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Supplement of

Drought propagation and ecosystem resilience in a peri-urban catchment of Berlin-Brandenburg

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Supplementary Material

Tables

Table S1: Summary Statistics of all Variables and Stations.

		Schildow	Luebars	Tegel
Precipitation (mm)	Min	0.2		
	Median	36.75		
	Mean	43.35		
	Max	260.5		
Surface Water Level (cm)	Min	9.28	7.00	11.00
	Median	25.20	43.00	26.00
	Mean	25.26	43.74	29.24
	Max	45.40	93.00	81.00
Groundwater Level (mNHN)	Min	39.11	35.82	31.27
	Median	39.73	37.24	31.82
	Mean	39.75	37.17	31.79
	Max	40.57	38.14	32.18
SPI3	Min	-2.5		
	Median	-0.01		
	Mean	0.01		
	Max	2.44		
SSWLI3	Min	-2.35	-2.17	-1.82
	Median	0.02	0.05	-0.18
	Mean	0.01	0.15	0.01
	Max	1.9	1.88	2.93
SGLI3	Min	-1.45	-2.23	-2.45
	Median	0.02	0.19	0.1
	Mean	0	0	0
	Max	1.92	1.47	1.33
NDVI	Min	0.03	0.00	0.09
	Median	0.59	0.66	0.63
	Mean	0.54	0.59	0.61
	Max	0.77	0.83	0.91

Table S2: R^2, Linear Model (LM) Slope and p-value, Mann-Kendall (MK) tau and p-value, Sen's Slope of Indices.

Station	Variable	R^2	Slope LM	p-value LM	MK tau	p-value MK	Sen's Slope
Tegel-DWD	SPI3	0	0	0.924	0.007	0.899	2.00E-04
Schildow	SSWLI3	0.502	-5.00E-04	0	-0.503	0	-0.0161
	SGLI3	0.391	-4.00E-04	0	-0.468	0	-0.0139
	NDVI	0.026	0	0.047	0.066	0.229	2.00E-04
Luebars	SSWLI3	0.024	-1.00E-04	0.06	-0.124	0.026	-0.0051
	SGLI3	0.515	-5.00E-04	0	-0.492	0	-0.017
	NDVI	0.021	0	0.078	0.026	0.634	1.00E-04
Tegel	SSWLI3	0.032	-1.00E-04	0.029	-0.142	0.01	-0.0044
	SGLI3	0.496	-5.00E-04	0	-0.501	0	-0.0156
	NDVI	0.007	0	0.313	0.038	0.492	2.00E-04

Table S3: R^2, Linear Model (LM) Slope and p-value, Mann-Kendall (MK) tau and p-value, Sen's Slope of precipitation and water level data.

Station	Variable	R2	Slope LM	p-value LM	MK tau	MK p-value	Sen's Slope
Tegel-DWD	precipitation	0.001	-8.00E-04	0.669	-0.36	0.512	-0.0266
Schildow	surface water level	0.213	-0.0018	0	-0.319	0	-0.052
	groundwater level	0.281	-1.00E-04	0	-0.376	0	-0.0041
Luebars	surface water level	0.02	-0.0014	0.083	-0.088	0.112	-0.0433
	groundwater level	0.29	-2.00E-04	0	-0.354	0	-0.0044
Tegel	surface water level	0.006	-5.00E-04	0.362	-0.07	0.205	-0.018
	groundwater level	0.472	-1.00E-04	0	-0.478	0	-0.0036

Supplementary Figures

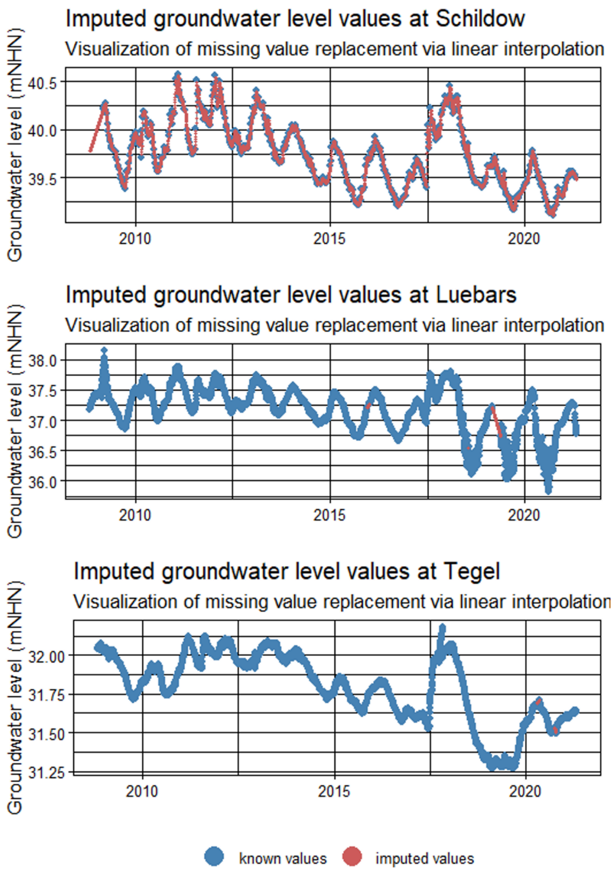

Figure S1: Visualisation of original and imputed daily Groundwater Level Measurements at Schildow, Luebars, and Tegel.

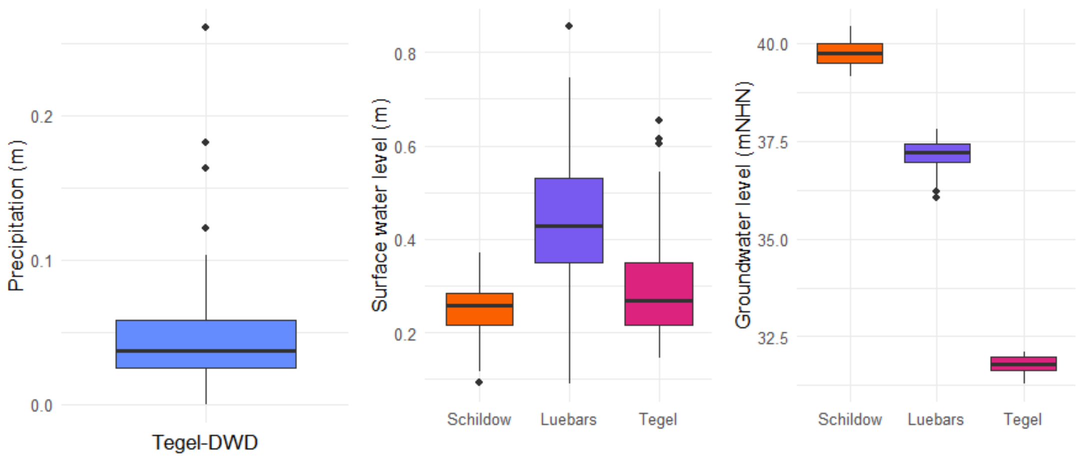

Figure S2: Boxplot of monthly precipitation sum at Tegel-DWD, monthly means of Surface Water Level and Groundwater Level Data at the Stations Schildow, Luebars, and Tegel.

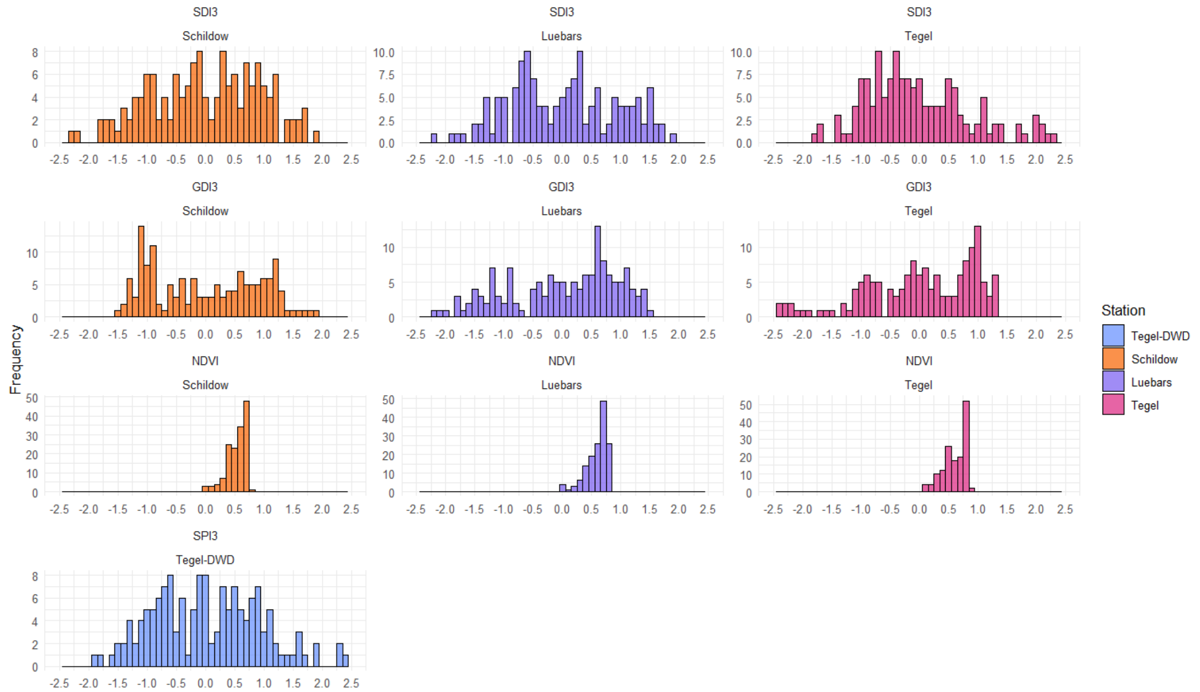

Figure S3: Frequency Distribution of all Indices and for all Stations.

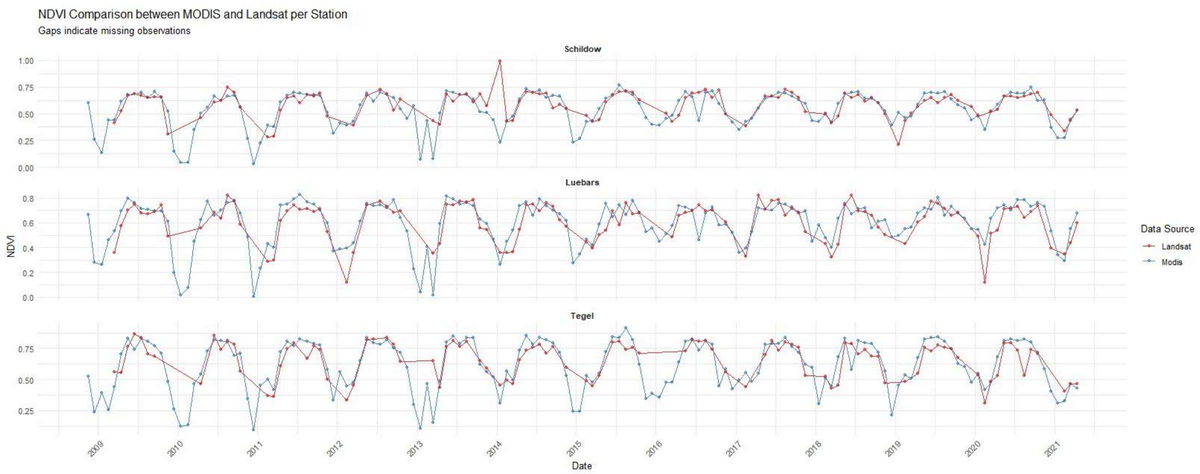

Figure S4: Comparison between MODIS and Landsat NDVI data for Schildow, Luebars, and Tegel within the NDVI Buffer.

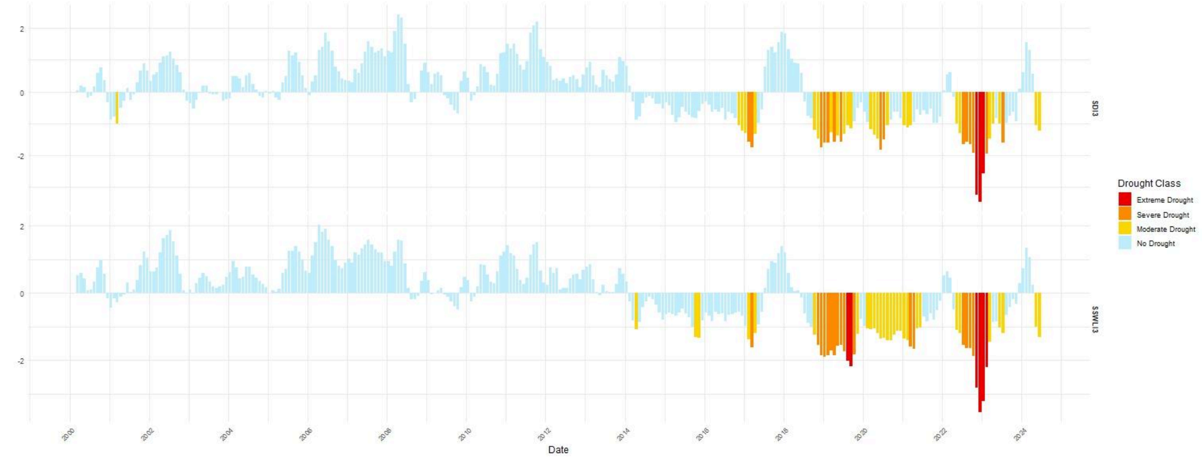

Figure S5: Comparison of drought classifications derived from surface water level (SSWLI3) and discharge-based (SDI3) indices at Schildow.

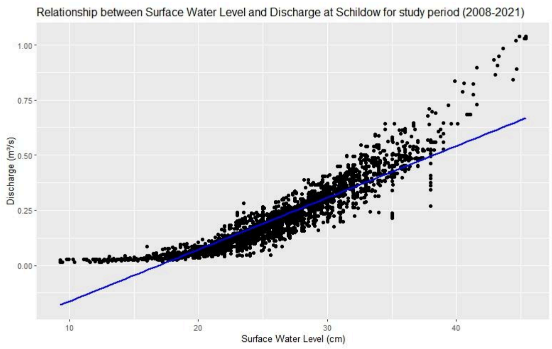

Figure S6: Relationship between surface water level (cm) and discharge (m^3 s^{-1}) at the Schildow station.

Discussion on SSWLI and Comparison with Discharge-Based Approach

To strengthen the methodological reliability of the surface water level–based drought index (SSWLI), we evaluated its relationship with discharge at the Schildow station, where both parameters were available. This comparison aimed to assess whether water level can serve as a practical proxy for discharge in drought monitoring. The results (Fig. S6) reveal a strong linear relationship between surface water level and discharge for levels above 20 cm, confirming that variations in river stage reliably reflect changes in flow within this range. At very low levels, discharge approaches zero, which is consistent with hydrological expectations for near-dry stream conditions.

In addition, we directly compared the drought classifications derived from SSWLI and the discharge-based SDI (Fig. S5). Both indices show closely aligned temporal drought patterns, though SSWLI tends to indicate slightly more severe drought classes during low-flow periods. This heightened sensitivity makes SSWLI particularly effective in identifying critical low-water events that might be underestimated by discharge-based indices. These findings demonstrate that surface water level can be used as a robust proxy for discharge in small or data-limited catchments, supporting the applicability of the SSWLI approach in broader hydrological drought analyses.

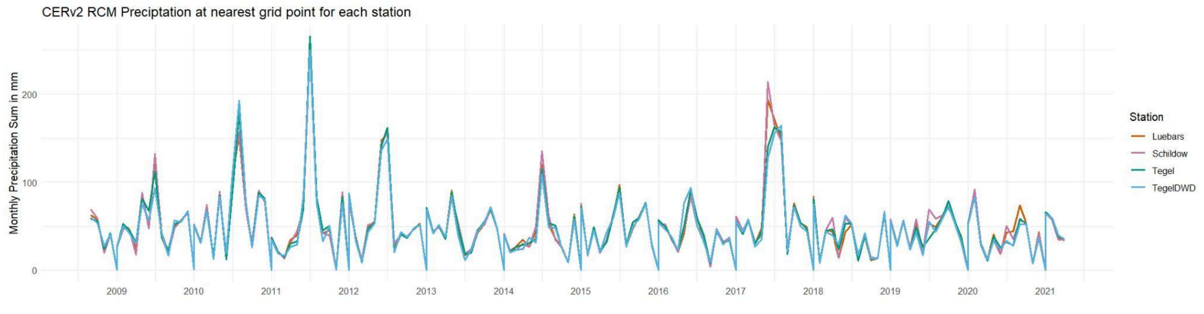

Figure S7: Spatial distribution of precipitation data based on the gridded CER v2 dataset. The time series at the different stations taken from the gridded climate dataset shows small variations in precipitation between the stations used in the study. Data source: Bart, F.; Schmidt, B.; Wang, X.; Holtmann, A.; Meier, F.; Otto, M.; Scherer, D. (2024). *The Central Europe Refined analysis version 2 (CER v2): evaluating three decades of high-resolution precipitation data for the Berlin-Brandenburg metropolitan region.* Meteorologische Zeitschrift, 33 (5):339-363. http://dx.doi.org/10.1127/metz/2024/1233