

Supplement of

**Parameter optimisation for a better representation of drought by
LSMs: inverse modelling vs. sequential data assimilation**

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Disaggregated satellite LAI vs. grain yield observations

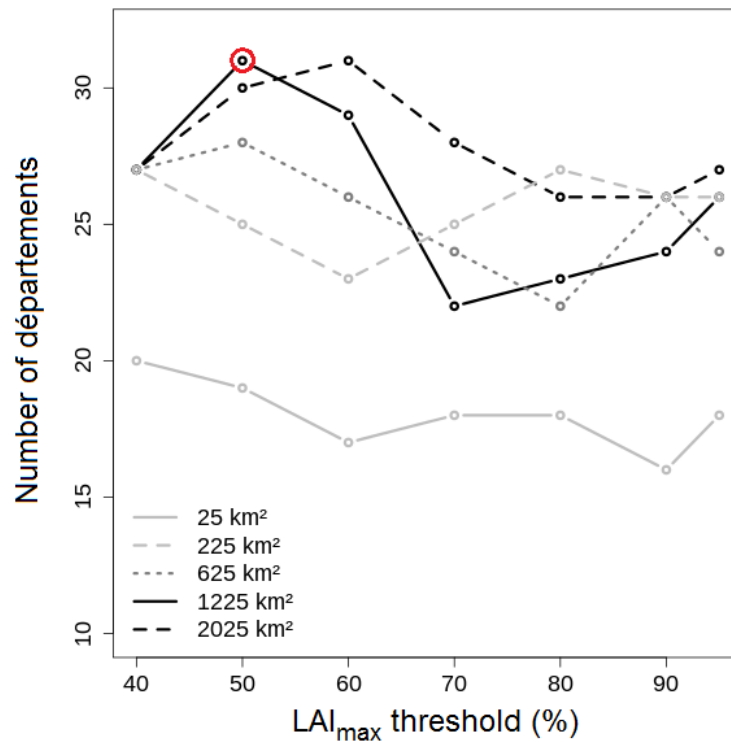


Figure S1. Number of départements presenting a significant correlation ($R^2 > 0.41$, F-test p-value < 0.01) between GY and the mean annual maximum disaggregated LAI derived from satellite observations ($LAI_{Io_{max}}$). The $LAI_{Io_{max}}$ value corresponds to the mean LAI values above a given fraction of the observed maximum annual LAI ($LAI_{Io_{max}}$ threshold). Results are shown for five area size values. The red circle indicates a configuration for 31 départements: area size of 1225 km² (35 km \times 35 km) and a $LAI_{Io_{max}}$ threshold of 50 %.

Characteristics of the 45 départements 35 km × 35 km grid cells

Table S1. Fraction of straw cereals given by ECOCLIMAP (Faroux et al., 2013), median satellite-derived LAI_{max}, maximum B_{ag} simulated by ISBA, retrieved MaxAWC using LDAS tuning, modelled MaxAWC using a statistical model based on median satellite-derived LAI_{max}, INRA MaxAWC estimates from pedotransfer functions (Al Majou et al., 2008). The simulated B_{agX} of the 24 highlighted départements present a significant correlation with Agreste GY observations.

Département		Longitude	Latitude	Straw cereals (%)	Observed LAI _{max} (m ² m ⁻²)	Maximum Bag (kg m ⁻²)	LDAS MaxAWC (mm)	Modelled MaxAWC (mm)	INRA MaxAWC (mm)
Yvelines	(78)	1.63	48.89	76	5.66	1.31	196	205	178 ± 34
Cher	(18)	1.86	47.17	68	5.89	1.31	178	218	129 ± 23
Seine et Marne	(77)	3.26	48.82	92	5.40	1.33	176	191	178 ± 34
Somme	(80)	2.39	49.97	100	5.17	1.32	176	178	66 ± 13
Essonne	(91)	2.28	48.32	95	5.11	1.3	176	175	207 ± 12
Val d'Oise	(95)	1.73	49.18	83	5.03	1.31	176	171	66 ± 13
Marne	(51)	3.71	49.32	93	4.97	1.26	166	167	102 ± 8
Aisne	(02)	3.06	49.83	98	4.38	1.26	156	135	207 ± 50
Eure	(27)	0.53	49.17	52	4.93	1.3	156	165	207 ± 56
Nord	(59)	3.29	50.04	100	4.85	1.34	156	161	207 ± 50
Loir et Cher	(41)	1.53	47.96	95	4.50	1.19	154	141	207 ± 12
Loiret	(45)	2.07	48.18	90	4.44	1.24	154	138	207 ± 12
Meuse	(55)	5.43	48.71	55	5.33	1.17	154	187	72 ± 45
Orne	(61)	0.76	48.67	54	5.09	1.25	154	174	178 ± 34
Pas de Calais	(62)	2.95	50.19	100	4.39	1.30	154	135	207 ± 50
Sarthe	(72)	0.78	47.95	75	4.68	1.25	154	151	178 ± 34
Yonne	(89)	3.24	47.53	51	5.03	1.24	154	171	72 ± 8
Eure et Loir	(28)	1.85	48.10	88	4.23	1.19	150	127	207 ± 12
Ardennes	(08)	4.16	49.60	76	4.16	1.17	133	123	66 ± 13
Indre et Loir	(37)	0.58	47.66	73	3.88	1.20	133	107	151 ± 35
Nièvre	(58)	3.13	47.45	49	4.69	1.23	132	152	72 ± 8
Oise	(60)	3.06	49.68	71	4.54	1.23	132	144	207 ± 50
Vendée	(85)	-1.04	46.40	62	3.28	1.12	129	74	124 ± 0
Maine et Loire	(49)	0.16	47.51	18	2.97	0.93	122	57	72 ± 35
Meurthe et Moselle	(54)	5.90	49.20	66	5.15	1.14	121	177	72 ± 45
Indre	(36)	1.13	46.95	70	3.98	1.10	111	113	77 ± 28
Moselle	(57)	6.23	49.19	35	5.29	1.15	110	185	162 ± 25
Haute Marne	(52)	4.78	48.65	37	3.73	1.05	104	99	179 ± 37
Deux Sèvres	(79)	0.01	46.14	76	3.12	1.01	100	66	68 ± 13
Haute Saone	(70)	5.47	47.49	34	4.20	1.05	99	125	151 ± 9
Vienne	(86)	0.72	46.58	66	3.68	1.03	99	96	72 ± 32
Aude	(11)	2.09	43.21	49	2.76	0.92	98	46	164 ± 25
Charente Maritimes	(17)	-0.92	46.04	63	3.03	1.02	97	61	66 ± 24
Charente	(16)	0.11	46.07	60	3.07	0.96	89	63	66 ± 24
Cote d'Or	(21)	5.14	47.21	68	4.15	0.99	78	122	151 ± 9
Allier	(03)	3.22	46.09	45	3.69	1.17	77	97	84 ± 7
Dordogne	(24)	0.57	44.71	14	2.86	0.88	66	51	84 ± 27
Puy de Dôme	(63)	3.21	45.94	65	3.81	1.07	66	104	122 ± 4
Haute Garonne	(31)	1.79	43.57	92	2.46	0.76	55	29	84 ± 27
Jura	(39)	5.34	46.99	46	3.22	0.84	55	71	151 ± 9
Saône et Loire	(71)	5.02	46.92	35	3.38	0.87	55	80	151 ± 9
Tarn	(81)	1.79	43.64	70	2.39	0.74	55	25	84 ± 27
Ariège	(09)	1.30	43.28	26	3.23	0.91	44	72	84 ± 27
Gers	(32)	1.00	43.71	76	2.65	0.78	44	40	84 ± 43
Tarn et Garonne	(82)	1.00	43.85	47	2.52	0.76	44	33	140 ± 26

