

Supplementary materials

1 Data

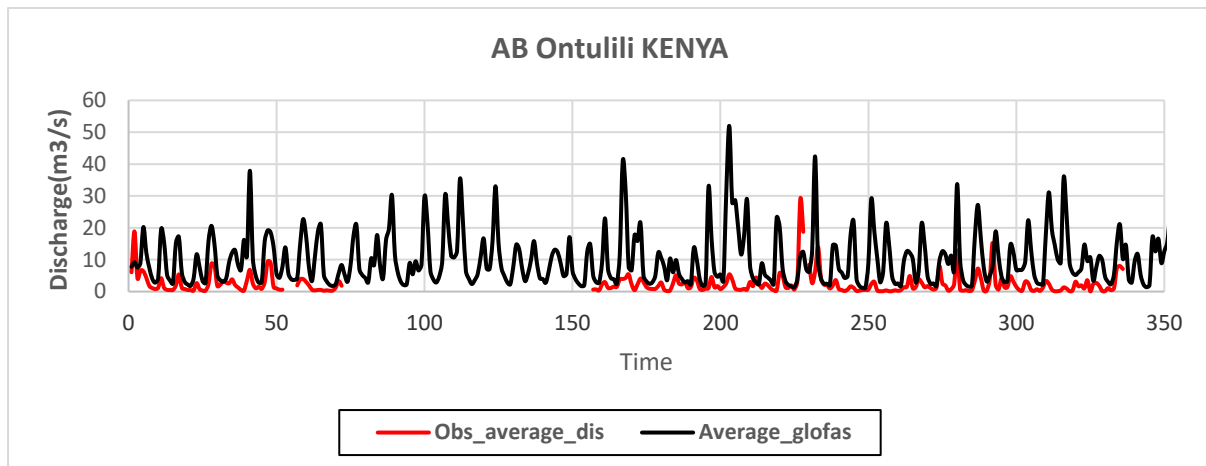


Figure S 1: Streamflow observation data against modelled GloFAS data in a weather station in Kenya

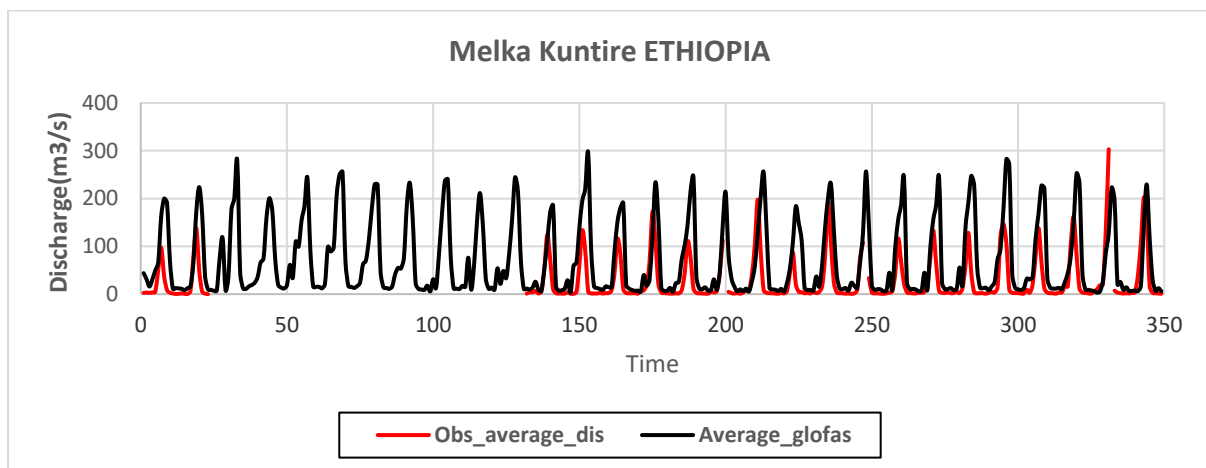


Figure S 2: Streamflow observation data against modelled GloFAS data in a weather station in Ethiopia

Table S 1: Catchment characteristics (based on BasinATLAS) (Linke et al., 2019), Africa Groundwater ATLAS (BGS, 2022; O Dochartaigh, 2021), Copernicus Landcover 100m resolution (Buchhorn et al., 2020)

Variable(Name of variable in heatmap)	Unit	Description	Resolution	Source data
Sub catchment area (SUB_AREA)	km ²	Area enclosing the sub-catchment	polygon	HydroBASINS
Upstream area (Upstream_area(m2))	m ²	Upstream area including the individual sub-catchment	0.1 degree	GloFAS
Upstream Annual mean precipitation (annual_prec_mean(mm/yr))	mm	Calculated by averaging the monthly precipitation values based on the upstream contributing area	0.1 degree	MWEP
Climate zones (climate_zones)	classes (18)	Statistically derived 125 environmental strata based on 42 variables and aggregated to 18 environmental zones	Polygons	Global Environmental Stratification (GEnS)
Upstream average elevation (Upstream_Avg_Elevation (m))	meters a.s.l.	Obtained from the EarthEnv-DEM90 which is a digital elevation model derived from CGIAR-CSI SRTM v4.1 and ASTER GDEM v2 data products representing conditions of 2000-2010.	15 arc-second grid	EarthEnv-DEM90

		Originally in 3 arc-second grid (approx. 90m at the equator) then aggregated to 15 arc-second grid using mean statistics		
Terrain slope (Terrain_slope)	degrees (x10)	Similar as above. Slope values were calculated based on Horn's method. Latitudinal corrections for the distortion in XY spacing of geographic coordinates were done by approximating the geodesic distance between cell centers	15 arc-second grid	EarthEnv-DEM90
Groundwater table depth (Avg_GW_table(cm))	centimeters	Obtained from compiled global observations of water depth from government archives and literature (1927-2009). Data gaps and inferred patterns and processes filled using a groundwater model forced by modern climate, terrain, and sea level	30 arc-second grid	Global Groundwater Map
Average soil water content (Avg_soilwater%_uyr)	percent	Percentage of the maximum soil soil water content per year, which is a measure of soil stress, and equal to soil water stress coefficient as a percentage. Primary inputs are based on WorldClim and Global-PET databases.	30 arc-second grid	Global High-Resolution Soil-Water Balance
Clay fraction (Clay_fraction%(top5cm))	percent	Fraction predictions are based on global spatial prediction models fitted, per soil variable, using a combination of major international soil profile databases and assortment of global environmental covariates representing soil forming factors. Represents the top 0-5cm	30 arc-second grid	SoilGrids1km
Sand fraction (Sand_fraction%(top5cm))	percent	Same as above	30 arc-second grid	SoilGrids1km
Silt fraction (Silt_fraction%(top5cm))	percent	Same as above	30 arc-second grid	SoilGrids1km
Global aridity index (Global_avg_aridity_index(x100))	index value (x100)	Modelled from WorldClim data parameters. Calculated as mean precipitation over mean annual PET. The aridity value increases with more humid regions and decreases with more arid regions. 0 no precipitation, 1 precipitation=PET, >1 precipitation>PET	30 arc-second grid	Global Aridity Index v1
Landcover classes (landcover_classes)	classes (5)	Landcover maps were based on daily data from PROBA-Vegetation sensor	100m resolution, global	Copernicus: Global Land Cover 2019
Average population density (Avg_Pop_density/km2)	people per km ²	Based on 2010 round of censuses and provides the distributions of people on a continuous global surface	30 arc-second grid	Gridded Population of the World (GPW) v4
Geology	map	Overview of hydrogeology from multiple sources	polygons	Africa Groundwater Atlas: Country hydrogeology maps

2 Results and Discussion

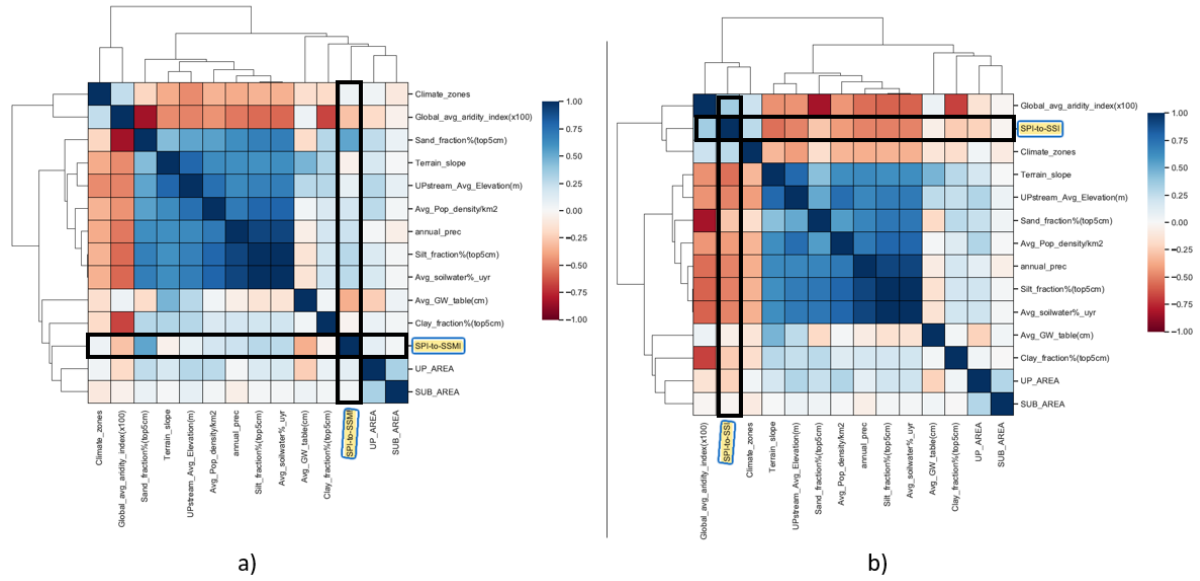


Figure S 3: Heatmap of Spearman correlations between the propagation indices and catchment characteristics ; a) the SPI-to-SSMI, b) SPI-to-SSI. Euclidean distances used for clustering variables with interchangeable correlations

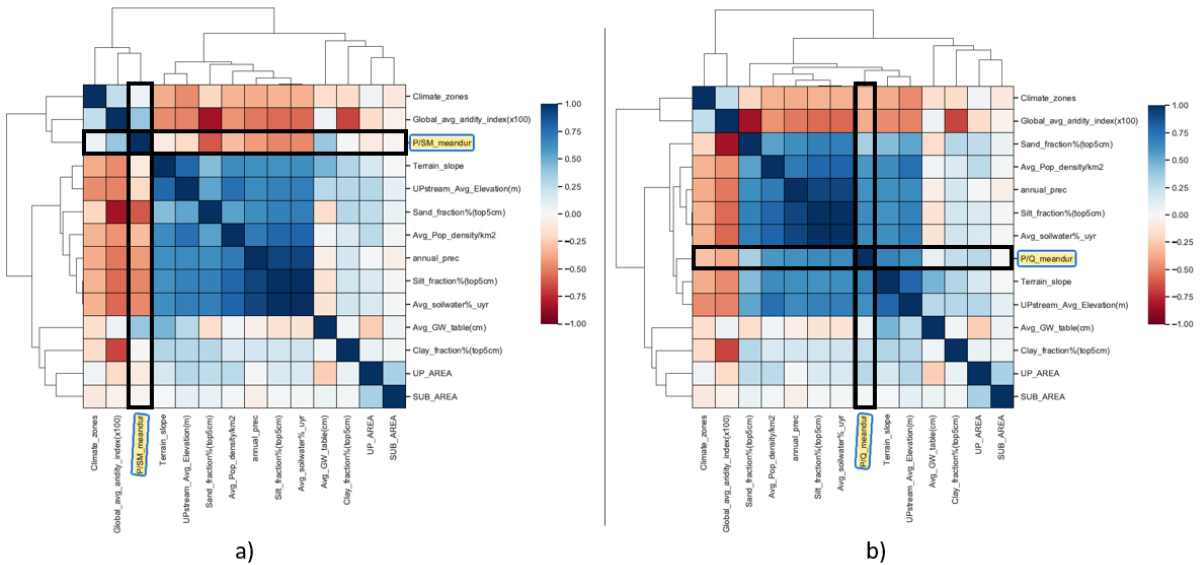


Figure S 4: Heatmap of Spearman correlations between the threshold mean duration and catchment characteristics ; a) the P/SM mean duration ratio, b) P/Q mean duration ratio. Euclidean distances used for clustering variables with interchangeable correlations

Table S 2: Mean average accumulation period per average catchment characteristics range based on equal interval (quantile)

Terrain slope (degrees)	Equal interval (quantile) range	SPI-to-SSMI	SPI-to-SSI
	0-7	4.5	6.2
	7-22.8	4.2	5.9
	22.8-40	4.7	5.2

Global average aridity index (x100)	40-66.6	4.6	4.0
	66.6-151	4.4	3.4
	31-39	4.8	4.2
	39-41	5.5	4.5
	41-45	4.6	4.8
	45-49	4.2	5.9
	49-79	3.4	5.9
Upstream Elevation (meters a.s.l.)	3-402	3.9	6.0
	402-731	4.4	6.0
	732-1043	4.7	4.9
	1044-1544	5.1	4.8
	1545-2493	4.3	3.1
Percent sand fraction (%)	11-26	3.1	5.5
	26-29	4.4	5.6
	29-32	4.8	5.1
	32-35	5.1	4.0
	35-40	5.8	4.6
Percent clay fraction (%)	8-23	4.4	6.0
	23-25	4.7	5.0
	25-26	4.5	4.5
	26-27.6	4.7	4.0
	27.6-32	4.2	4.7
Percent silt fraction (%)	0-12	3.1	6.3
	12-21	4.6	5.7
	21-31	5.0	4.4
	31-47.6	5.5	4.9
	47.6-77	4.4	3.2
Average annual soil water content (%)	1-15	3.1	6.3
	15-25	4.6	5.7
	25-37	5.0	4.3
	37-57	5.5	4.9
	57-112	4.3	3.2

Table S 3: Mean average accumulation period per climate zone

Name	SPI-to-SSMI	SPI-to-SSI
Tropical, rainforest	2.4	4.1
Tropical, monsoon	5.0	2.0
Tropical, savannah	4.8	1.8
Arid, desert, hot	5.1	3.5
Arid, desert, cold	3.9	5.2
Arid, steppe, hot	2.0	5.3
Arid, steppe, cold	5.0	4.3
Temperate, dry summer, hot summer	4.2	2.7
Temperate, dry summer, warm summer	3.7	4.5
Temperate, dry summer, cold summer	4.6	2.5
Temperate, dry winter, warm summer	4.8	0.9
Temperate, dry winter, cold summer	4.0	2.4
Temperate, no dry season, hot summer	3.0	4.0
Temperate, no dry season, cold summer	5.0	2.7
Cold, dry summer, hot summer	5.0	3.0

Polar, tundra	4.7	2.4
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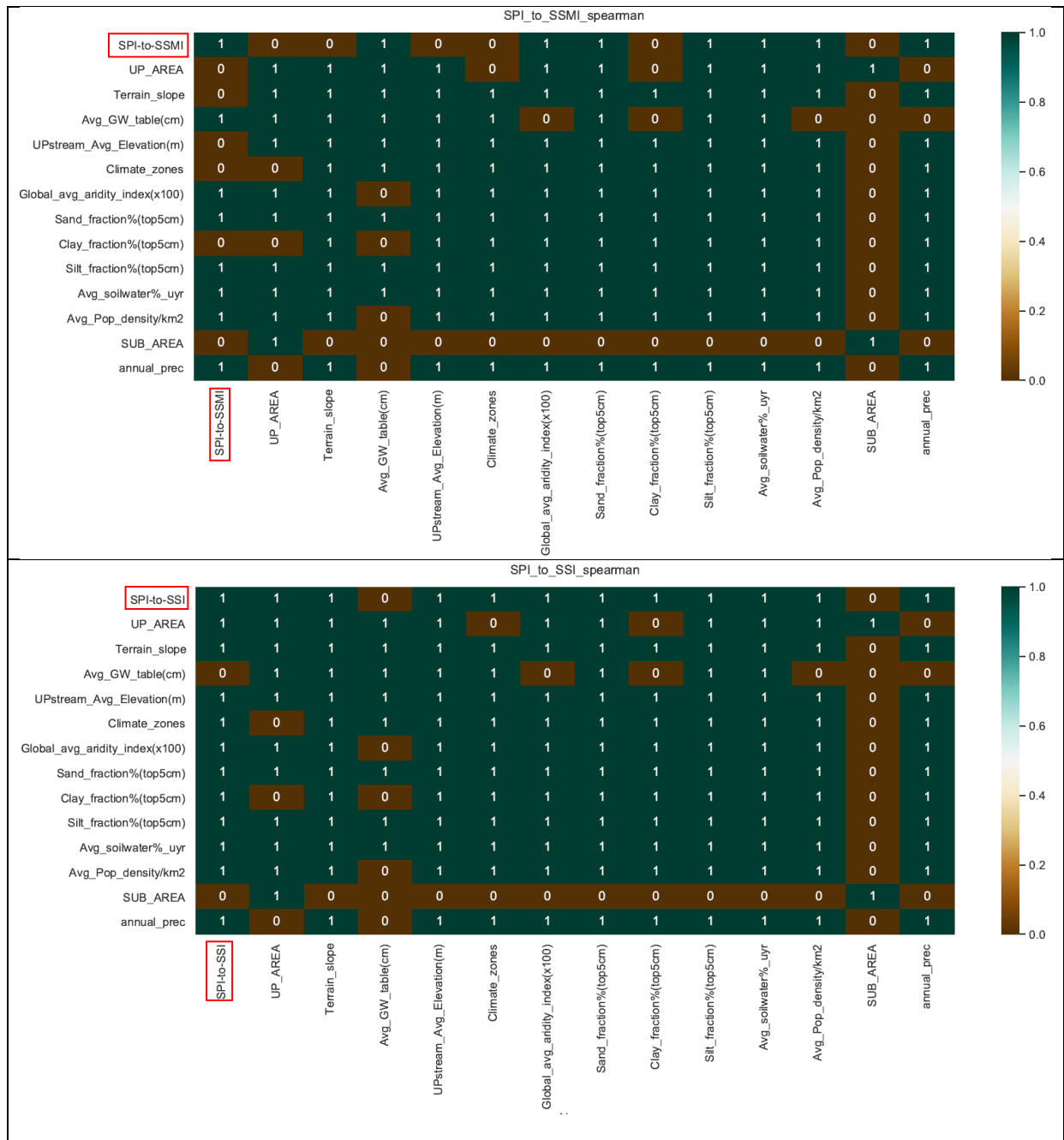
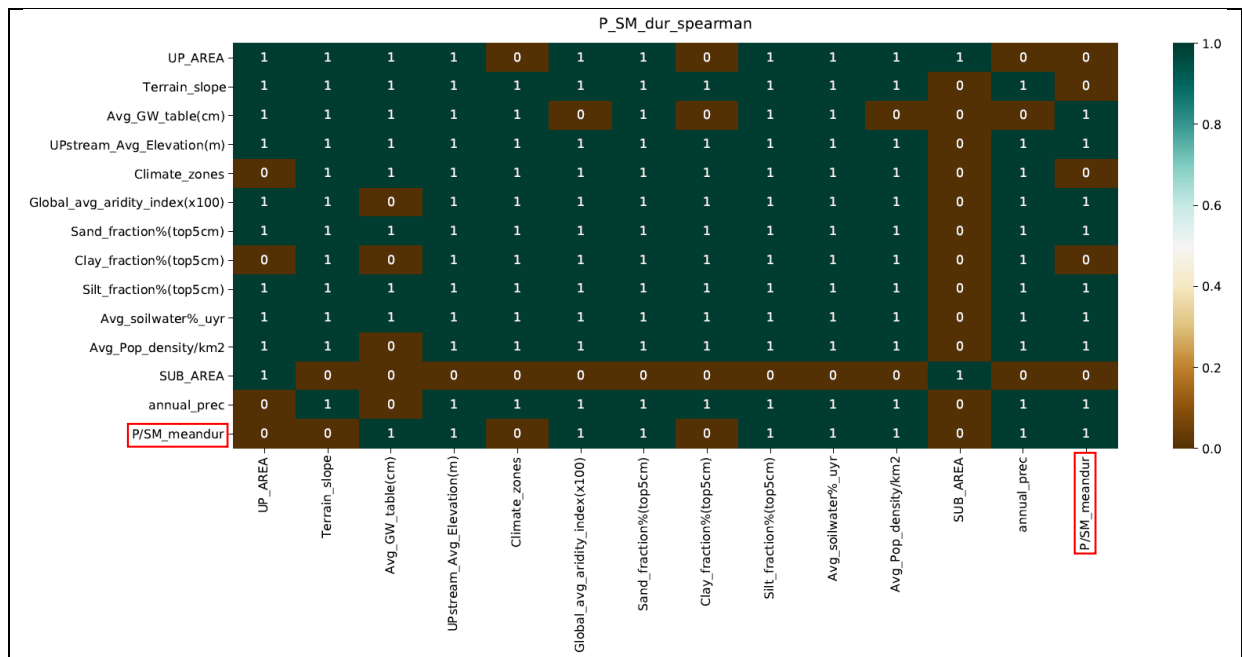


Figure S 5: Spearman significance test for the standardized propagation indices . *1 means significant relationship, *0 no significance



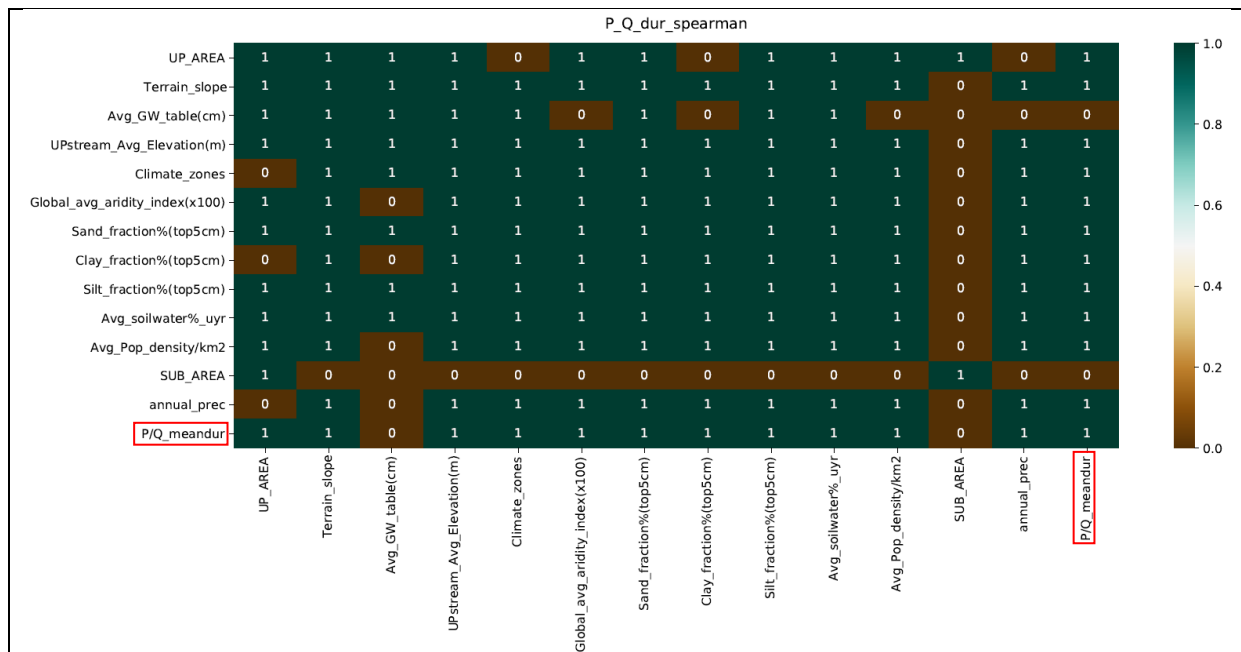


Figure S 6: Spearman significance test for the threshold-based duration indices . *1 means significant relationship, *0 no significance

Table S 4: T-test significance test of the accumulation periods against catchment characteristics

	Accumulation periods	Upstream area	Terrain slope	Average groundwater table depth (cm)	Percent sand fraction (top5cm)	Upstream mean annual precipitation	Upstream average elevation (m)	Global average aridity index (x100)	Percent clay fraction (top5cm)	Percent silt fraction (top5cm)	Average annual soil water content	Average population density/km2
SPI-to-SSMI	1	0.13	0.17	0.00	0.00	0.00	0.21	0.00	0.00	0.09	0.07	0.03
	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	9	0.08	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.25
SPI-to-SSI	1	nan	nan	nan	nan	nan	nan	nan	nan	nan	nan	nan
	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8	0.01	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23
	9	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
	10	nan	nan	nan	nan	nan	nan	nan	nan	nan	nan	nan
	11	nan	nan	nan	nan	nan	nan	nan	nan	nan	nan	nan
	12	nan	nan	nan	nan	nan	nan	nan	nan	nan	nan	nan

Table S 5: T-test significance test of the catchments groups per accumulation per catchment characteristics based on the number of pixels occupied by the catchment characteristic. *

	Accumulation periods	Type	SPI-to-SSMI									SPI-to-SSI								
			1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
Geology	1	Crystalline basement	1.00	0.02	0.00	0.16						1.00	0.07	0.02	0.19					
	2	Consolidated sedimentary rocks	0.02	1.00	0.05	0.97						0.07	1.00	0.00	0.98					
	3	Volcanic rocks	0.00	0.05	1.00	0.20						0.02	0.00	1.00	0.00					
	4	Unconsolidate sediments	0.16	0.97	0.20	1.00						0.19	0.98	0.00	1.00					
	5	Surface water																		
Landcover	1	Shrubland	1.00	0.21	0.00		0.01		0.00	0.01	0.04	1.00	0.06	0.00		0.00		0.63	0.04	0.00
	2	Herbaceous vegetation	0.21	1.00	0.23		0.05		0.00	0.03	0.04	0.06	1.00	0.02		0.01		0.02	0.84	0.01
	3	Cropland	0.00	0.23	1.00		0.13		0.00	0.00	0.00	0.00	0.02	1.00		0.13		0.00	0.01	0.15
	4	Built-up																		
	5	Permanent water bodies	0.01	0.05	0.13		1.00		0.02	0.02	0.04	0.00	0.01	0.13				0.00	0.03	0.44
	6	Herbaceous wetland																		
	7	Bare/sparse vegetation	0.00	0.00	0.00		0.02		1.00	0.00	0.00	0.63	0.02	0.00		0.00		1.00	0.03	0.00
	8	Open forests	0.01	0.03	0.00		0.02		0.00	1.00	0.66	0.04	0.84	0.01		0.03		0.03	1.00	0.03
	9	Closed forests	0.04	0.04	0.00		0.04		0.00	0.66	1.00	0.00	0.01	0.15		0.44		0.00	0.03	1.00
*least pixels: builtup and herbaceous wetland																				

Table S 6: T-test significance test of the catchments groups per accumulation per catchment characteristics. *highlighted characteristics have significant relationship with the propagation from SPI-to-SSI

SPI-to-SSI										
Accumulation periods		1	2	3	4	5	6	7	8	9
Upstream area	1	nan	nan	nan	nan	nan	nan	nan	nan	nan
	2	nan	1.00	0.02	0.00	0.37	0.08	0.73	0.02	0.13
	3	nan	0.02	1.00	0.43	0.99	0.00	0.01	0.01	0.03
	4	nan	0.00	0.43	1.00	0.68	0.00	0.00	0.02	0.05
	5	nan	0.37	0.99	0.68	1.00	0.08	0.35	0.41	0.49
	6	nan	0.08	0.00	0.00	0.08	1.00	0.19	0.19	0.56
	7	nan	0.73	0.01	0.00	0.35	0.19	1.00	0.04	0.19
	8	nan	0.02	0.01	0.02	0.41	0.19	0.04	1.00	0.15
	9	nan	0.13	0.03	0.05	0.49	0.56	0.19	0.15	1.00
Terrain slope	1	nan	nan	nan	nan	nan	nan	nan	nan	nan
	2	nan	1.00	0.07	0.38	0.00	0.00	0.00	0.05	0.00
	3	nan	0.07	1.00	0.32	0.00	0.00	0.00	0.27	0.01
	4	nan	0.38	0.32	1.00	0.00	0.00	0.00	0.12	0.01
	5	nan	0.00	0.00	0.00	1.00	0.03	0.21	0.17	0.93
	6	nan	0.00	0.00	0.00	0.03	1.00	0.56	0.01	0.20
	7	nan	0.00	0.00	0.00	0.21	0.56	1.00	0.09	0.46
	8	nan	0.05	0.27	0.12	0.17	0.01	0.09	1.00	0.46
	9	nan	0.00	0.01	0.01	0.93	0.20	0.46	0.46	1.00
Average groundwater table depth (cm)	1	nan	nan	nan	nan	nan	nan	nan	nan	nan
	2	nan	1.00	0.61	0.42	0.48	0.94	0.02	0.77	0.46
	3	nan	0.61	1.00	0.19	0.83	0.68	0.08	0.53	0.29
	4	nan	0.42	0.19	1.00	0.17	0.41	0.00	0.84	0.75
	5	nan	0.48	0.83	0.17	1.00	0.52	0.19	0.52	0.32
	6	nan	0.94	0.68	0.41	0.52	1.00	0.03	0.78	0.50
	7	nan	0.02	0.08	0.00	0.19	0.03	1.00	0.07	0.03
	8	nan	0.77	0.53	0.84	0.52	0.78	0.07	1.00	0.73
	9	nan	0.46	0.29	0.75	0.32	0.50	0.03	0.73	1.00
Percent sand fraction (top5cm)	1	nan	nan	nan	nan	nan	nan	nan	nan	nan
	2	nan	1.00	0.98	0.95	0.00	0.00	0.00	0.37	0.00
	3	nan	0.98	1.00	0.93	0.00	0.00	0.00	0.32	0.00
	4	nan	0.95	0.93	1.00	0.00	0.00	0.00	0.37	0.00
	5	nan	0.00	0.00	0.00	1.00	0.73	0.60	0.35	0.13
	6	nan	0.00	0.00	0.00	0.73	1.00	0.34	0.27	0.16
	7	nan	0.00	0.00	0.00	0.60	0.34	1.00	0.44	0.04
	8	nan	0.37	0.32	0.37	0.35	0.27	0.44	1.00	0.14
	9	nan	0.00	0.00	0.00	0.13	0.16	0.04	0.14	1.00
Upstream mean annual precipitation	1	nan	nan	nan	nan	nan	nan	nan	nan	nan
	2	nan	1.00	0.01	0.38	0.00	0.00	0.00	0.05	0.01
	3	nan	0.01	1.00	0.21	0.00	0.00	0.00	0.56	0.10
	4	nan	0.38	0.21	1.00	0.00	0.00	0.00	0.26	0.07
	5	nan	0.00	0.00	0.00	1.00	0.01	0.25	0.13	0.61
	6	nan	0.00	0.00	0.00	0.01	1.00	0.20	0.00	0.03
	7	nan	0.00	0.00	0.00	0.25	0.20	1.00	0.03	0.23
	8	nan	0.05	0.56	0.26	0.13	0.00	0.03	1.00	0.39
	9	nan	0.01	0.10	0.07	0.61	0.03	0.23	0.39	1.00
Upstream average elevation (m)	1	nan	nan	nan	nan	nan	nan	nan	nan	nan
	2	nan	1.00	0.23	0.27	0.00	0.00	0.00	0.02	0.01
	3	nan	0.23	1.00	0.03	0.00	0.00	0.00	0.05	0.02
	4	nan	0.27	0.03	1.00	0.00	0.00	0.00	0.00	0.00
	5	nan	0.00	0.00	0.00	1.00	0.00	0.22	0.64	0.98
	6	nan	0.00	0.00	0.00	0.00	1.00	0.01	0.01	0.04
	7	nan	0.00	0.00	0.00	0.22	0.01	1.00	0.22	0.50
	8	nan	0.02	0.05	0.00	0.64	0.01	0.22	1.00	0.77
	9	nan	0.01	0.02	0.00	0.98	0.04	0.50	0.77	1.00
Global average aridity index (x100)	1	nan	nan	nan	nan	nan	nan	nan	nan	nan
	2	nan	1.00	0.62	0.43	0.00	0.00	0.00	0.18	0.00
	3	nan	0.62	1.00	0.67	0.00	0.00	0.00	0.02	0.00
	4	nan	0.43	0.67	1.00	0.00	0.00	0.00	0.09	0.00
	5	nan	0.00	0.00	0.00	1.00	0.90	0.97	0.63	0.00
	6	nan	0.00	0.00	0.00	0.90	1.00	0.86	0.63	0.00
	7	nan	0.00	0.00	0.00	0.97	0.86	1.00	0.60	0.00
	8	nan	0.18	0.02	0.09	0.63	0.63	0.60	1.00	0.04
	9	nan	0.00	0.00	0.00	0.00	0.00	0.00	0.04	1.00
Percent clay fraction (top5cm)	1	nan	nan	nan	nan	nan	nan	nan	nan	nan
	2	nan	1.00	0.28	0.19	0.31	0.09	0.23	0.21	0.00
	3	nan	0.28	1.00	0.73	0.07	0.02	0.02	0.04	0.00
	4	nan	0.19	0.73	1.00	0.05	0.01	0.02	0.06	0.00
	5	nan	0.31	0.07	0.05	1.00	0.66	0.97	0.64	0.00
	6	nan	0.09	0.02	0.01	0.66	1.00	0.58	0.81	0.00
	7	nan	0.23	0.02	0.02	0.97	0.58	1.00	0.53	0.00
	8	nan	0.21	0.04	0.06	0.64	0.81	0.53	1.00	0.05
	9	nan	0.00	0.00	0.00	0.00	0.00	0.00	0.05	1.00
Percent silt fraction (top5cm)	1	nan	nan	nan	nan	nan	nan	nan	nan	nan
	2	nan	1.00	0.01	0.13	0.00	0.00	0.00	0.01	0.00
	3	nan	0.01	1.00	0.26	0.00	0.00	0.00	0.11	0.07
	4	nan	0.13	0.26	1.00	0.00	0.00	0.00	0.06	0.04
	5	nan	0.00	0.00	0.00	1.00	0.00	0.80	0.33	0.46
	6	nan	0.00	0.00	0.00	0.00	1.00	0.01	0.00	0.01
	7	nan	0.00	0.00	0.00	0.80	0.01	1.00	0.24	0.36
	8	nan	0.01	0.11	0.06	0.33	0.00	0.24	1.00	0.88
	9	nan	0.00	0.07	0.04	0.46	0.01	0.36	0.88	1.00
Average annual soil water content	1	nan	nan	nan	nan	nan	nan	nan	nan	nan
	2	nan	1.00	0.00	0.48	0.00	0.00	0.00	0.01	0.01
	3	nan	0.00	1.00	0.06	0.00	0.00	0.00	0.08	0.08
	4	nan	0.48	0.06	1.00	0.00	0.00	0.00	0.04	0.04
	5	nan	0.00	0.00	0.00	1.00	0.01	0.84	0.42	0.44
	6	nan	0.00	0.00	0.00	0.01	1.00	0.01	0.01	0.01
	7	nan	0.00	0.00	0.00	0.84	0.01	1.00	0.32	0.34
	8	nan	0.01	0.08	0.04	0.42	0.01	0.32	1.00	0.99
	9	nan	0.01	0.08	0.04	0.44	0.01	0.34	0.99	1.00
Average population density/km2	1	nan	nan	nan	nan	nan	nan	nan	nan	nan
	2	nan	1.00	0.17	0.75	0.00	0.00	0.00	0.93	0.54
	3	nan	0.17	1.00	0.31	0.01	0.00	0.02	0.59	0.79
	4	nan	0.75	0.31	1.00	0.00	0.00	0.00	0.95	0.68
	5	nan	0.00	0.01	0.00	1.00	0.05	0.45	0.04	0.00
	6	nan	0.00	0.00	0.00	0.05	1.00	0.01	0.00	0.00
	7	nan	0.00	0.02	0.00	0.45	0.01	1.00	0.05	0.01
	8	nan	0.93	0.59	0.95	0.04	0.00	0.05	1.00	0.83
	9	nan	0.54	0.79	0.68	0.00	0.00	0.01	0.83	1.00

Table S 7: T-test significance test of the catchments groups per accumulation per catchment characteristics.
**highlighted characteristics have significant relationship with the propagation from SPI-to-SSMI*

SPI-to-SSMI										
	Accumulation periods	1	2	3	4	5	6	7	8	9
Upstream area	1	1.00	0.71	0.12	0.19	0.37	0.21	0.31	0.90	0.65
	2	0.71	1.00	0.00	0.01	0.04	0.00	0.25	0.54	0.85
	3	0.12	0.00	1.00	0.05	0.84	0.31	0.14	0.04	0.26
	4	0.19	0.01	0.05	1.00	0.10	0.00	0.40	0.08	0.40
	5	0.37	0.04	0.84	0.10	1.00	0.38	0.38	0.24	0.51
	6	0.21	0.00	0.31	0.00	0.38	1.00	0.18	0.10	0.34
	7	0.31	0.25	0.14	0.40	0.38	0.18	1.00	0.12	0.62
	8	0.90	0.54	0.04	0.08	0.24	0.10	0.12	1.00	0.31
	9	0.65	0.85	0.26	0.40	0.51	0.34	0.62	0.31	1.00
Terrain slope	1	1.00	0.11	0.00	0.04	0.22	0.17	0.00	0.01	0.09
	2	0.11	1.00	0.00	0.13	0.96	0.97	0.00	0.03	0.53
	3	0.00	0.00	1.00	0.00	0.00	0.00	0.71	0.14	0.14
	4	0.04	0.13	0.00	1.00	0.10	0.08	0.00	0.30	0.96
	5	0.22	0.96	0.00	0.10	1.00	0.93	0.00	0.09	0.66
	6	0.17	0.97	0.00	0.08	0.93	1.00	0.00	0.05	0.58
	7	0.00	0.00	0.71	0.00	0.00	0.00	1.00	0.05	0.04
	8	0.01	0.03	0.14	0.30	0.09	0.05	0.05	1.00	0.44
	9	0.09	0.53	0.14	0.96	0.66	0.58	0.04	0.44	1.00
Average groundwater table depth (cm)	1	1.00	0.91	0.13	0.00	0.00	0.00	0.09	0.01	0.11
	2	0.91	1.00	0.01	0.00	0.00	0.00	0.01	0.00	0.01
	3	0.13	0.01	1.00	0.00	0.00	0.00	0.55	0.00	0.14
	4	0.00	0.00	0.00	1.00	0.41	0.65	0.03	0.80	0.77
	5	0.00	0.00	0.00	0.41	1.00	0.76	0.01	0.90	0.55
	6	0.00	0.00	0.00	0.65	0.76	1.00	0.01	0.98	0.64
	7	0.09	0.01	0.55	0.03	0.01	0.01	1.00	0.02	0.21
	8	0.01	0.00	0.00	0.80	0.90	0.98	0.02	1.00	0.64
	9	0.11	0.01	0.14	0.77	0.55	0.64	0.21	0.64	1.00
Percent sand fraction (top5cm)	1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3	0.00	0.00	1.00	0.20	0.61	0.12	0.00	0.00	0.11
	4	0.00	0.00	0.20	1.00	0.02	0.00	0.00	0.00	0.03
	5	0.00	0.00	0.61	0.02	1.00	0.16	0.00	0.00	0.09
	6	0.00	0.00	0.12	0.00	0.16	1.00	0.01	0.00	0.20
	7	0.00	0.00	0.00	0.00	0.00	0.01	1.00	0.03	0.73
	8	0.00	0.00	0.00	0.00	0.00	0.00	0.03	1.00	0.22
	9	0.00	0.00	0.11	0.03	0.09	0.20	0.73	0.22	1.00
Upstream mean annual precipitation	1	1.00	0.35	0.00	0.01	0.03	0.01	0.00	0.00	0.01
	2	0.35	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3	0.00	0.00	1.00	0.04	0.00	0.00	0.88	0.59	0.99
	4	0.01	0.00	0.04	1.00	0.11	0.00	0.13	0.48	0.39
	5	0.03	0.00	0.00	0.11	1.00	0.08	0.01	0.10	0.13
	6	0.01	0.00	0.00	0.00	0.08	1.00	0.00	0.00	0.00
	7	0.00	0.00	0.88	0.13	0.01	0.00	1.00	0.38	0.91
	8	0.00	0.00	0.59	0.48	0.10	0.00	0.38	1.00	0.61
	9	0.01	0.00	0.99	0.39	0.13	0.00	0.91	0.61	1.00
Upstream average elevation (m)	1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
	3	0.00	0.00	1.00	0.00	0.00	0.00	0.60	0.01	0.08
	4	0.00	0.00	0.00	1.00	0.03	0.08	0.05	0.47	0.63
	5	0.00	0.00	0.00	0.03	1.00	0.87	0.00	0.79	0.88
	6	0.00	0.00	0.00	0.08	0.87	1.00	0.00	0.85	0.93
	7	0.00	0.00	0.60	0.05	0.00	0.00	1.00	0.00	0.02
	8	0.00	0.00	0.01	0.47	0.79	0.85	0.00	1.00	0.97
	9	0.00	0.03	0.08	0.63	0.88	0.93	0.02	0.97	1.00
Global average aridity index (x100)	1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11
	3	0.00	0.00	1.00	0.06	0.03	0.46	0.08	0.06	0.79
	4	0.00	0.00	0.06	1.00	0.88	0.10	0.00	0.00	0.63
	5	0.00	0.00	0.03	0.88	1.00	0.06	0.00	0.00	0.56
	6	0.00	0.00	0.46	0.10	0.06	1.00	0.00	0.00	0.99
	7	0.00	0.00	0.08	0.00	0.00	0.00	1.00	0.85	0.02
	8	0.00	0.00	0.06	0.00	0.00	0.00	0.85	1.00	0.01
	9	0.00	0.11	0.79	0.63	0.56	0.99	0.02	0.01	1.00
Percent clay fraction (top5cm)	1	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
	2	0.00	1.00	0.01	0.07	0.86	0.34	0.07	0.42	0.34
	3	0.00	0.01	1.00	0.16	0.00	0.01	0.70	0.24	0.00
	4	0.00	0.07	0.16	1.00	0.01	0.25	0.26	0.89	0.05
	5	0.00	0.86	0.00	0.01	1.00	0.14	0.02	0.27	0.27
	6	0.00	0.34	0.01	0.25	0.14	1.00	0.04	0.61	0.04
	7	0.00	0.07	0.70	0.26	0.02	0.04	1.00	0.16	0.00
	8	0.00	0.42	0.24	0.89	0.27	0.61	0.16	1.00	0.03
	9	0.03	0.34	0.00	0.05	0.27	0.04	0.00	0.03	1.00
Percent silt fraction (top5cm)	1	1.00	0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2	0.95	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3	0.00	0.00	1.00	0.16	0.01	0.00	0.19	0.62	0.89
	4	0.00	0.00	0.16	1.00	0.12	0.00	0.02	0.14	0.46
	5	0.00	0.00	0.01	0.12	1.00	0.05	0.00	0.02	0.20
	6	0.00	0.00	0.00	0.00	0.05	1.00	0.00	0.00	0.00
	7	0.00	0.00	0.19	0.02	0.00	0.00	1.00	0.30	0.43
	8	0.00	0.00	0.62	0.14	0.02	0.00	0.30	1.00	0.67
	9	0.00	0.00	0.89	0.46	0.20	0.00	0.43	0.67	1.00
Average annual soil water content	1	1.00	0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2	0.88	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3	0.00	0.00	1.00	0.06	0.00	0.00	0.47	0.73	0.73
	4	0.00	0.00	0.06	1.00	0.07	0.00	0.03	0.37	0.69
	5	0.00	0.00	0.00	0.07	1.00	0.03	0.00	0.05	0.28
	6	0.00	0.00	0.00	0.00	0.03	1.00	0.00	0.00	0.00
	7	0.00	0.00	0.47	0.03	0.00	0.00	1.00	0.20	0.35
	8	0.00	0.00	0.73	0.37	0.05	0.20	1.00	0.72	0.72
	9	0.00	0.00	0.73	0.69	0.28	0.00	0.35	0.72	1.00
Average population density/km2	1	1.00	0.87	0.00	0.11	0.47	0.31	0.00	0.03	0.16
	2	0.87	1.00	0.00	0.07	0.00	0.01	0.00	0.00	0.00
	3	0.00	0.00	1.00	0.19	0.98	0.09	0.73	0.01	0.06
	4	0.11	0.00	0.19	1.00	0.47	0.44	0.62	0.28	0.39
	5	0.47	0.07	0.98	0.47	1.00	0.35	0.92	0.54	0.65
	6	0.31	0.01	0.09	0.44	0.35	1.00	0.43	0.61	0.64
	7	0.00	0.00	0.73	0.62	0.92	0.43	1.00	0.03	0.08
	8	0.03	0.00	0.01	0.28	0.54	0.61	0.03	1.00	0.63
	9	0.16	0.00	0.06	0.39	0.65	0.64	0.08	0.63	1.00

*1,10,12 Accumulation periods only had single catchments hence Nan values in the t-test