005
University of Michigan*	USA	45.56	-84.71	Deciduous broadleaf	1999-2003

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\* Selected site

**Table S2.** Parameter values for the three soil classes used to run CABLE. “Default” and “new” refer to the two hydrological schemes employed in the study. Where only one value is given, both schemes use an identical value for the parameter.

Parameter	Sand		Medium		Clay	
	<i>Default</i>	<i>New</i>	<i>Default</i>	<i>New</i>	<i>Default</i>	<i>New</i>
Silt content (fraction)	0.08		34		0.17	
Clay content (fraction)	0.09		33		0.67	
Sand content (fraction)	0.83		33		0.16	
Soil density (kg/m <sup>3</sup> )	1600		1490		1381	
Soil heat capacity (J/kg/C)	850		850		850	
	<i>Default</i>	<i>New</i>	<i>Default</i>	<i>New</i>	<i>Default</i>	<i>New</i>
Volumetric water content at wilting (m <sup>3</sup> /m <sup>3</sup> )	0.072	0.034	0.179	0.149	0.286	0.251
Volumetric water content at field capacity (m <sup>3</sup> /m <sup>3</sup> )	0.142	0.168	0.255	0.298	0.367	0.369
Volumetric water content at saturation (m <sup>3</sup> /m <sup>3</sup> )	0.398	0.384	0.440	0.447	0.482	0.469
Parameter <i>B</i> (Clapp and Hornberger, 1978)	4.20	4.34	7.80	8.12	11.4	13.6
Hydraulic conductivity at saturation (m/s)	166 x 10 <sup>-6</sup>	17 x 10 <sup>-6</sup>	83 x 10 <sup>-6</sup>	2.9 x 10 <sup>-6</sup>	1 x 10 <sup>-6</sup>	2 x 10 <sup>-6</sup>
Suction at saturation (m)	-0.106	-0.062	-0.255	-0.280	-0.405	-0.468



**Fig. S1.** The range in simulated latent heat (red) during the whole observational data period using the default (left panel) and new (right panel) hydrological schemes with alternative LAI,  $g_s$  and soil parameterisations. Observed latent heat is shown in black. The grey shading denotes the year of lowest precipitation.

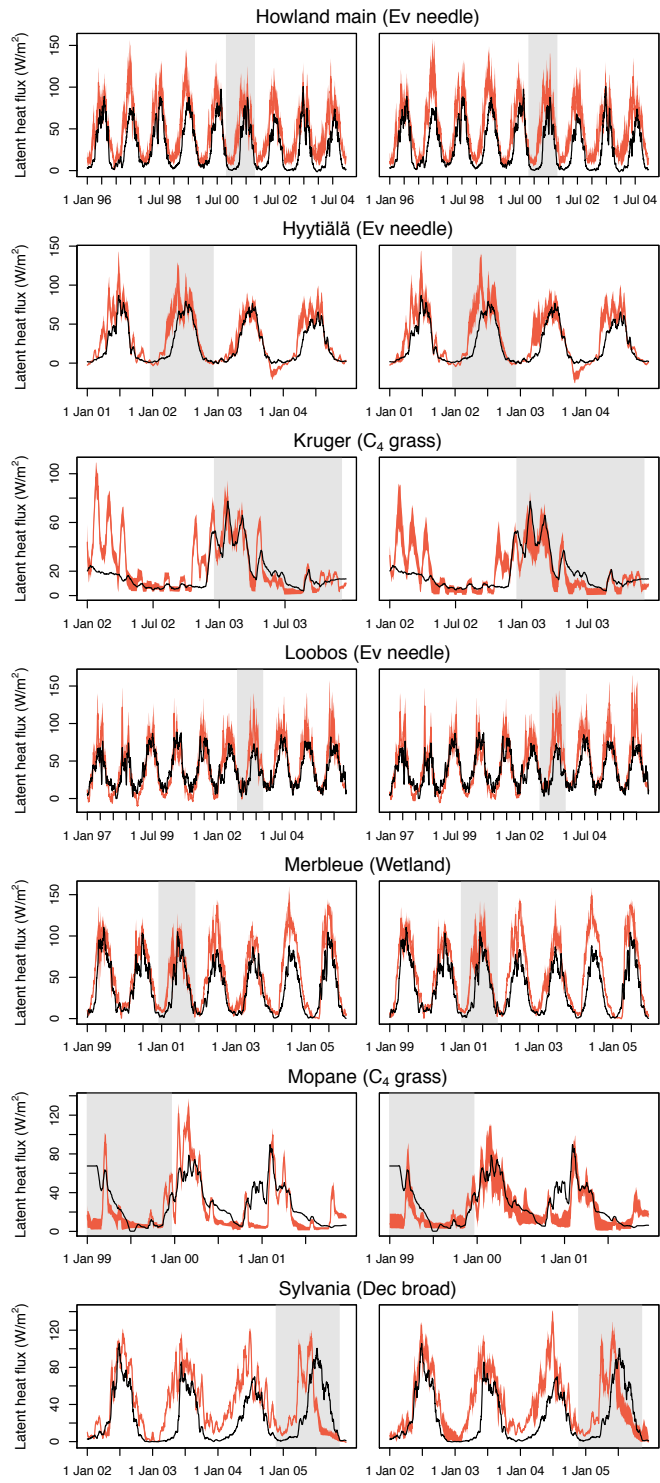
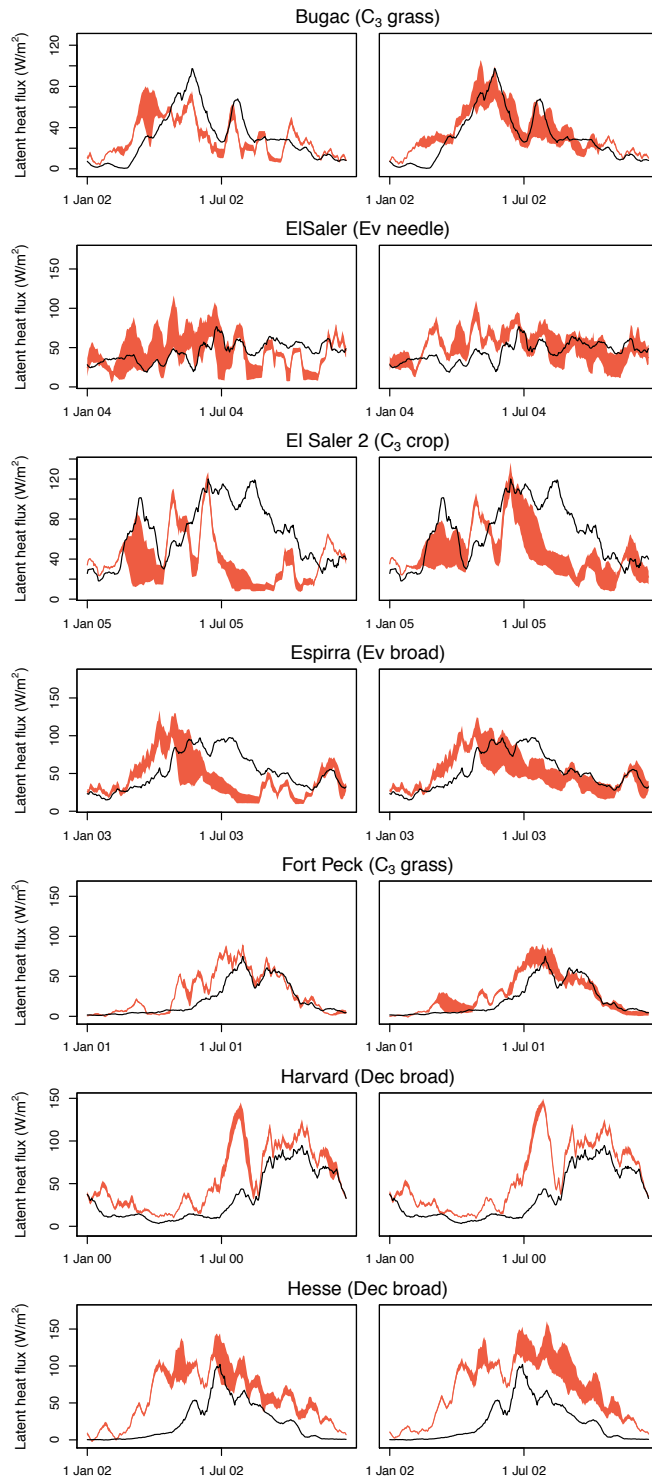


Fig. S1 continued.



**Fig. S2.** The range in simulated latent heat (red) during the year of lowest precipitation using the default (left panel) and new (right panel) hydrological schemes with alternative LAI,  $g_s$  and soil parameterisations. Observed latent heat is shown in black.

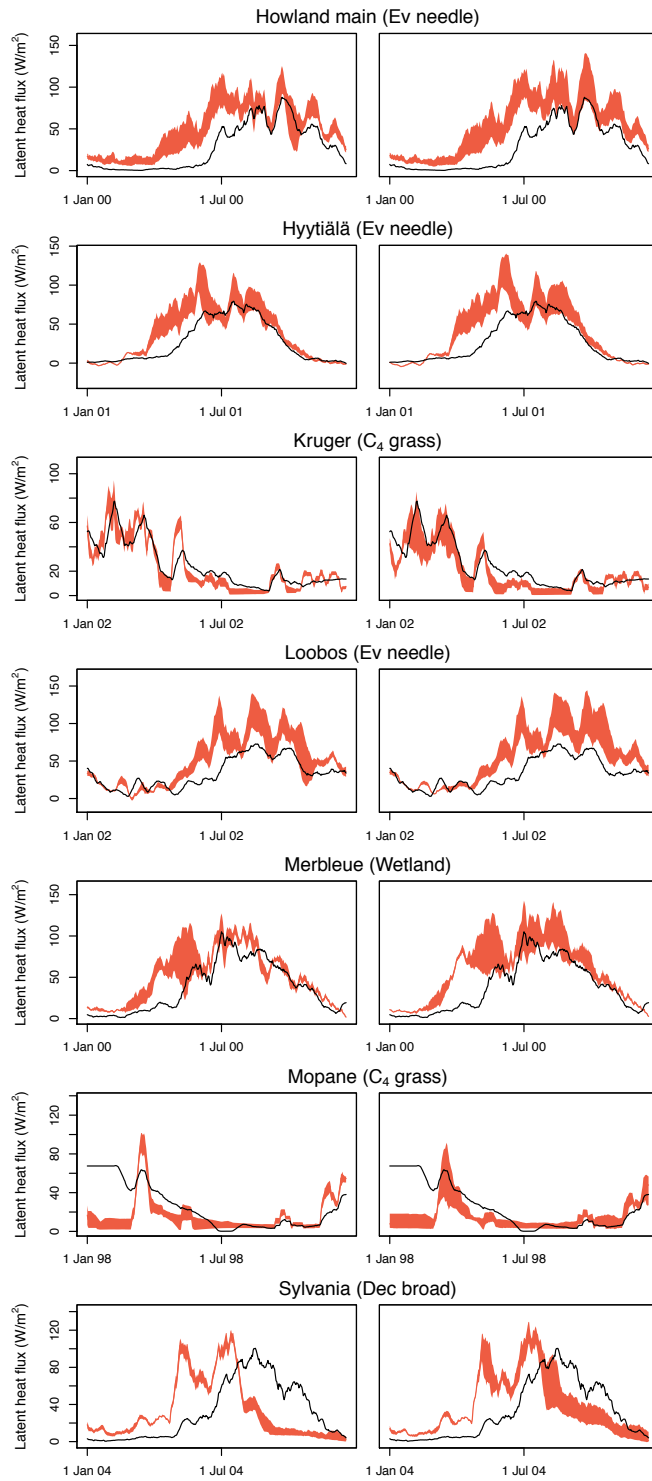
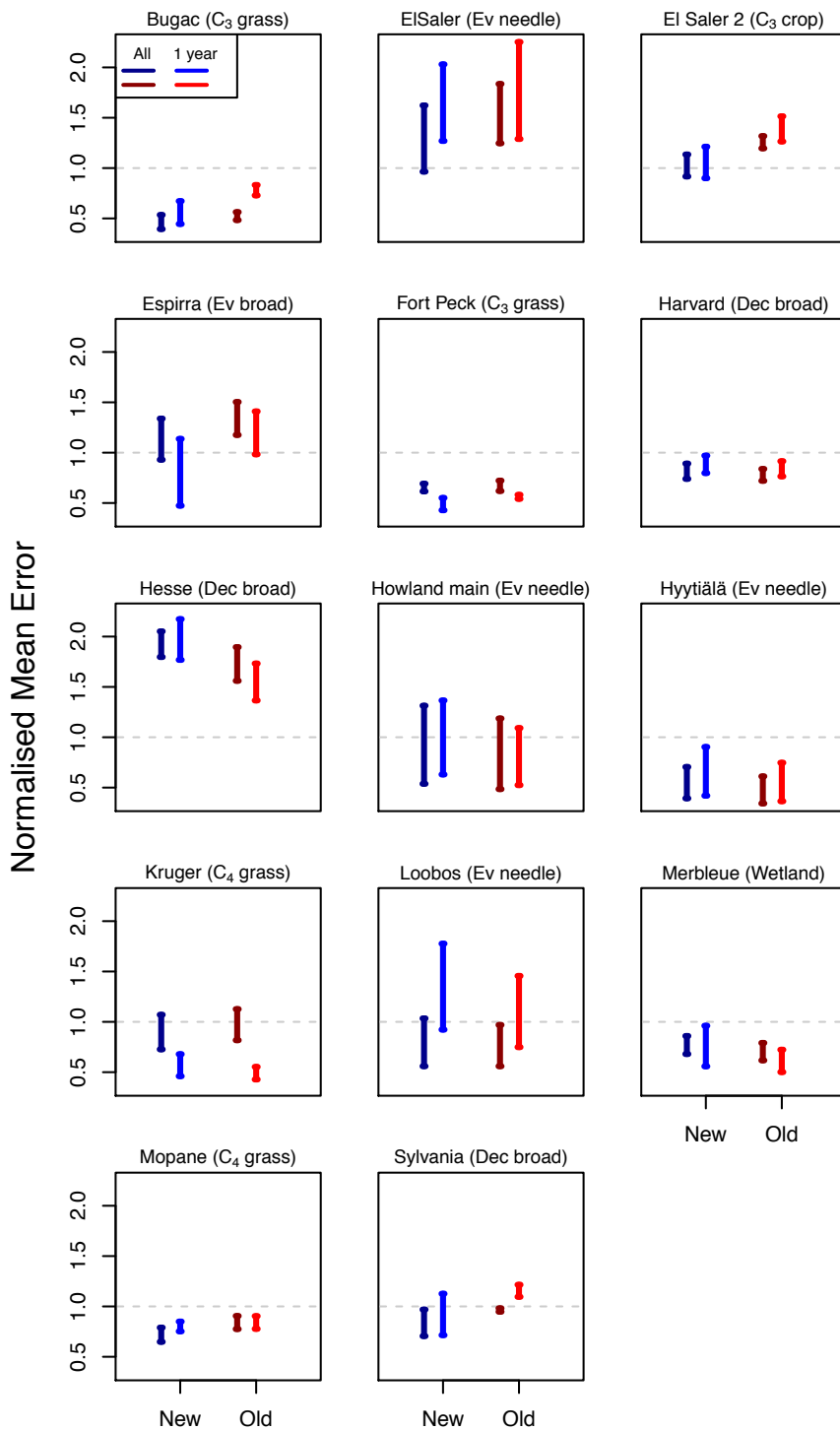
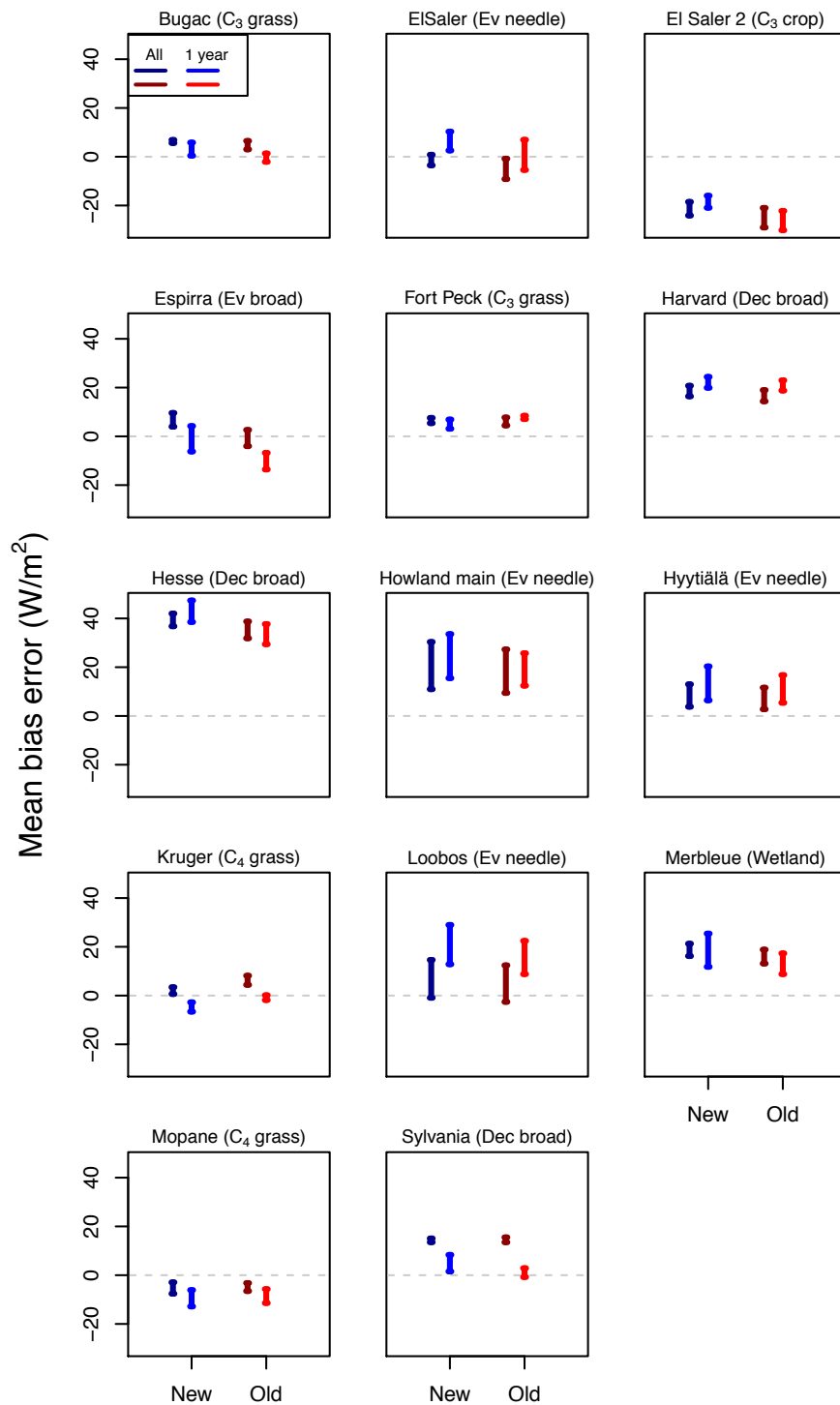


Fig. S2 continued.

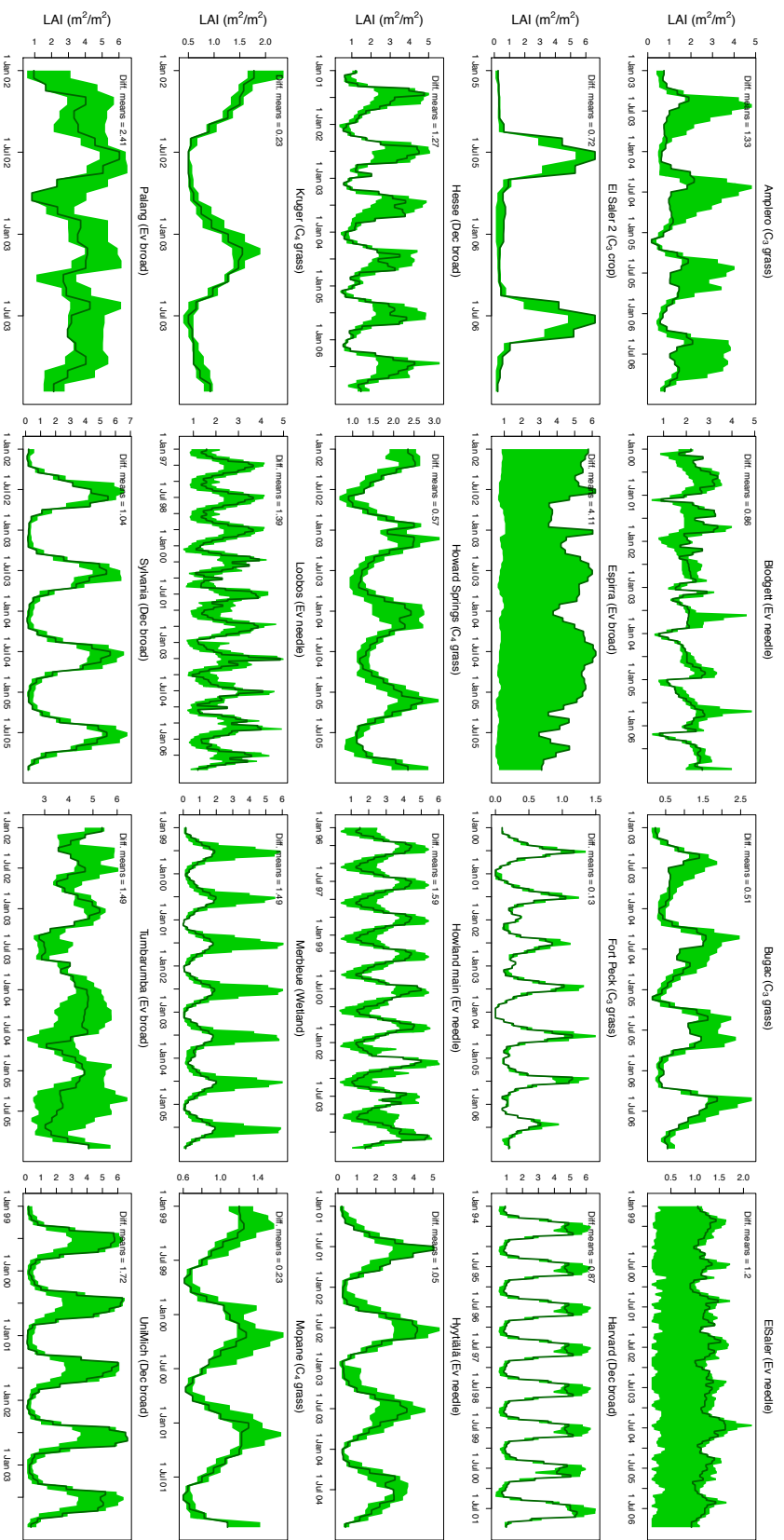


**Fig. S3.** The range in normalised mean error metrics of latent heat simulations using the default (red) and new (blue) hydrological schemes with alternative LAI,  $g_s$  and soil parameterisations during the whole data period and the year of lowest precipitation. The new scheme was run with 0° slope.

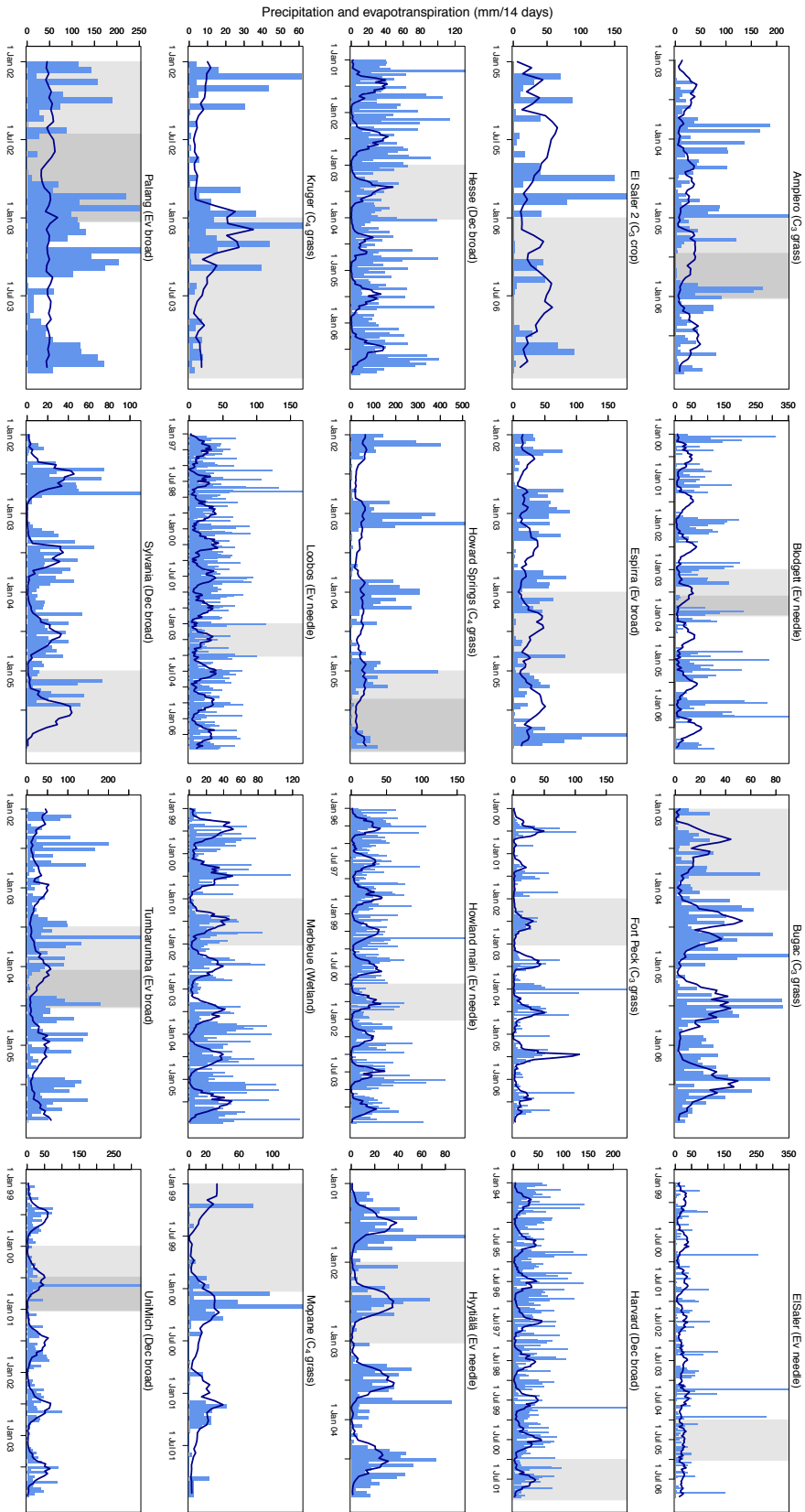




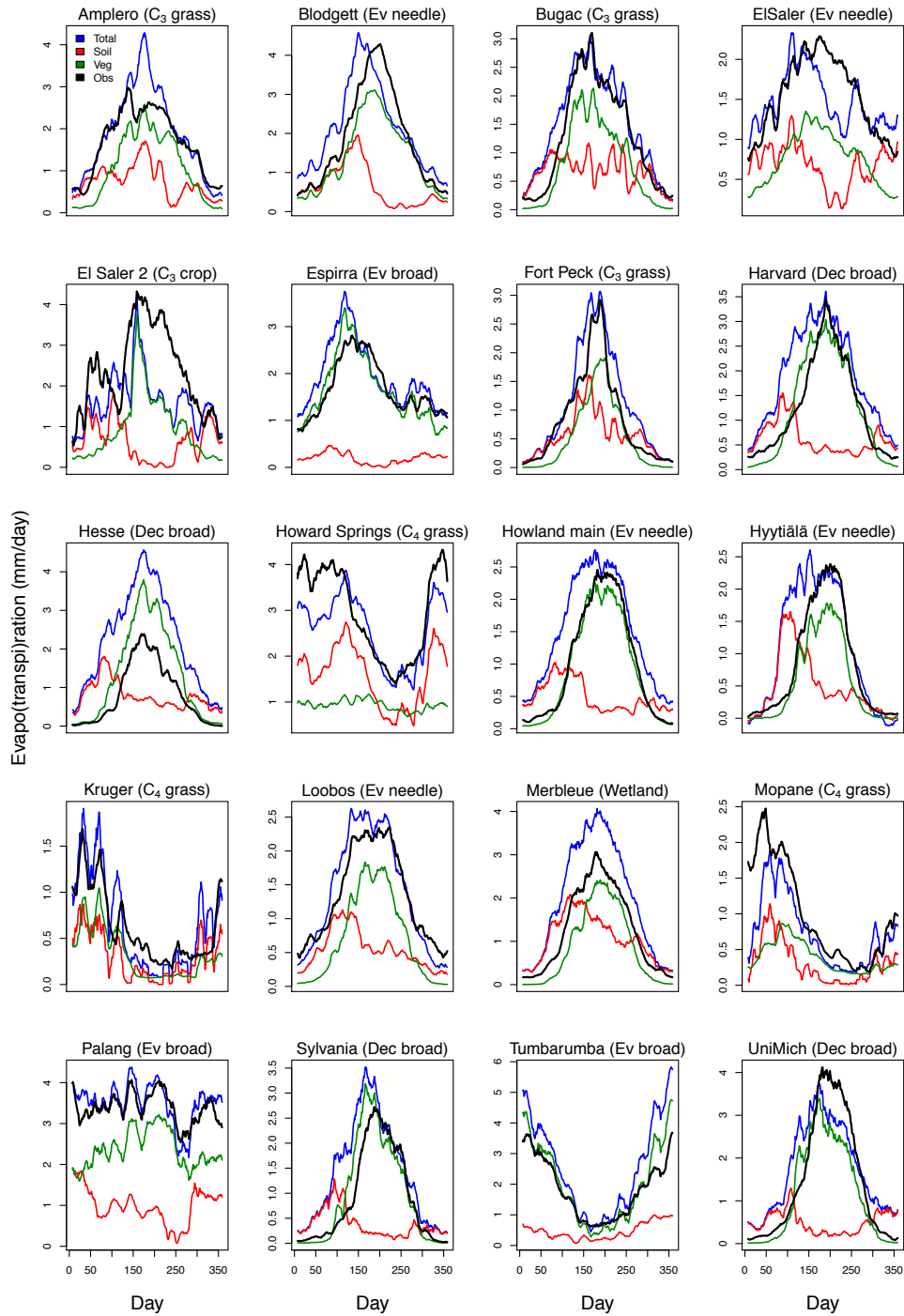
**Fig. S4.** The range in mean bias error metrics of latent heat simulations using the default (red) and new (blue) hydrological schemes with alternative LAI,  $g_s$  and soil parameterisations during the whole, annual and dry-down periods. The new scheme was run with  $0^\circ$  slope.



**Fig. S5.** LAI time series used to run CABLE. The solid line shows “the centre” time series, the upper bound of the green range shows the “maximum” and the lower bound the “minimum” time series. The mean absolute difference between the “maximum” and “minimum” LAI time series is shown.



**Fig. S6.** Observed 14-day precipitation (bars) and evapotranspiration (lines; converted from  $Q_E$ ) totals. The grey shading denotes the one-year period and the dark grey shading denotes the dry-down period for the selected sites.



**Fig. S7.** 14-day running mean climatology of simulated total evapotranspiration (blue), soil evaporation (red) and transpiration (green). Observed total evapotranspiration (converted from  $Q_E$ ) is shown in black. CABLE simulation using the new hydrology with Medlyn  $g_s$ , medium soil, centre LAI and  $0^\circ$  slope was used for plotting.

## References

Clapp, R. B. and Hornberger, G. M.: Empirical equations for some soil hydraulic properties, *Water Resour. Res.*, 14, 601–604, 1978.