



Supplement of

Uncertainties in long-term ensemble estimates of contextual evapotranspiration over southern France

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Section S1. Performance and similarity assessment of the EVASPA estimates (similar to section 4.2 but including VIIRS LST data)

Table S1: Global performance of daily evapotranspiration based on the average of all EVASPA ensemble members (as in Table 2, but including VIIRS-based estimates).

	Interpolated daily ET estimates							non-interpolated daily ET estimates						
	RMSD	Willmott's	Bias	MAE	uncertainty (median)*			RMSD	Willmott's	Bias	MAE	uncertainty (median)*		
	[mm/d]	D [-]	[mm/d]	[mm/d]	SD	CV	QCD	[mm/d]	D [-]	[mm/d]	[mm/d]	SD	CV	QCD
<i>Aurade</i>	0.93	0.83	0.10	0.68	0.42	0.30	0.21	1.18	0.80	0.23	0.90	0.48	0.25	0.18
<i>Bilos</i>	0.83	0.86	-0.17	0.62	0.43	0.34	0.23	1.08	0.81	-0.09	0.82	0.52	0.28	0.20
<i>Coussoul</i>	1.01	0.63	0.62	0.72	0.47	0.41	0.28	1.19	0.57	0.77	0.93	0.56	0.38	0.26
<i>Fontblanche</i>	0.94	0.58	-0.19	0.75	0.39	0.41	0.27	1.06	0.52	-0.01	0.85	0.43	0.36	0.24
<i>Lamasquere</i>	1.04	0.71	-0.41	0.70	0.40	0.44	0.30	1.27	0.62	-0.37	0.88	0.49	0.38	0.26
<i>LeBray</i>	0.74	0.85	-0.11	0.57	0.43	0.36	0.25	0.88	0.83	0.06	0.68	0.49	0.30	0.21
<i>Puechabon</i>	0.87	0.84	0.45	0.67	0.43	0.26	0.18	1.09	0.81	0.59	0.85	0.49	0.23	0.16
<i>Toulouse</i>	1.10	0.55	-0.70	0.79	0.40	0.68	0.47	1.35	0.42	-0.67	0.97	0.47	0.64	0.44
<i>Croplands</i>	0.99	0.78	-0.16	0.69	0.41	0.36	0.25	1.22	0.74	-0.07	0.89	0.49	0.31	0.21
<i>Forests</i>	0.87	0.80	-0.02	0.67	0.42	0.34	0.23	1.06	0.76	0.18	0.83	0.48	0.28	0.20
<i>Grasslands</i>	1.07	0.50	-0.27	0.78	0.43	0.51	0.35	1.28	0.40	-0.13	0.96	0.52	0.45	0.31
<i>Winter</i>	0.52	0.54	-0.14	0.38	0.16	0.36	0.25	0.59	0.49	-0.07	0.47	0.18	0.31	0.22
<i>Spring</i>	1.01	0.71	-0.22	0.78	0.54	0.35	0.24	1.23	0.64	-0.11	0.95	0.59	0.32	0.22
<i>Summer</i>	1.32	0.59	0.06	1.05	0.73	0.32	0.22	1.52	0.57	0.21	1.22	0.74	0.33	0.23
<i>Autumn</i>	0.70	0.65	-0.05	0.53	0.32	0.35	0.24	0.83	0.60	0.07	0.65	0.36	0.32	0.22
<i>All sites and seasons combined</i>	0.94	0.78	-0.09	0.69	0.41	0.35	0.24	1.15	0.73	0.04	0.87	0.49	0.32	0.22

* Reported uncertainty are the median values over the uncertainty time series';
E.g. for SD, the standard deviation is calculated for the ensemble at each time step, then the median of the SD time series is reported.

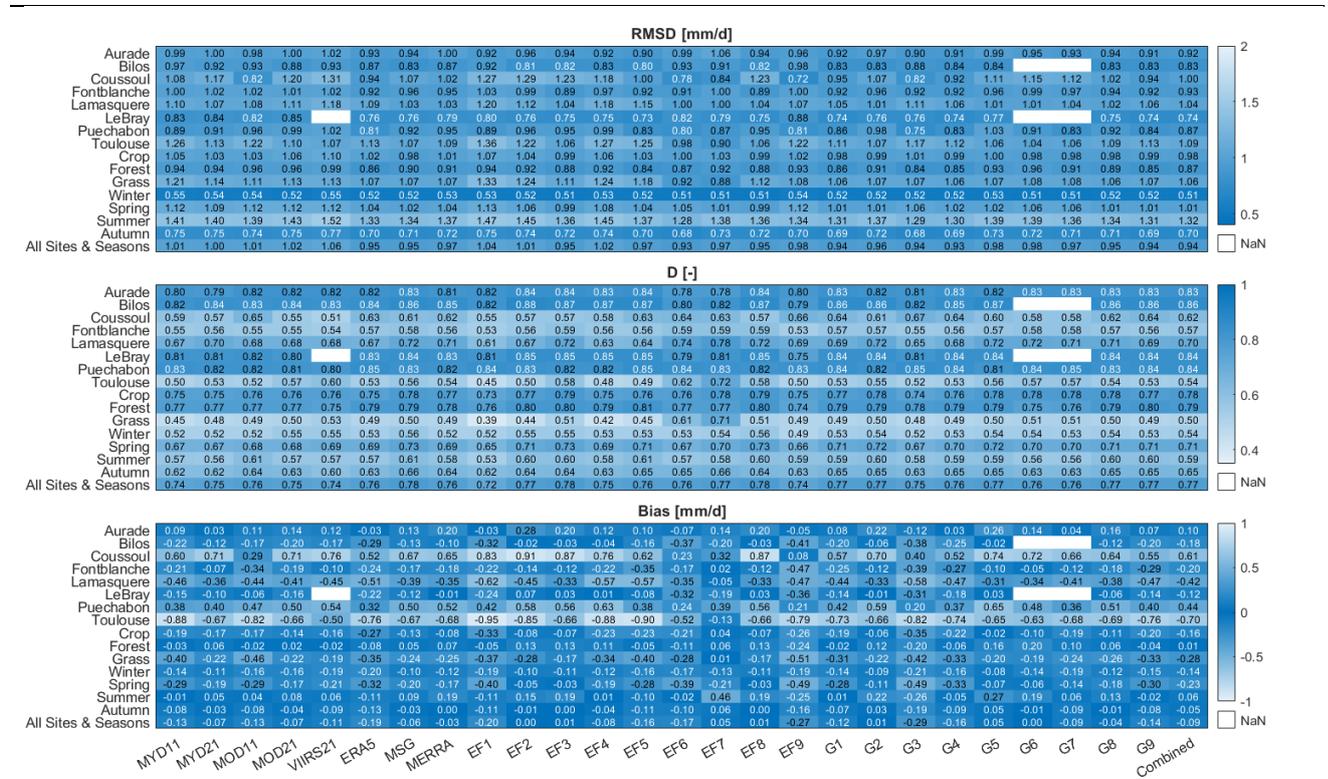


Figure S1: As in Figure 5, but including VIIRS-based set* of gap-filled daily ET estimates.

* EVASPA model / set construction:

- *LSTs example: the MYD11 set of gap-filled daily ET is constructed taking MYD11 LST/E as the unique LST dataset used together with the 3 radiation datasets, 9 EF and 9 G methods for 243 estimates. Here, the source of the ensemble spread or uncertainty is therefore the 3 radiation data, 9 EF algorithms and 9 G flux methods when used in combination with MYD11.*
- *Radiation example: the ERA5 set of gap-filled daily ET is constructed taking ERA5 as the unique radiation dataset used together with the 4 LSTs (or 5 LSTs here, including VIIRS), 9 EF and 9 G methods for 324 (or 405 here, including VIIRS-based) ET estimates.*
- *EFs example: the EF1 set of gap-filled daily ET is constructed taking EF1 as the unique EF method used together with the 4 LSTs (or 5 LSTs here, including VIIRS), 3 radiation datasets, and 9 G methods for 108 (or 135 here, including VIIRS-based) estimates.*
- *G example: the G1 set of gap-filled daily ET is constructed taking G1 as the unique G flux method used together with the 4 LSTs (or 5 LSTs here, including VIIRS), 3 radiation datasets, and 9 EF methods for 108 (or 135 here, including VIIRS-based) estimates.*

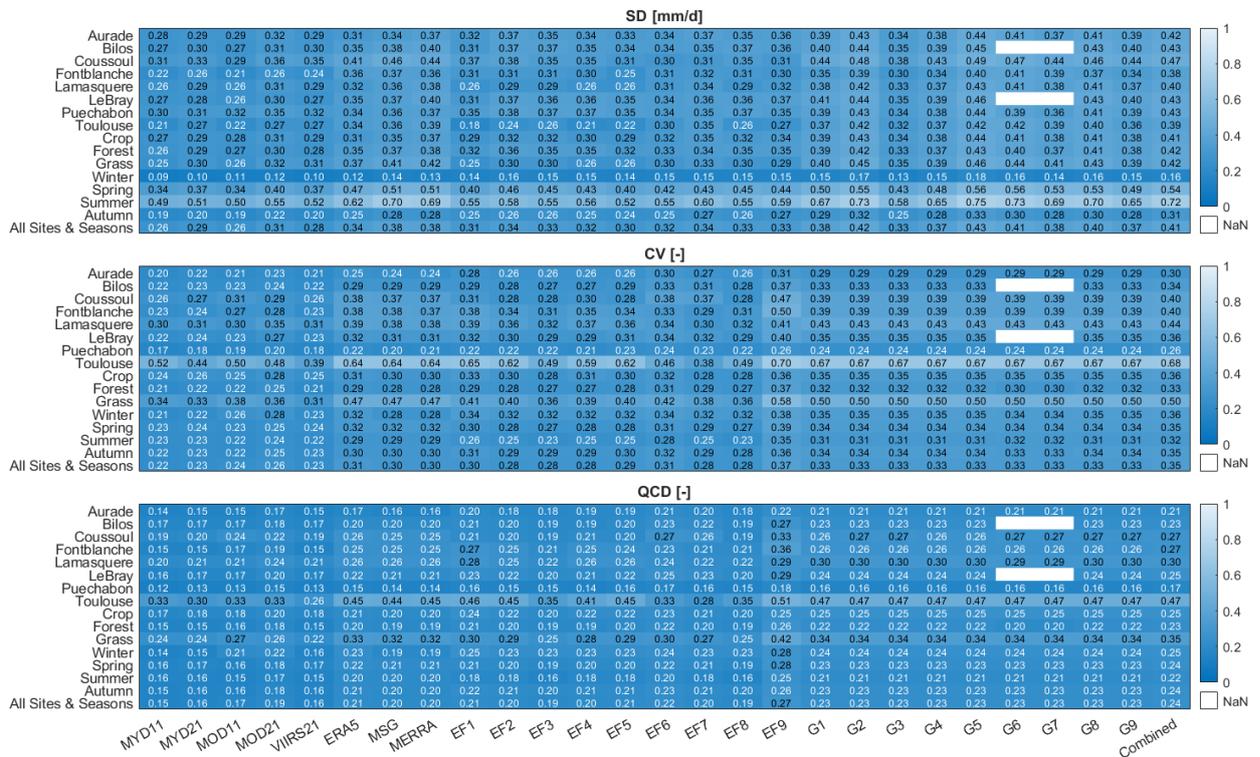


Figure S2: As in Figure 6, but including VIIRS-based set* of gap-filled daily ET estimates.

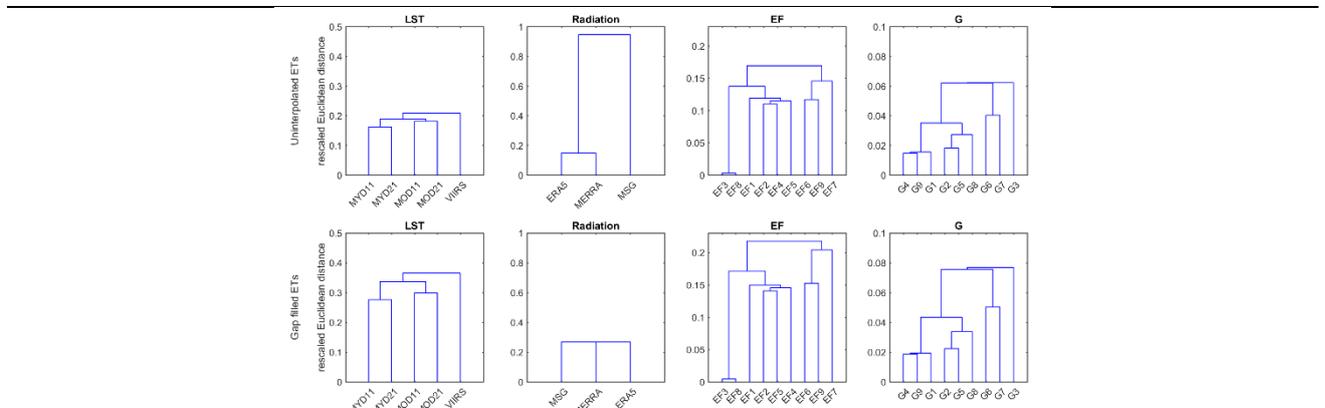


Figure S3: As in Figure 8, but including VIIRS-based estimates.

Section S2. Comparison of individual EVASPA members according to land cover type and seasons

S2.1. Heatmaps between distinct/individual ensemble members

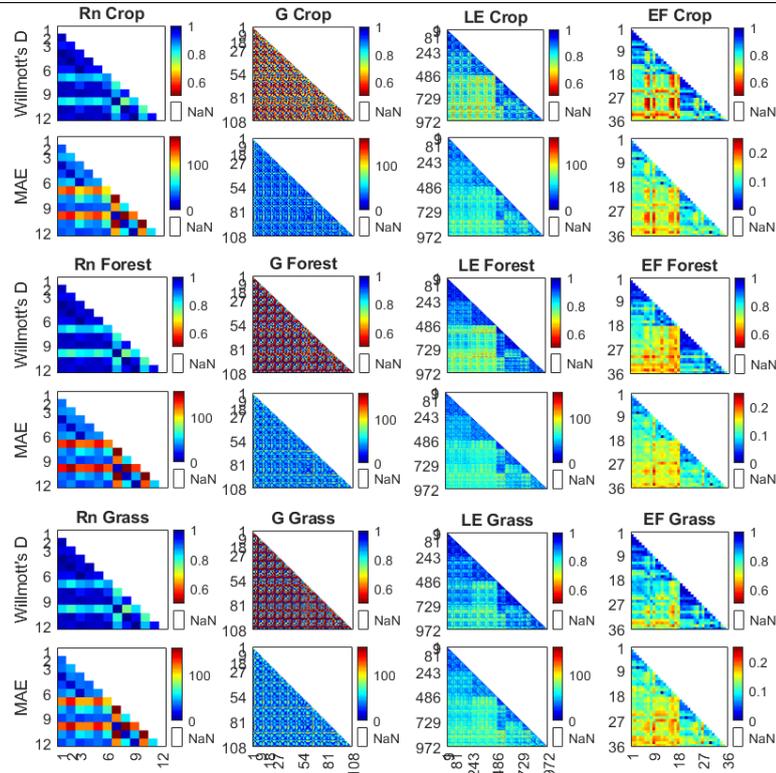
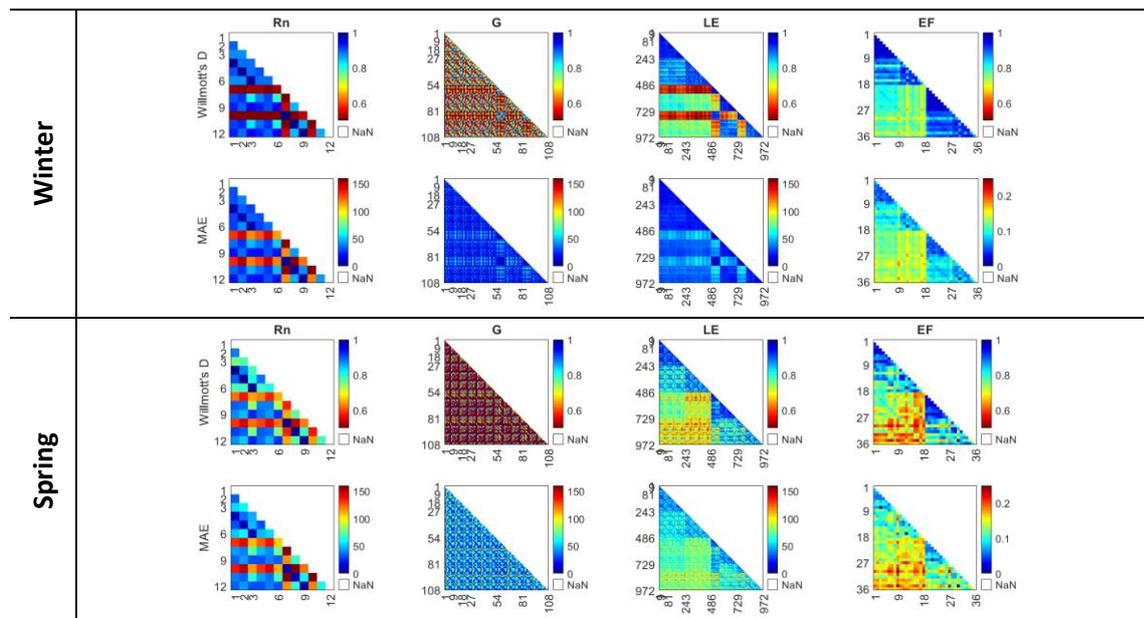


Figure S4: Heat maps showing variability within the EVASPA ensemble according to land cover type (separately for net radiation - Rn, ground heat flux - G, latent heat flux – LE, and evaporative fraction - EF). Fluxes (Rn, G, LE) were rescaled for consistent comparisons between overpasses.



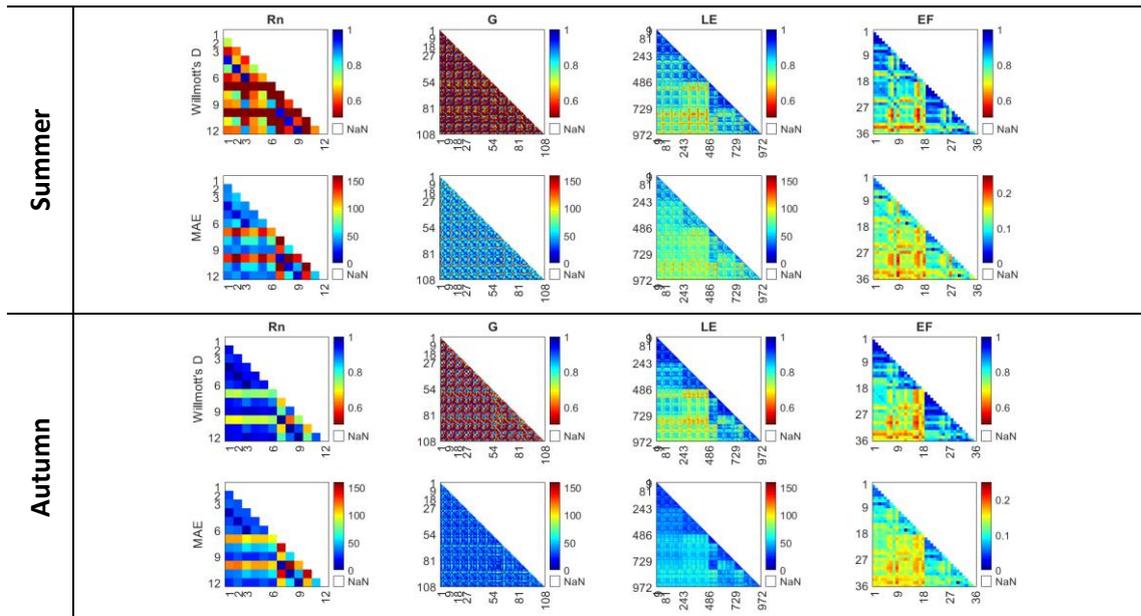


Figure S5: Heat maps showing variability within the EVASPA ensemble per season (separately for Rn, G, LE and EF). Fluxes (Rn, G, LE) were rescaled for consistent comparisons between overpasses.

S2.2. Standard deviation bar graphs of the specific uncertainty introduced by selecting different member combinations of LST-Radiation-EF-G over the 2004-2024 simulation period: according to land cover types

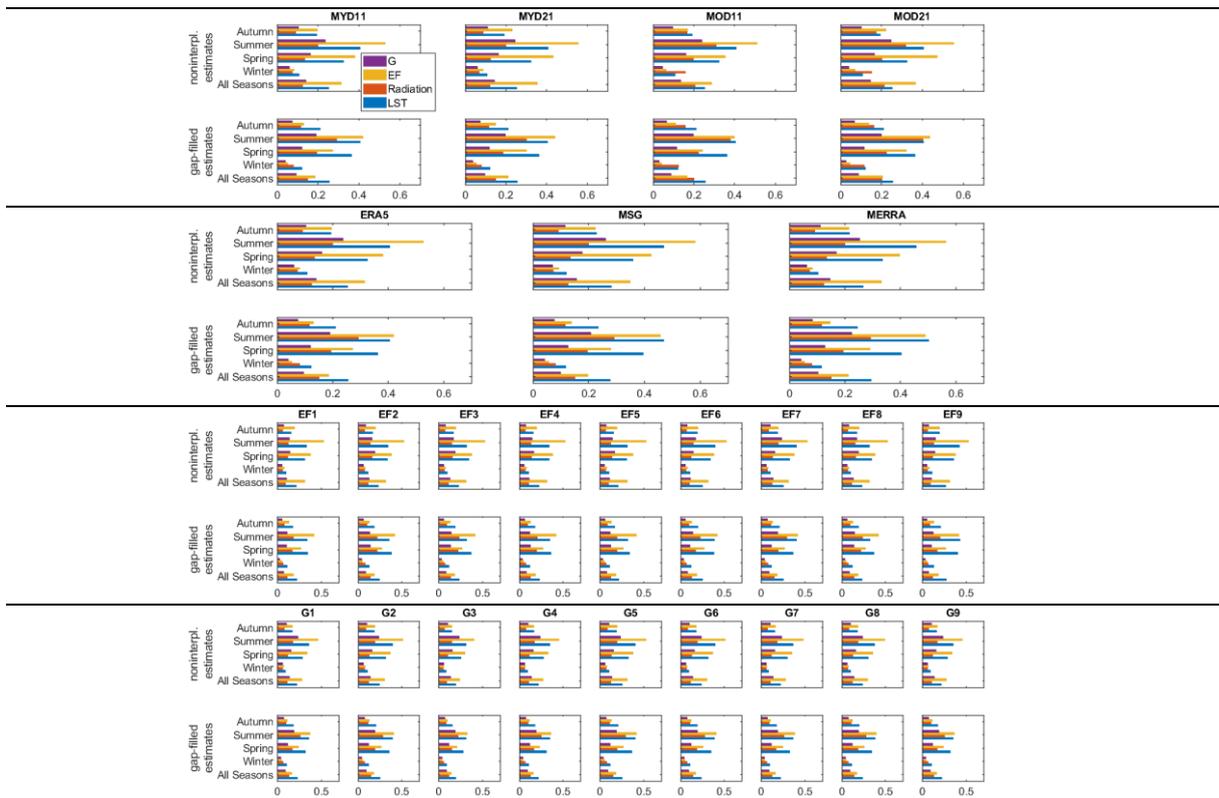


Figure S6: As in Figure 12, but for Croplands – Auradé and Lamasquère.

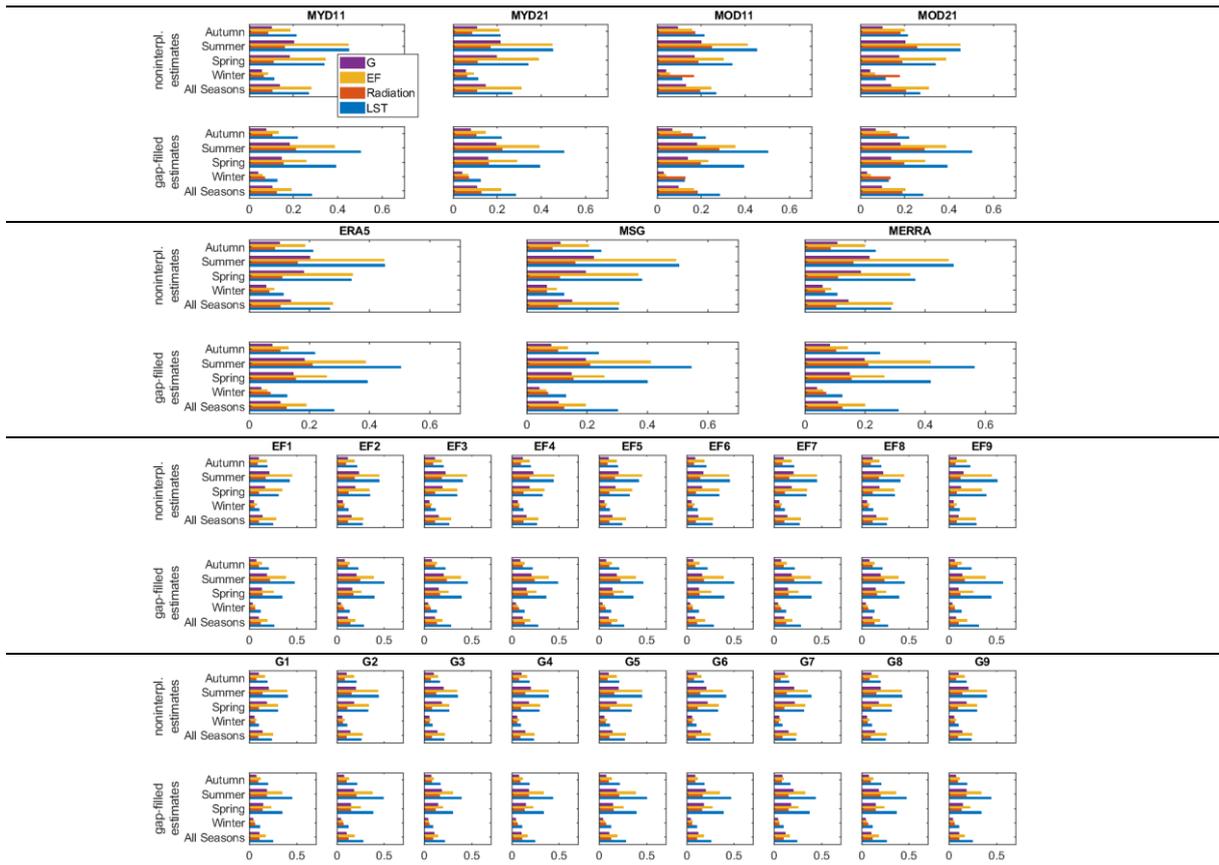


Figure S7: As in Figure 12, but for Forests – Bilos, Le Bray, Fontblanche, Puechabon.

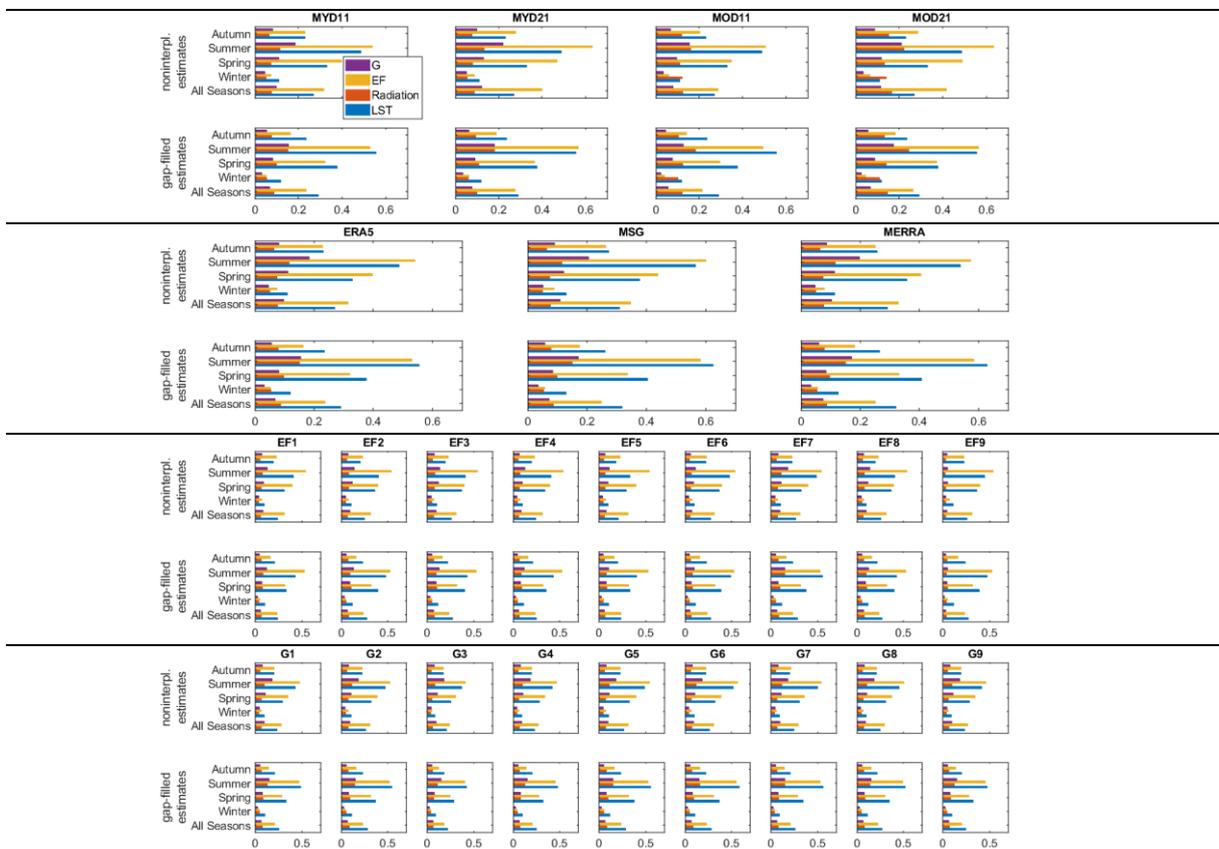


Figure S8: As in Figure 12, but for Grasslands: Coussoul, Toulouse.