

Table S1 – List of the ISMN observation networks (Dorigo et al., 2021) used in the study.

Network	No.	Data availability	Country	Climate	Land Cover	Scale	Type
XMS-CAT	16	from 2016 to 2023	E Spain	Cf, Cs	Forest and shrubland	Regional	TDR-
WSMN	8	from 2011 to 2016	W UK	Cf	Pasture and woodlands	Local	TDR
VAS	3	from 2010 to 2012	E Spain	B	Croplands and shrubland	Local	TDR
UMSUOL	1	from 2009 to 2017	Italy	Cs	Croplands, irrigation	Local	TDR
UDC_SMOS	11	from 2007 to 2011	S Germany	Dfb	Croplands and forest	Regional	TDR-
TWENTE	44	from 2008 to 2021	E Netherlands	Cf	Croplands	Regional	FDR
TERENO	5	from 2009 to 2023	W Germany	Cf-Dfb	Croplands	Regional	TDR
SWEX_POLAND	6	from 2000 to 2013	E Poland	Dfb	Forest and shrubland	Local	TDR
STEMS	4	from 2015 to 2023	N Italy	Cs, Cf	Croplands	Local	FDR
SMOSMANIA	22	from 2007 to 2023	S France	Cf, Cs	Croplands, shrubland and forest	Regional	TDR
Ru_CFR	2	from 2015 to 2022	W Russia	Dfb	Forest	Local	TDR
RSMN	20	from 2014 to 2023	Romania	Dfb, Dfa	Forest, shrubland and croplands	Country	FDR
REMEDHUS	24	from 2005 to 2023	W Spain	B	Croplands	Local	TDR
ORACLE	6	from 1985 to 2013	N France	Cf	Croplands	Local	TDR
NVE	5	from 2012 to 2021	Norway	Dfc, E	Forest and openland	Country	FDR
MOL_RAO	2	from 2003 to 2020	E Germany	Dfb	Forest	Local	TDR
IPE	2	from 2008 to 2020	N Spain	Cf, B	Forest, shrubland and croplands	Local	TDR
IMA_CAN1	12	from 2011 to 2015	N Italy	Cs, Cf	Croplands	Local	FDR
HYDROL-NET_PERUGIA	2	from 2010 to 2016	C Italy	Cs, Cf	Forest and shrubland	Local	TDR
HOBE	32	from 2009 to 2019	Denmark	Cf, Dfb	Forest, pasture and croplands	Regional	FDR
HOAL	33	from 2013 to 2021	E Austria	Dfb	Forest, pasture and croplands	Local	TDR
GTK	7	from 2001 to 2012	Finland	Dfc	Forest	Country	TDR
GROW	151	from 2017 to 2019	Europe	Cf, Dfb,	Various	Continental	FDR
FR_Aqui	5	from 2012 to 2023	SW France	Cs	Forest	Local	TDR
FMI	27	from 2007 to 2023	N Finland	Dfc	Forest	Regional	TDR
BIEBRZA_S-1	30	from 2015 to 2018	E Poland	Dfb	Forest	Local	FDR

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