Supplementary Material

Table S1: **The UMD-AVHRR 14 classes (Map code) classification (on the left) was used to reclassify the 23 classes-based PROBA-V LC map. On the right side of the table the PROBA-V land uses are displayed, together with the map codes for each land use. Additionally, the number of pixels, related to each class are shown, together with the UMD-AVHRR reclassification map code.**

UMD-AVHRR LC classification		PROBA-V LC classification (23 classes)-100 m spatial resolution			
Land use	Map code	Land use	Map code	Number of pixels in the study area	UMD- AVHRR reclassification
Evergreen needle leaf forest	1	Evergreen needle leaf closed forest	111	1382	1
Evergreen broad leaf forest	2	Deciduous needle leaf closed forest	113	0	/
Deciduous needle leaf forest	3	Evergreen broad leaf closed forest	112	0	/
Deciduos broad leaf open forest	4	Deciduos broad leaf closed forest	114	409941	4
Mixed forest	5	Mixed closest forest	115	165	5
Woodland	6	Unknown closed forest type	116	55558	5
Wooded grassland	7	Evergreen needle leaf open forest	121	1	1
Closed shrubland	8	Deciduous needle leaf open forest	123	0	/
Open shrubland	9	Evergreen broad leaf open forest	122	0	/
Grassland	10	Deciduos broad leaf open forest	124	14678	4
Cropland	11	Mixed open forest	125	0	/
Bare ground	12	Unknown open forest type	126	192883	5
Urban	13	Shrubland	20	44105	9
Water	14	Herbaceous vegetation	30	52007	10
		Herbaceous wetland	90	4151	10
		Moss & lichens	100	0	/
		Bare/sparse vegetation	60	0	/
		Cropland	40	1434823	11
		Urban/built up	50	242714	13
		Snow & ice	70	0	/
		Permanent water bodies	80	17798	14
		Ocean	200	0	/
		No input data available	0	0	/
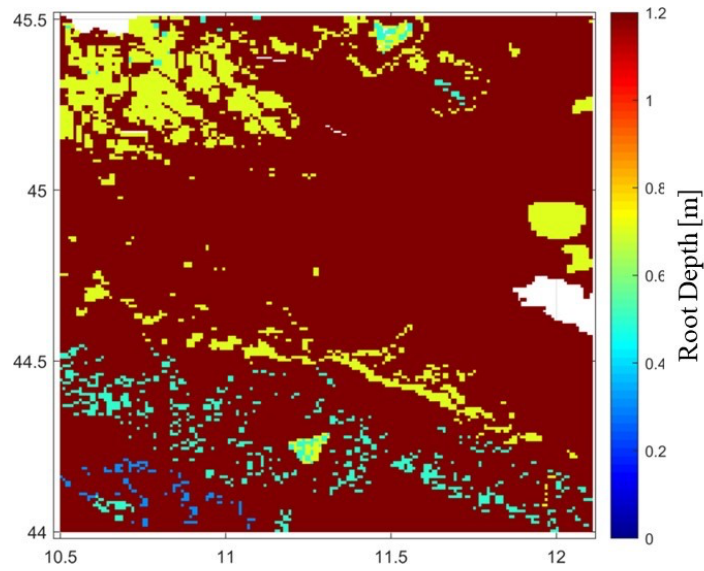
Figure S1: 1-km ESDAC root depth data; available at https://esdac.jrc.ec.europa.eu/content/european-soil-database-derived-data

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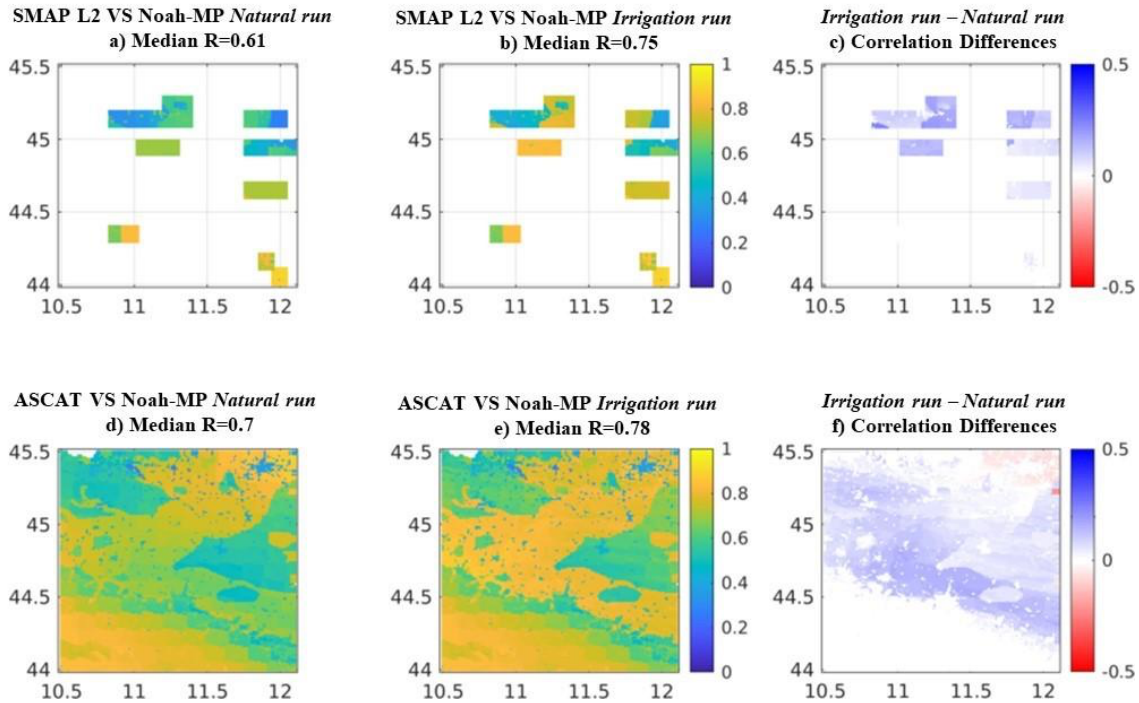
Figure S2: Maps of temporal Pearson-R between biweekly values of SSM from Noah MP: a) *Natural* run and SMAP L2; b) *Irrigation* run and SMAP L2; d) *Natural* run and ASCAT; e) *Irrigation* run and ASCAT. Maps of the Pearson-R differences display the grid-based difference between: c) map b and map a; f) map e and map d. The reference period is April 2015-December 2019.