

Supporting Information for: Parameter transferability of a distributed hydrological model to droughts

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Table S1. Overview of the datasets used in the study.

Variable	Dataset	Reference	Purpose
Digital Elevation Model	HDMA	(Verdin, 2017)	Model setup
Hydrological Soil Group	HYSOGs250m	(Ross et al., 2018)	Model setup
Soil texture	ISRIC SoilGrids	(Hengl et al., 2017)	Model setup
Soil porosity	ESACCI Soil Moisture	(Dorigo et al., 2017)	Model setup
Land Cover	ESACCI 2018 Land Cover	(ESA, 2017)	Model setup
Dams	DPC and GranD database	(Lehner et al., 2011) for GranD database	Model setup
Lakes	DPC		Model setup
Glaciers	RGV6	(Arendt et al., 2017)	Model setup
Meteo data	DPC	(Bruno et al., 2021; Alfieri et al., 2022)	Model simulation
Streamflow	DPC and regional hydrometeorological offices	(Alfieri et al., 2022; Bruno et al., 2022)	Model calibration and evaluation
Evapotranspiration	LSASAF	https://landsaf.ipma.pt/en/products/evapotranspiration-energy-flux/mef/ (last access on 06 October 2022) (Ghilain et al., 2011; EUM, 2016)	Model evaluation
Terrestrial Water Storage Anomalies	GRACE JPL mascon RL06	https://podaac-tools.jpl.nasa.gov/drive/files/GeodeticsGravity/tellus/L3/mascon/RL06/JPL/v02/CRI/netcdf (last access on 06 October 2022) (Watkins et al., 2015; Wiese et al., 2019)	Model evaluation
Terrestrial Water Storage Anomalies	GRACE CSR mascon RL06	http://www2.csr.utexas.edu/grace/RL06_mascons.html (last access on 06 October 2022) (Save et al., 2016; Save, 2020)	Model evaluation
Terrestrial Water Storage Anomalies	GRACE GSFC mascon RL06	https://earth.gsfc.nasa.gov/geo/data/grace-mascons (last access on 06 October 2022) (Loomis et al., 2019)	Model evaluation

Table S2. Properties of study catchments: ID, name, location, drainage area [km²], mean elevation [m a.s.l.], dominant climate, dominant land cover type, and model performances during the two calibration experiments in terms of Kling Gupta Efficiency (KGE, Kling et al. (2012)). Calibration 1 refers to the calibration during "normal" years and calibration 2 to that including a moderate drought (Section 2.4.2). For data sources please refer to Table S1. Catchments are west-to-east ordered.

ID	Section	Basin	Lat	Lon	Area [km ²]	Elev [m a.s.l.]	Climate	Land cover	KGE calibration 1 [-]	KGE calibration 2 [-]
1	Susa Via Mazzini	Dora Riparia	45.14	7.05	832	2120	Cold	Forest	-	-
2	Gaiola	Stura di Demonte	44.33	7.42	562	1744	Cold	Grass	0.52	0.47
3	Lanzo	Stura di Lanzo	45.27	7.48	580	1767	Cold	Grass	0.47	<0
4	Busca	Maira	44.52	7.48	613	1514	Cold	Forest	-	-
5	Carignano	Po	44.91	7.69	3957	1021	Temperate no dry	Forest	0.85	0.74
6	Torino Murazzi	Po	45.07	7.71	5152	971	Temperate no dry	Crop	0.81	0.62
7	Torino	Dora Riparia	45.08	7.72	1475	1373	Cold	Grass	-	-
8	S.Benigno	Orco	45.25	7.81	852	1645	Cold	Grass	-	-
9	Tavagnasco	Dora Baltea	45.55	7.82	3297	2124	Alpine	Grass	0.71	0.7
10	Farigliano	Tanaro	44.52	7.9	1505	916	Temperate dry	Forest	0.84	0.58
11	Alba Q.A.	Tanaro	44.71	8.03	3468	1313	Temperate dry	Forest	0.79	0.59
12	Verolengo	Dora Baltea	45.19	8.04	3962	1802	Alpine	Grass	-	-
13	Domodossola	Toce	46.11	8.31	954	1928	Alpine	Grass	-	-
14	Piana Crixia	Bormida	44.48	8.31	249	610	Temperate dry	Forest	-	-
15	Quinto Vercellese Cervo	Sesia	45.38	8.37	840	578	Temperate no dry	Forest	-	-
16	Candoglia	Toce	45.97	8.42	1564	1896	Alpine	Grass	-	-
17	Cartosio	Erro	44.57	8.42	196	544	Temperate dry	Forest	0.55	0.25
18	Palestro	Sesia	45.30	8.51	2709	826	Temperate no dry	Forest	0.74	0.08
19	Vigevano	Ticino	45.34	8.88	7467	1453	Cold	Forest	-	-
20	Ponte della Libertà	Ticino	45.18	9.15	8378	1383	Cold	Forest	-	-
21	Valsigiara	Trebbia	44.64	9.33	209	959	Cold	Forest	0.46	<0
22	Spessa	Po	45.10	9.35	38626	1094	Temperate no dry	Forest	0.87	0.84
23	Salsominore	Aveto	44.63	9.41	186	1060	Cold	Forest	<0	0.67
24	Lodi	Adda	45.32	9.51	6127	1515	Cold	Forest	-	-
25	Rivergaro	Trebbia	44.9	9.58	886	820	Cold	Forest	-	-
26	Ostia Parmense	Taro	44.51	9.84	422	859	Temperate no dry	Forest	0.54	0.2
27	Piacenza	Po	45.06	9.71	42090	992	Temperate no dry	Forest	-	-
28	Capriolo	Oglio	45.64	9.92	1921	1347	Cold	Forest	-	-
29	Cremona	Po	45.13	10.00	51163	1214	Temperate no dry	Forest	0.81	0.78
30	S.Secondo	Taro	44.92	10.25	1545	645	Temperate no dry	Forest	0.46	0.25
31	Ponte Verdi	Parma	44.81	10.25	527	649	Temperate no dry	Forest	0.23	0.44
32	Marcaria	Oglio	45.11	10.53	6085	723	Temperate no dry	Crop	-	-
33	Cadelbosco	Crostolo	44.78	10.58	258	247	Temperate no dry	Crop	-	-
34	Borgoforte	Po	45.04	10.75	63575	954	Temperate no dry	Forest	-	-
35	Ponte Alto	Secchia	44.67	10.9	1174	743	Temperate no dry	Forest	0.67	0.12
36	Pioppa	Secchia	44.86	10.97	1330	661	Temperate no dry	Forest	-	-
37	Ficarolo	Po	44.95	11.43	69315	867	Temperate no dry	Forest	-	-
38	Pontelagoscuro	Po	44.89	11.61	72545	832	Temperate no dry	Forest	0.79	0.71

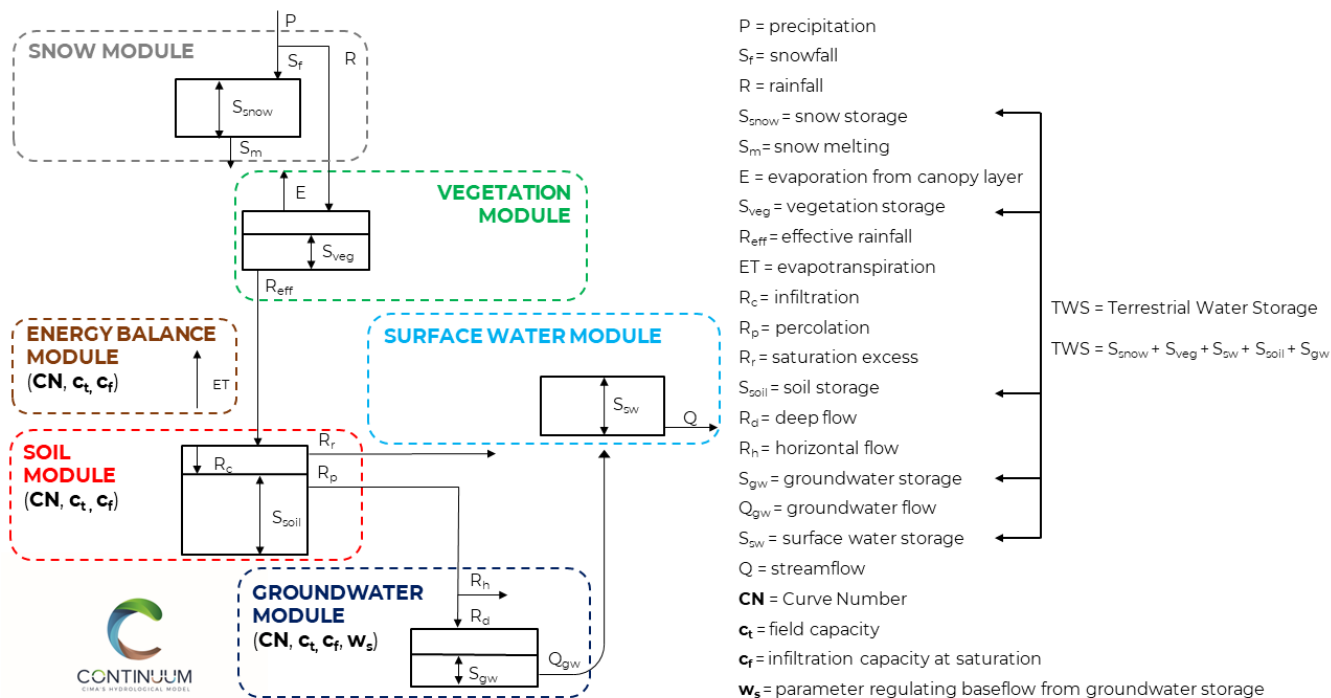


Figure S1. Diagram of the hydrological model Continuum, with model modules, output, states, and calibration parameters (in bold).

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