Supporting Information for

Impacts of fertilization on grassland productivity and water quality across the European Alps: insights from a mechanistic model

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Introduction

The supporting information includes additional results supporting the analysis of the main manuscript (Figure S1, S2 and Table S2) and the list of the model parameters for each study site (Table S1)

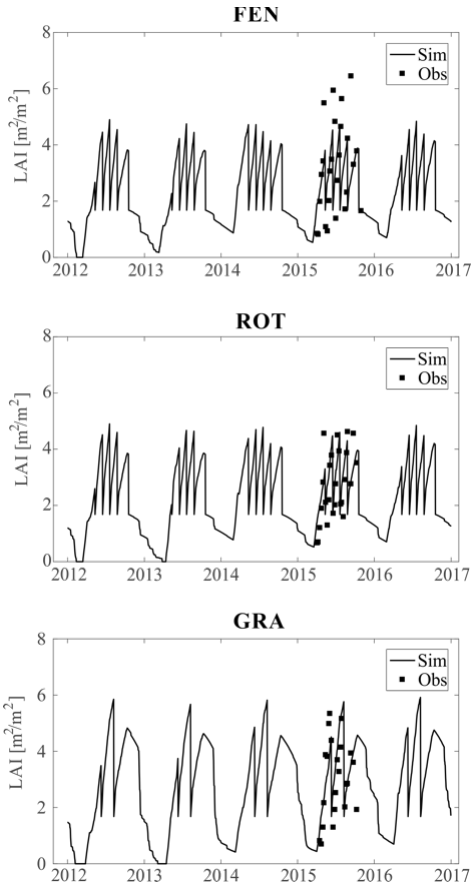

Figure S1. Observed vs simulates Leaf Area Index (LAI) in FEN, ROT, GRA. Simulations (black line) are compare with observations (black dots) from the ScaleX campaign 2015 (Wolf et al. 2017; Zeeman et al. 2019).

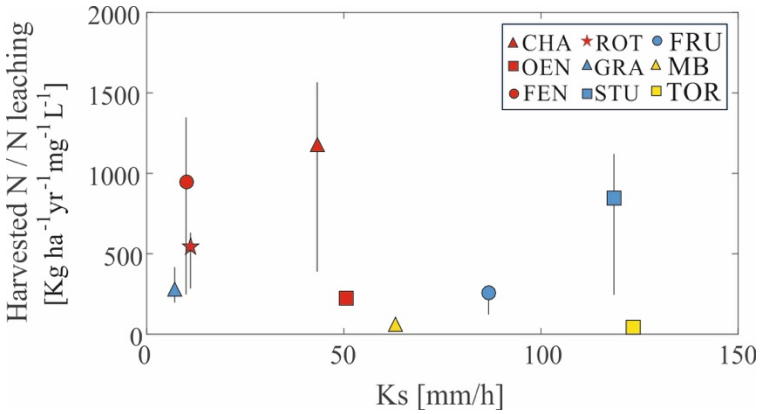

Figure S2. Ratio between harvested N and N leaching concentration as a function of soil saturated hydraulic conductivity (Ks). The whiskers span the 25th and 75th percentile of the interannual variability.

Table S1. Model parametrization in each site.

Table S2. Mean bias error (MBR), Mean Absolute Error (MAE) and Root Mean Square Error (RMSE) of the simulated latent heat, sensible heat, net radiation, and GPP compared to observations from flux towers. The values of the goodness of fit indexes is reported for each station.

	Latent heat			**Sensible heat**			**Net radiation**			**GPP**		
	MBE (Wm^{-2})	MAE (Wm^{-2})	RMSE (Wm^{-2})	MBE (Wm^{-2})	MAE (Wm^{-2})	RMSE (Wm^{-2})	MBE (Wm^{-2})	MAE (Wm^{-2})	RMSE (Wm^{-2})	MBE (gCm^{-2} day^{-1})	MAE (gCm^{-2} day^{-1})	RMSE (gCm^{-2} day^{-1})
CHA	-8.53	21.0	35.2	6.29	14.90	25	-0.08	14.3	26.27	-1.30	2.7	4.90
OEN	-2.54	19.7	34.0	18.25	24.22	43	11.52	16.34	28.09	-0.21	2.28	4.73
FEN	5.17	26.0	41.2	12.19	22.70	33	8.27	23.4	34.50	-0.50	1.9	3.78
ROT	22.53	27.6	45.9	11.80	21.77	34	-18.75	53.61	88.19	0.01	1.69	3.49
GRA	1.90	25.8	49.0	16.04	25.36	41	11.66	24.56	38.58	-0.29	1.52	3.28
STU	3.54	16.1	34.3	12.20	20.51	34	5.50	29.05	41.63	-1.72	2.29	4.55
FRU	-7.94	19.5	32.8	7.49	17.77	28	-0.63	15.41	31.69	-0.49	1.75	3.51
MB	-5.39	14.5	27.6	10.07	18.25	37	13.44	26.07	46.74	-0.20	1.14	2.50
TOR	-1.99	15.2	26.3	15.95	24.55	35	8.04	24.07	43.58	-0.03	1.87	3.88

References

Wolf, B., C. Chwala, B. Fersch, J. Garvelmann, W. Junkermann, M. J. Zeeman, A. Angerer, et al.: The Scalex Campaign: Scale-Crossing Land Surface and Boundary Layer Processes in the TERENO-Prealpine Observatory, Bulletin of the American Meteorological Society, 98 (6): 1217–34. https://doi.org/10.1175/BAMS-D-15-00277.1, 2017.

Zeeman, M. J., Shupe, H., Baessler, C., and Ruehr N. K.: Productivity and Vegetation Structure of Three Differently Managed Temperate Grasslands, Agriculture, Ecosystems and Environment, 270–271, https://doi.org/10.1016/j.agee.2018.10.003, 2019.