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Evaluating four gap-filling methods for eddy covariance measurements of evapotranspiration over hilly crop fields

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Supplementary Materials: list of Figures

Field B

GV

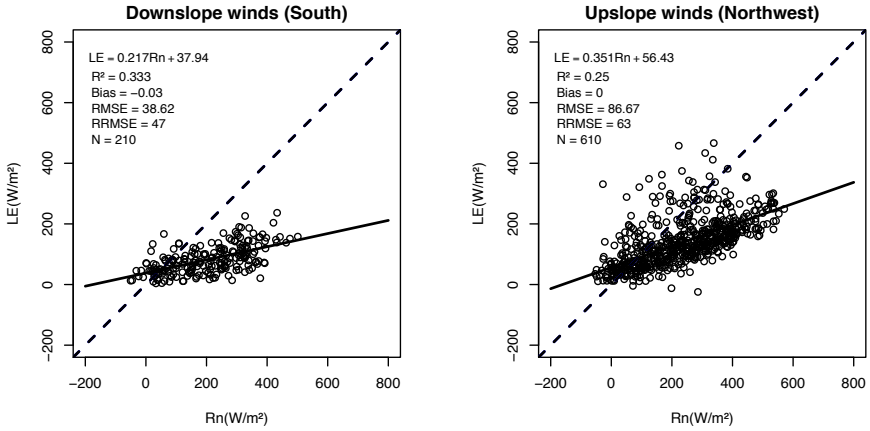

Figure S1a. Calibration of the LE - Rn gap-filling method on field B. Columns 1 and 2 correspond to downslope and upslope winds, respectively. Line 1 corresponds to the period with green vegetation (GV). The dashed line is the 1:1 line, and the continuous line is the regression line. R^2 is coefficient of determination. RMSE and RRMSE are absolute and relative root mean square errors, respectively. N is the number of flux data calculated over 30 min intervals.

Field C

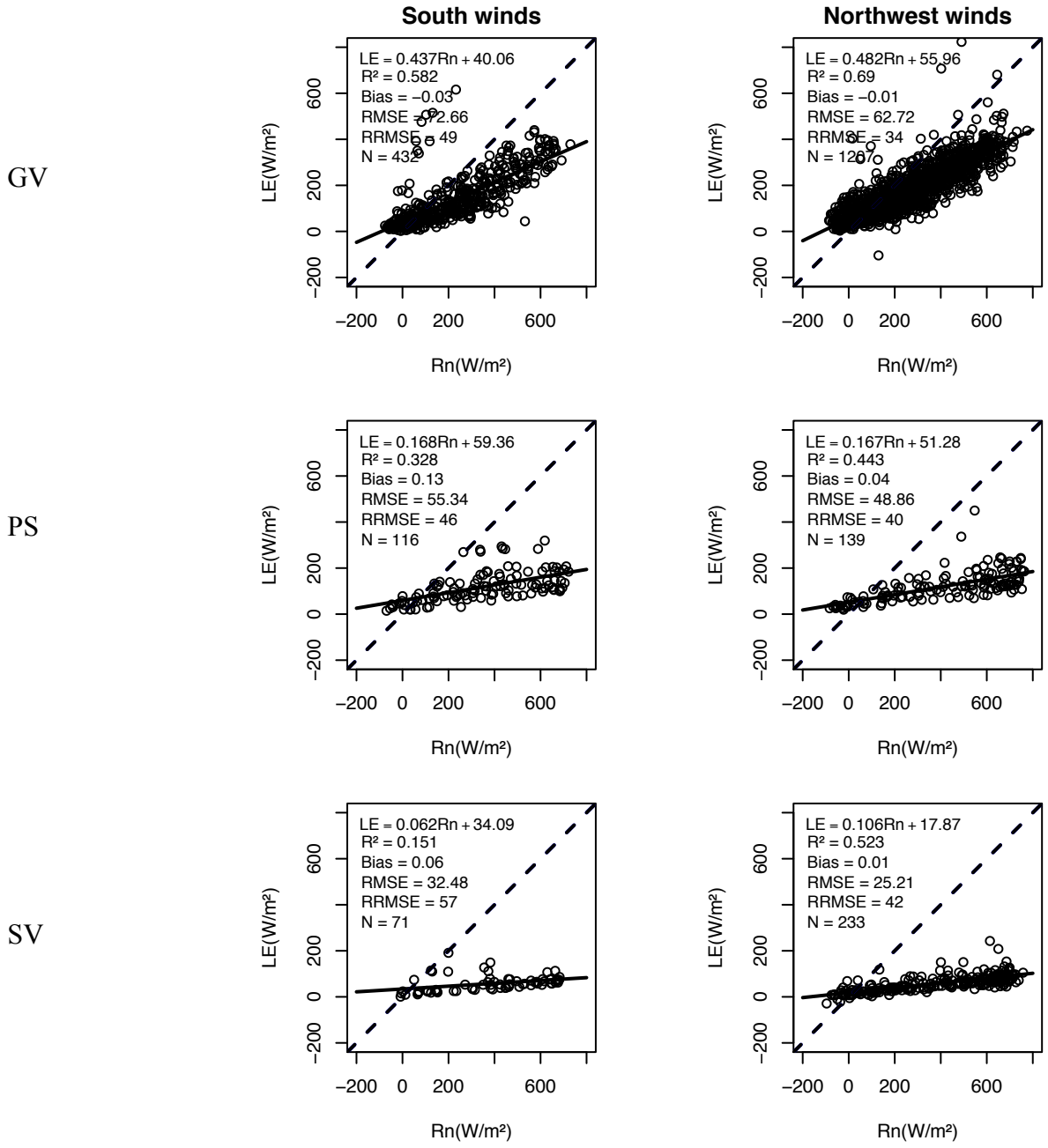

Figure S1b. Calibration of the LE - Rn gap-filling method on field C. Columns 1 and 2 correspond to south and northwest winds, respectively. Lines 1, 2 and 3 correspond to the three periods (GV, PS, SV) that differed in vegetation phenology, soil water content and climatic conditions. The dashed line is the 1:1 line, and the continuous line is the regression line. R^2 is coefficient of determination. RMSE and RRMSE are absolute and relative root mean square errors, respectively. N is the number of flux data calculated over 30 min intervals.

Field B

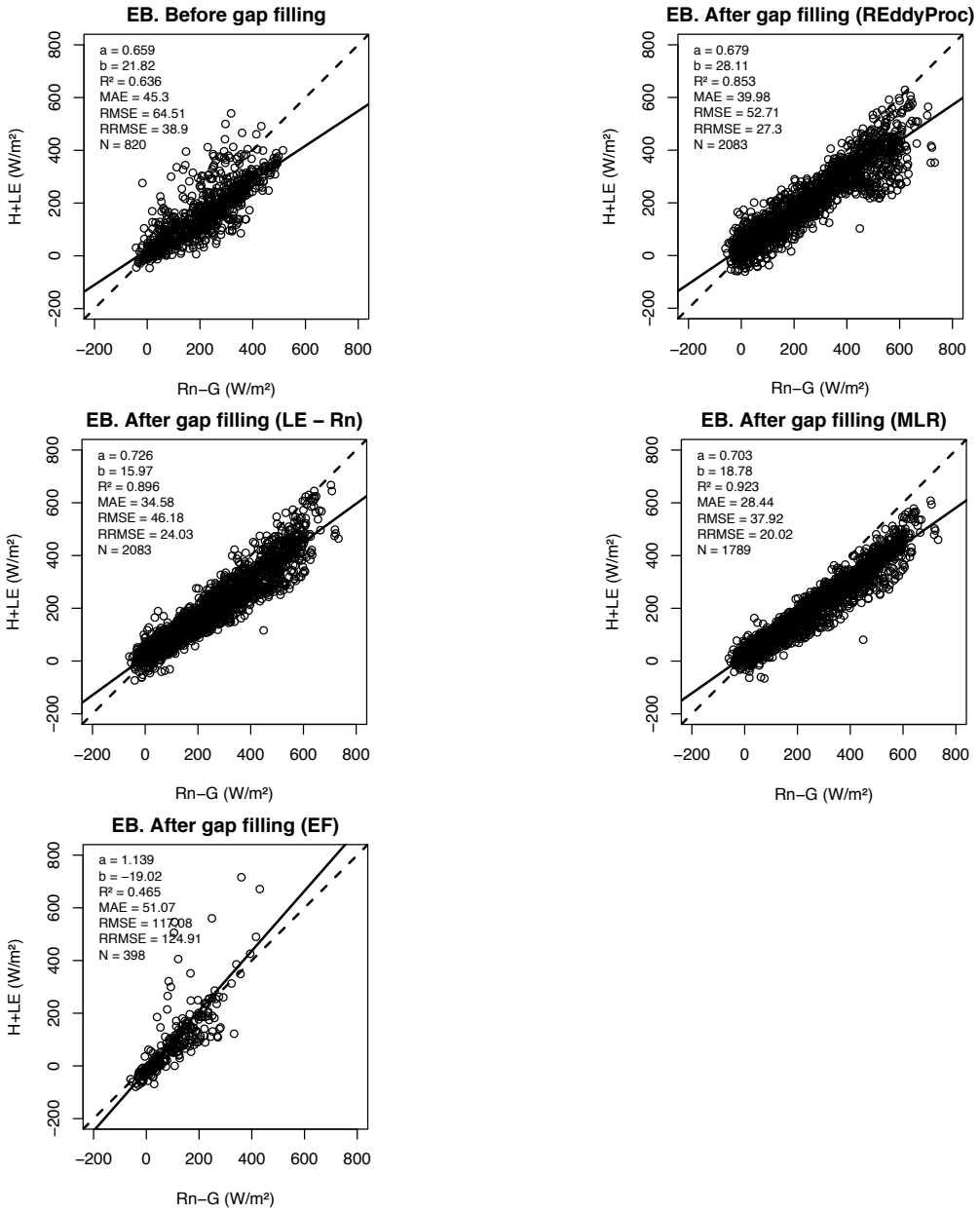

Figure S2a. Energy balance closure (EB) for field B. Flux data are calculated over 30 minutes intervals. Statistical indicators correspond to the comparison of convective energy (H + LE) on y-axis against the available energy (Rn −G) on x-axis, before (top left subplot) and after (other subplots) reconstruction of LE data by the four gap-filling methods. The dashed line is the 1:1 line, and the continuous line is the regression line. Terms a and b are the slope and the intercept of the linear regression, respectively. R^2 is coefficient of determination. MAE is the mean absolute error. RMSE and RRMSE are absolute and relative root mean square errors, respectively. N is the number of 30 min intervals data.

Field C

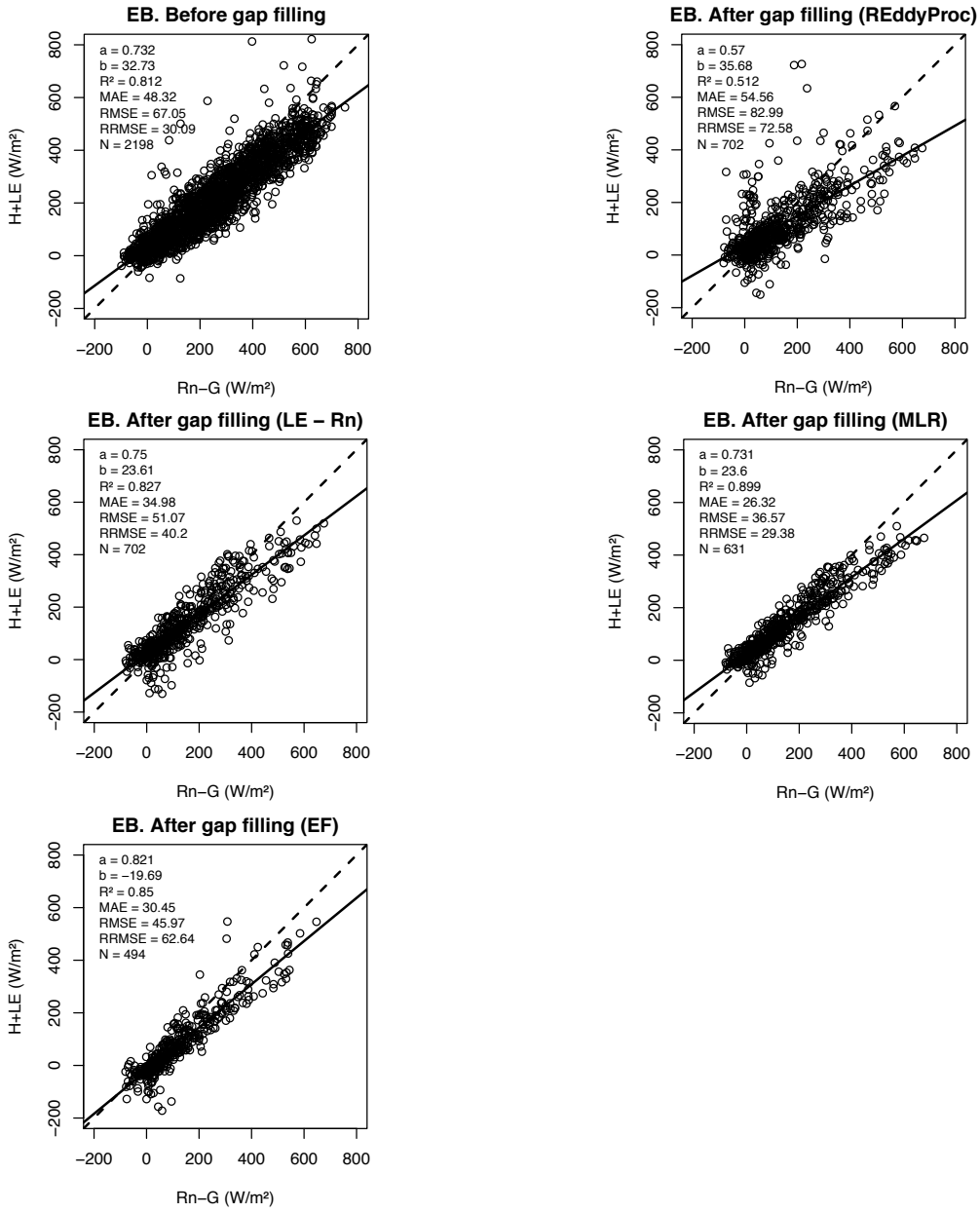

Figure S2b. Energy balance closure (EB) for field C. Flux data are calculated over 30 minutes intervals. Statistical indicators correspond to the comparison of convective energy (H + LE) on y-axis against the available energy (Rn −G) on x-axis, before (top left subplot) and after (others subplots) reconstruction of LE data by the four gap-filling methods. The dashed line is the 1:1 line, and the continuous line is the regression line. Terms a and b are the slope and the intercept of the linear regression, respectively. R^2 is coefficient of determination. MAE is the mean absolute error. RMSE and RRMSE are absolute and relative root mean square errors, respectively. N is the number of 30 min intervals data.

Supplementary Materials: list of tables

Table S1. Covariance analysis on regression coefficients for the LE - Rn method when discriminating between the two main winds directions.

Field	Period	Test of equal slopes	Test of equal intercepts
A	GV	**	*
	PS		**
	SV		
B	GV	***	
C	GV		**
	PS		
	SV	*	*

Signification codes

*** <= 0.001
0.001 < ** <= 0.01
0.01 < * <= 0.05

Table S2. Accuracy of LE retrievals for the four gap-filling methods (REddyProc, LE - Rn, MLR, EF). Fluxes were calculated over 30-min intervals. Retrieval accuracy is given for each field (A, B, C) and each wind direction (NW and S stands for northwest and south winds, respectively) along with the corresponding airflow inclination when applicable (Up and Down stands for upslope and downslope winds, respectively). Accuracy is quantified using statistical indicators (absolute and relative RMSE, Bias, coefficient of determination R^2).

		Field A	Field B	Field C	Field A		Field B		Field C	
		All data	All data	All data	S (Up)	NW (Down)	S (Down)	NW (Up)	S	NW
RMSE (W/m²)	REddyProc	44.8	70.5	51.9	42.3	41.4	23.3	77.2	51.1	49.1
	LE-Rn	56.8	80.2	61.0	56.3	55.5	38.6	86.7	66.2	57.5
	MLR	58.3	61.7	59.7	55.1	55.8	37.3	61.9	61.9	57.0
	EF	57.5	87.3	62.8	48.1	56.8	42.9	98.2	63.8	57.8
RRMSE (%)	REddyProc	36	57	34	37	32	28	56	42	30
	LE-Rn	46	65	40	50	44	47	63	50	35
	MLR	45	48	37	47	41	45	43	45	34
	EF	47	70	41	43	44	52	70	48	36
Bias (W/m²)	REddyProc	-1.34	-1.13	-0.65	-2.14	-0.90	-0.96	-1.58	2.20	-0.80
	LE-Rn	0.01	0.00	0.00	0.00	0.01	-0.03	0.00	0.01	0.00
	MLR	0.04	-0.02	0.01	-0.09	0.08	-0.15	0.00	0.00	0.03
	EF	-16.15	-6.48	-15.79	-10.54	-19.04	-0.93	-8.43	-12.84	-17.73
R^2	REddyProc	0.74	0.42	0.78	0.75	0.78	0.75	0.40	0.83	0.81
	LE-Rn	0.58	0.25	0.69	0.56	0.61	0.32	0.25	0.59	0.73
	MLR	0.58	0.35	0.72	0.59	0.62	0.36	0.38	0.65	0.75
	EF	0.69	0.29	0.74	0.75	0.71	0.52	0.24	0.83	0.80