

Daily extreme temperatures in ERA5-LAND versus in-situ
measurements in Poland 1991-2020

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Monitoring and extreme events analysis in high spatial and temporal resolution is one of the most critical tasks facing NNHSs in the context of present climate change.

It is also crucial in contemporary adaptation measures as well as actions awaiting in the future for climate community.

Reanalyses may serve as a tool that allows the monitoring and analysis of meteorological variables' long-term characteristics, thus allowing a proper estimation of probabilistic features of extreme events providing that reanalyses are able to reconstruct reality at a desired level.

Aim of the research

Evaluation of ERA5-Land t2m daily extreme temperatures (min & max) over Poland via the comparison with in-situ measurements.

Research area – Poland

Temporal scope – 1991-2020

Data - t2m

- ERA5_Land data
(0.1x 0.1 lat x lon & 1h resolution)
- in situ obs. - synoptic stations from polish NHMS – 55 (some coastal stations due to their location have been excluded from the analysis), observation times data have been used (24 or 8 depending on the station's tier an period)

Variables to be compared

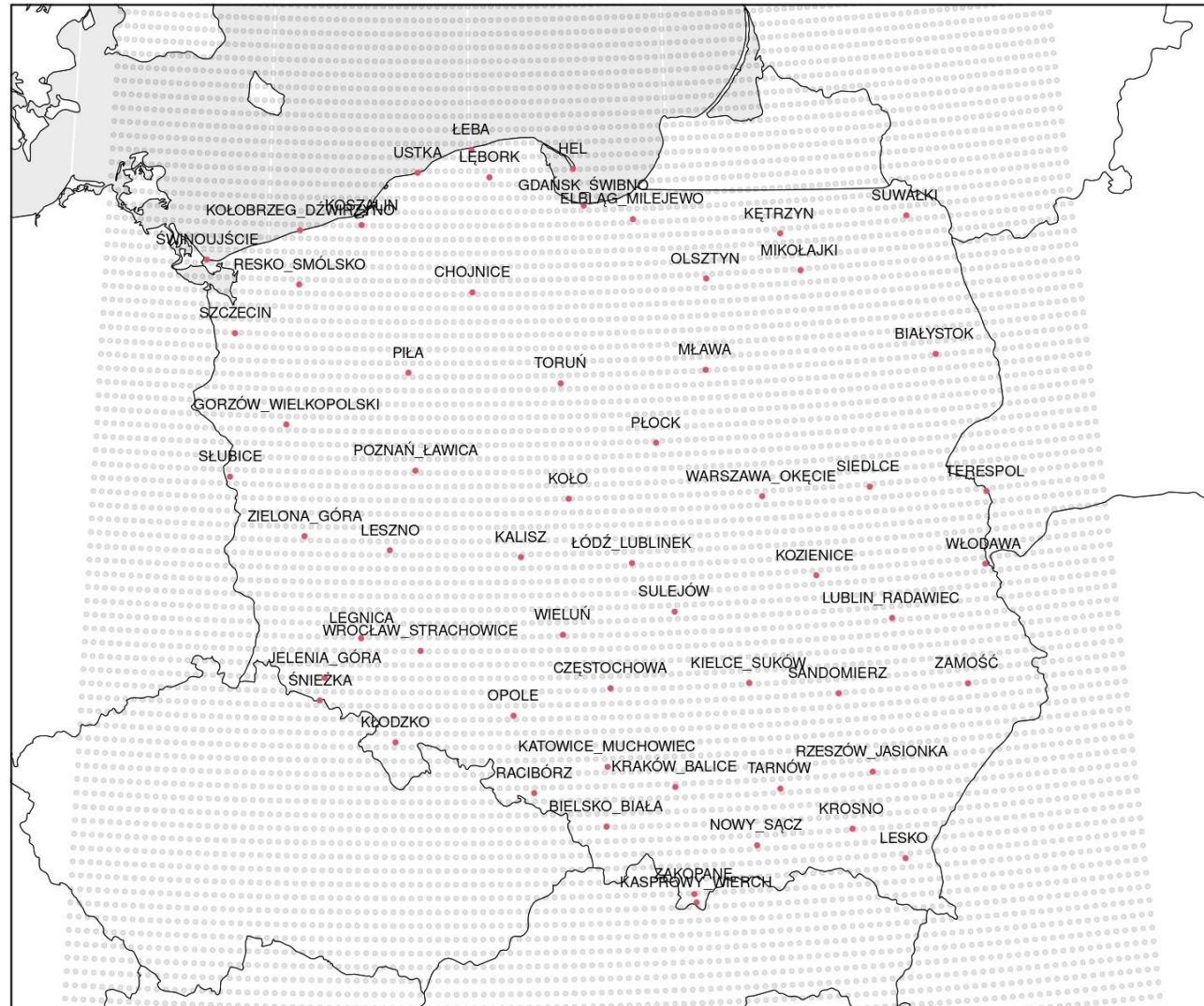
t_{\min} – minimum daily temperature

t_{\max} – maximum daily temperature

In both cases derived from data with hourly resolution (where possible)

Characteristics comparison

Bias, quantiles, statistical distributions, GEV derived RLs for selected RPs



RESULTS

Correlation coefficients



t_{ma}

t_{mi}

x

n

STATION

STATION	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
ZIELONA GÓRA-	0.97	0.98	0.97	0.98	0.97	0.97	0.97	0.98	0.98	0.98	0.97	0.98	0.97	0.95	0.89	0.88	0.88	0.86	0.85	0.86	0.87	0.92	0.95	0.96	
ZAMOŚĆ-	0.95	0.98	0.97	0.98	0.97	0.97	0.97	0.89	0.96	0.97	0.97	0.98	0.96	0.95	0.93	0.91	0.88	0.88	0.91	0.87	0.85	0.89	0.93	0.96	0.95
ZAKOPANE-	0.91	0.94	0.96	0.96	0.96	0.96	0.96	0.96	0.97	0.96	0.93	0.89	0.92	0.91	0.88	0.84	0.87	0.89	0.87	0.88	0.87	0.91	0.89	0.88	
WROCLAW_STRACHOWICE-	0.98	0.98	0.97	0.98	0.98	0.98	0.97	0.97	0.98	0.97	0.97	0.97	0.95	0.95	0.92	0.92	0.91	0.92	0.89	0.9	0.9	0.91	0.9	0.92	
WŁODAWA-	0.98	0.97	0.97	0.98	0.98	0.97	0.96	0.97	0.97	0.97	0.97	0.97	0.97	0.96	0.95	0.94	0.92	0.93	0.91	0.91	0.91	0.9	0.94	0.96	0.96
WIELUN-	0.97	0.97	0.97	0.98	0.97	0.97	0.97	0.97	0.98	0.98	0.98	0.98	0.98	0.98	0.96	0.94	0.94	0.92	0.92	0.92	0.94	0.94	0.96	0.96	0.97
WARSZAWA_OKĘCIE-	0.98	0.97	0.97	0.98	0.98	0.97	0.97	0.97	0.98	0.98	0.98	0.98	0.97	0.97	0.95	0.93	0.94	0.92	0.92	0.92	0.91	0.92	0.94	0.95	0.96
USTKA-	0.97	0.96	0.94	0.92	0.9	0.9	0.9	0.9	0.94	0.96	0.96	0.97	0.97	0.97	0.97	0.92	0.88	0.78	0.78	0.81	0.85	0.93	0.94	0.96	
TORUŃ-	0.98	0.97	0.97	0.98	0.98	0.97	0.97	0.97	0.97	0.98	0.97	0.98	0.97	0.97	0.95	0.93	0.91	0.92	0.91	0.9	0.9	0.88	0.92	0.94	0.96
TERESPOL-	0.98	0.97	0.97	0.98	0.97	0.97	0.96	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.96	0.94	0.93	0.92	0.91	0.9	0.9	0.88	0.93	0.96	0.96
TARNÓW-	0.96	0.97	0.97	0.98	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.96	0.94	0.93	0.9	0.86	0.79	0.76	0.75	0.79	0.86	0.91	0.93	0.92	
ŚWINOUJSCIE-	0.98	0.97	0.96	0.93	0.92	0.93	0.93	0.93	0.96	0.97	0.97	0.98	0.98	0.97	0.94	0.92	0.9	0.89	0.88	0.88	0.88	0.94	0.95	0.97	
ŚNIEŻKA-	0.88	0.83	0.9	0.94	0.94	0.96	0.95	0.95	0.94	0.86	0.82	0.82	0.86	0.88	0.84	0.88	0.88	0.89	0.87	0.84	0.82	0.79	0.84	0.84	
SZCZECIN-	0.98	0.97	0.97	0.98	0.98	0.97	0.97	0.97	0.97	0.97	0.97	0.98	0.97	0.95	0.93	0.9	0.91	0.9	0.89	0.87	0.84	0.91	0.93	0.96	
SUWAŁKI-	0.98	0.97	0.95	0.98	0.98	0.97	0.97	0.97	0.97	0.96	0.97	0.98	0.98	0.98	0.97	0.94	0.92	0.92	0.88	0.89	0.86	0.88	0.93	0.96	0.97
SULEJÓW-	0.97	0.97	0.97	0.98	0.98	0.97	0.97	0.97	0.98	0.98	0.97	0.98	0.97	0.97	0.96	0.94	0.92	0.91	0.9	0.89	0.9	0.89	0.93	0.94	0.97
SŁUBICE-	0.98	0.97	0.97	0.98	0.97	0.96	0.98	0.97	0.97	0.97	0.97	0.98	0.96	0.95	0.9	0.85	0.82	0.7	0.72	0.75	0.78	0.89	0.91	0.94	
SIEDLCE-	0.98	0.98	0.97	0.98	0.98	0.97	0.97	0.97	0.98	0.97	0.97	0.98	0.97	0.97	0.96	0.94	0.91	0.89	0.88	0.86	0.85	0.84	0.92	0.95	0.97
SANDOMIERZ-	0.97	0.97	0.97	0.98	0.97	0.97	0.97	0.97	0.98	0.97	0.97	0.97	0.97	0.97	0.95	0.94	0.93	0.91	0.9	0.92	0.93	0.94	0.96	0.96	
RZESZÓW_JASIONKA-	0.97	0.97	0.97	0.98	0.97	0.97	0.97	0.97	0.97	0.97	0.95	0.96	0.96	0.95	0.94	0.9	0.89	0.9	0.88	0.9	0.9	0.9	0.92	0.94	0.94
RESKO_SMÓLSKO-	0.97	0.97	0.96	0.98	0.97	0.97	0.97	0.94	0.92	0.96	0.96	0.97	0.97	0.95	0.92	0.89	0.81	0.66	0.7	0.76	0.86	0.92	0.94	0.96	
RACIBÓRZ-	0.97	0.97	0.98	0.98	0.97	0.97	0.97	0.97	0.98	0.98	0.97	0.97	0.97	0.95	0.93	0.91	0.9	0.89	0.86	0.89	0.89	0.93	0.94	0.95	
POZNAN_ŁAWICA-	0.98	0.98	0.97	0.98	0.98	0.97	0.97	0.97	0.97	0.97	0.97	0.98	0.97	0.97	0.96	0.93	0.94	0.92	0.91	0.91	0.91	0.93	0.94	0.97	
PŁOCK-	0.98	0.98	0.97	0.98	0.98	0.97	0.97	0.97	0.97	0.97	0.97	0.98	0.98	0.98	0.96	0.94	0.94	0.91	0.92	0.9	0.91	0.94	0.96	0.97	
PILA-	0.98	0.97	0.97	0.98	0.98	0.97	0.97	0.97	0.97	0.97	0.97	0.98	0.97	0.96	0.93	0.92	0.91	0.92	0.9	0.89	0.88	0.86	0.9	0.93	0.95
OPOLE-	0.97	0.97	0.97	0.98	0.97	0.97	0.97	0.96	0.97	0.98	0.98	0.97	0.97	0.97	0.94	0.92	0.9	0.91	0.9	0.87	0.91	0.9	0.92	0.93	0.95
OLSZTYN-	0.98	0.96	0.96	0.98	0.98	0.97	0.97	0.97	0.97	0.97	0.97	0.98	0.97	0.98	0.96	0.94	0.92	0.9	0.89	0.86	0.89	0.94	0.95	0.97	
NOWY_SACZ-	0.94	0.96	0.97	0.97	0.96	0.96	0.96	0.97	0.97	0.97	0.95	0.93	0.93	0.9	0.88	0.83	0.84	0.86	0.83	0.88	0.87	0.91	0.92	0.9	
MŁAWA-	0.98	0.98	0.97	0.98	0.98	0.97	0.97	0.97	0.97	0.97	0.97	0.98	0.97	0.98	0.96	0.94	0.95	0.91	0.92	0.91	0.91	0.95	0.96	0.97	
MIKOŁAJKI-	0.98	0.97	0.96	0.98	0.98	0.97	0.97	0.97	0.98	0.97	0.98	0.98	0.98	0.98	0.97	0.95	0.95	0.93	0.94	0.92	0.94	0.92	0.94	0.96	0.98
ŁÓDŹ_LUBLINEK-	0.97	0.97	0.97	0.98	0.98	0.97	0.97	0.97	0.98	0.98	0.97	0.98	0.97	0.97	0.95	0.93	0.93	0.9	0.9	0.89	0.88	0.94	0.94	0.96	0.96
LUBLIN_RADAWIEC-	0.98	0.98	0.98	0.98	0.98	0.97	0.97	0.98	0.98	0.97	0.98	0.98	0.97	0.98	0.96	0.94	0.93	0.92	0.92	0.93	0.93	0.95	0.96	0.97	
LEBORK-	0.96	0.96	0.96	0.97	0.97	0.96	0.95	0.97	0.97	0.96	0.96	0.97	0.96	0.95	0.93	0.86	0.76	0.63	0.69	0.74	0.84	0.92	0.93	0.96	
LESZNO-	0.98	0.98	0.97	0.98	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.98	0.97	0.98	0.95	0.93	0.9	0.9	0.87	0.87	0.87	0.91	0.91	0.95	0.95
LESKO-	0.94	0.95	0.96	0.97	0.97	0.97	0.97	0.97	0.97	0.96	0.96	0.94	0.96	0.95	0.93	0.91	0.91	0.91	0.88	0.9	0.92	0.95	0.95	0.95	
LEGNICA-	0.97	0.98	0.97	0.98	0.98	0.97	0.97	0.97	0.98	0.97	0.96	0.97	0.97	0.98	0.95	0.94	0.9	0.9	0.89	0.86	0.88	0.9	0.92	0.91	0.94
KROSNO-	0.96	0.97	0.97	0.98	0.97	0.97	0.97	0.97	0.98	0.97	0.97	0.96	0.96	0.95	0.93	0.92	0.92	0.92	0.91	0.92	0.92	0.95	0.96	0.96	
KRAKÓW_BALICE-	0.96	0.97	0.97	0.98	0.97	0.97	0.97	0.97	0.97	0.97	0.96	0.95	0.94	0.92	0.9	0.89	0.9	0.89	0.87	0.9	0.89	0.91	0.9	0.9	
KOZIENICE-	0.98	0.98	0.97	0.98	0.98	0.97	0.97	0.97	0.98	0.97	0.97	0.98	0.97	0.98	0.95	0.92	0.88	0.85	0.84	0.84	0.82	0.83	0.9	0.92	0.96
KOSZALIN-	0.97	0.97	0.97	0.98	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.98	0.98	0.98	0.97	0.95	0.93	0.93	0.9	0.9	0.9	0.95	0.96	0.97	
KOŁO-	0.98	0.98	0.97	0.98	0.98	0.97	0.96	0.97	0.92	0.97	0.97	0.98	0.97	0.98	0.98	0.92	0.93	0.94	0.92	0.92	0.93	0.92	0.95	0.96	0.97
KŁODZKO-	0.95	0.97	0.97	0.98	0.97	0.98	0.97	0.97	0.97	0.97	0.96	0.96	0.95	0.92	0.85	0.8	0.8	0.8	0.75	0.8	0.8	0.91	0.94	0.95	0.95
KIELCE_SUKÓW-	0.97	0.96	0.97	0.98	0.98	0.98	0.97	0.97	0.97	0.98	0.97	0.97	0.97	0.95	0.93	0.9	0.88	0.89	0.88	0.87	0.88	0.84	0.89	0.92	0.94
KĘTRZYN-	0.98	0.98	0.97	0.98	0.98	0.97	0.97	0.97	0.97	0.97	0.98	0.98	0.97	0.98	0.97	0.96	0.94	0.92	0.9	0.9	0.82	0.85	0.94	0.96	0.98
KATOWICE_MUCHOWIEC-	0.96	0.96	0.97	0.98	0.97	0.97	0.97	0.97	0.98	0.98	0.97	0.96	0.96	0.95	0.94	0.92	0.91	0.91	0.92	0.88	0.89	0.88	0.92	0.94	0.94
KASPROWY_WIERCH-	0.84	0.9	0.94	0.94	0.95	0.95	0.94	0.95	0.95	0.93	0.9	0.84	0.89	0.77	0.85	0.86	0.86	0.88	0.86	0.86	0.84	0.83	0.8	0.78	0.69
KALISZ-	0.98	0.98	0.98	0.98	0.98	0.97	0.96	0.97	0.98	0.98	0.98	0.98	0.98	0.98	0.97	0.95	0.93	0.93	0.91	0.91	0.92	0.93	0.96	0.96	0.97
JELENIA_GÓRA-	0.96	0.96	0.97	0.98	0.98	0.98	0.98	0.98	0.98	0.97	0.96	0.95	0.93	0.91	0.85	0.81	0.82	0.8	0.8	0.81	0.81	0.86	0.85	0.89	0.89
GORZÓW_WIELKOPOLSKI-	0.98	0.97	0.97	0.98	0.98	0.98	0.98	0.97	0.98	0.97	0.97	0.98	0.97	0.98	0.97	0.96	0.94	0.95	0.94	0.93	0.92	0.91	0.94	0.95	0.96
GDANSK_SWIBNO-	0.97	0.97	0.96	0.95	0.96	0.95	0.92	0.92	0.94	0.97	0.95	0.96	0.96	0.96	0.93	0.89	0.89	0.92	0.91	0.88	0.89	0.91	0.93	0.92	0.92
ELBLĄG_MILEJEWÓ-	0.97	0.96	0.95	0.97	0.97	0.95	0.95	0.95	0.95	0.95	0.96	0.9													

BIAS (E5L - OBS)

t_{max} (left), t_{min} (right)



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STATION	t _{max}												t _{min}												
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
ZIELONA_GÓRA	0.6	0.7	0.6	0.3	0.6	0.6	0.5	0.6	0.8	0.8	0.9	0.8	0.3	-0.1	-0.4	-0.9	-0.2	0	0.1	0.1	0.3	0.5	0.5	0.6	
ZAMOŚĆ	-0.1	-0.1	-0.1	-0.5	-0.6	-0.7	-0.9	-0.7	-0.4	-0.5	-0.2	-0.2	0.2	-0.1	0	0.5	1.2	1.6	1.7	2.2	1.7	1.1	0.5	0.2	
ZAKOPANE	-3.4	-3.1	-3.2	-3.6	-2.8	-3	-3	-3.1	-2.6	-2.8	-3	-3.3	-2.6	-2.4	-2.3	-2.5	-1.7	-1.5	-1.2	-0.9	-0.8	-1	-1.5	-2.1	
WROCLAW_STRACHOWICE	-0.3	-0.2	-0.1	-0.4	-0.5	-0.6	-0.7	-0.6	-0.3	-0.2	-0.2	-0.3	0.2	0	0.1	0.2	0.7	0.8	1	1.4	1.4	1.5	0.9	0.6	
WLODAWA	0	0	0	-0.3	-0.4	-0.3	-0.7	-0.6	-0.4	-0.2	0.1	0.1	0.1	-0.1	-0.3	0.2	0.9	1.3	1.4	1.7	1.8	1.3	0.7	0.4	
WIELUN	-0.1	0.1	0	-0.3	-0.2	-0.1	-0.4	-0.3	-0.1	0	0.2	0.1	-0.4	-0.6	-0.8	-0.6	0.1	0.5	0.6	0.7	0.7	0.5	0.1	0	
WARSZAWA_OKECIE	0	0.1	0	-0.3	-0.3	-0.4	-0.6	-0.5	-0.3	-0.2	0.2	0	0.2	-0.1	-0.2	-0.1	0.4	0.5	0.6	0.9	1.2	1.1	0.6	0.5	
USTKA	-0.1	-0.4	-0.5	-0.2	0.1	-0.2	-0.3	-0.5	-0.7	-0.5	-0.1	0.1	0.4	0.2	-0.1	-0.2	0.2	0.5	0.6	1	1.2	1.1	0.8	0.6	
TORUN	0	-0.1	-0.2	-0.7	-0.7	-0.8	-0.9	-1	-0.5	-0.3	0.2	0	0.4	0.4	0.4	0.8	1.2	1.3	1.2	1.6	1.8	1.6	0.7	0.6	
TERESPOL	-0.2	-0.3	-0.3	-0.5	-0.5	-0.4	-0.4	-0.5	-0.4	-0.4	-0.1	-0.2	-0.1	-0.3	-0.5	-0.1	0.7	1.2	1.4	1.9	1.9	1.2	0.4	0.1	
TARNÓW	-0.7	-0.8	-0.6	-0.9	-1	-1.1	-1.2	-1.1	-0.8	-0.8	-0.7	-0.6	-1.5	-1.6	-1.4	-1.2	-0.9	-0.6	-0.1	0.1	0.4	0.1	-0.5	-0.8	
ŚWINOUJŚCIE	0.1	-0.3	-0.6	-0.6	-0.6	-0.7	-0.6	-0.7	-0.6	-0.2	0.2	0.3	0.8	0.6	0.5	0.6	1.1	1.3	1.4	1.7	1.7	1.6	1.2	0.9	
ŚNIEŻKA	1.9	3.6	5.4	7.1	7.3	7.3	7.1	7	6.8	5.2	3.2	1.8	1.4	2.1	2.7	2.9	3.6	3.9	3.8	3.5	3.6	3.2	2.5	1.4	
SZCZECIN	-0.3	-0.3	-0.5	-0.9	-0.7	-0.7	-0.7	-0.6	-0.5	-0.4	-0.2	-0.2	-0.1	-0.1	-0.1	0	0.5	0.7	0.8	1.2	1.3	1.2	0.4	0	
SUWAŁKI	-0.1	0	-0.1	-0.7	-0.8	-0.7	-0.9	-1	-0.7	-0.3	0.2	0	0.2	0.2	0.3	0.6	1.3	1.6	1.6	2.1	2.1	1.4	0.6	0.4	
SULEJÓW	-0.1	-0.1	0.1	-0.3	-0.2	-0.3	-0.8	-0.7	-0.3	-0.1	0.1	0.1	0.1	-0.1	0	0.4	1.2	1.4	1.6	1.7	1.6	1.3	0.6	0.3	
ŚLUBICE	-0.2	-0.3	-0.4	-0.8	-0.5	-0.4	-0.6	-0.6	-0.5	-0.3	0	-0.1	0.3	0.1	0.3	0.4	0.8	0.8	1	1.4	1.8	1.5	0.7	0.3	
SIEDLCE	0	0	-0.1	-0.5	-0.5	-0.4	-0.8	-0.8	-0.6	-0.4	0	0	0.1	0.1	0.2	0.8	1.8	1.9	2.1	2.4	2.2	1.5	0.6	0.4	
SANDOMIERZ	0.3	0.2	0.2	-0.2	-0.2	-0.2	-0.2	-0.2	0.1	0.2	0.4	0.5	0	-0.3	-0.5	-0.6	0.1	0.4	0.7	0.8	0.9	0.9	0.6	0.6	
RZESZÓW_JASIONKA	-0.2	-0.2	-0.2	-0.6	-0.6	-0.8	-1	-0.9	-0.6	-0.4	-0.2	-0.1	-0.1	0.1	0.1	0.8	1.2	1.3	1.5	1.8	1.8	1.5	0.8	0.4	
RESKO_SMÓLSKO	0.2	0.3	0.3	0.1	0.1	0	0	-0.1	0	0.1	0.3	0.3	-0.8	-1	-1	-1.6	-2.1	-1.9	-1.4	-0.4	0.2	0.4	-0.3	-0.6	
RACIBÓRZ	-0.2	-0.1	0	-0.5	-0.6	-0.7	-0.9	-0.8	-0.4	-0.2	-0.1	-0.1	-0.3	-0.7	-0.7	-0.3	0.3	0.7	1.2	1.3	1	0.7	0.2	-0.2	
POZNAŃ_ŁAWICA	0.1	0.1	-0.1	-0.7	-0.7	-0.6	-0.8	-0.8	-0.4	-0.2	0.1	0.1	0.3	0.3	0.2	0.2	0.8	1	1	1.3	1.5	1.4	0.6	0.4	
PŁOCK	0.1	0.2	0.3	-0.3	-0.4	-0.3	-0.7	-0.8	-0.3	-0.1	0.3	0.1	-0.1	-0.3	-0.4	-0.1	0.6	1.1	1.2	1.2	1.2	0.9	0.3	0.1	
PIŁA	0.1	0	-0.3	-0.7	-0.6	-0.6	-0.8	-0.8	-0.4	-0.2	0.2	0.2	0.7	0.6	0.7	0.9	1.3	1.4	1.3	1.9	2.1	1.9	0.9	0.7	
OPOLE	-0.4	-0.3	-0.4	-0.7	-0.7	-0.8	-1	-0.9	-0.6	-0.3	-0.2	-0.3	-0.3	-0.5	-0.2	0	0.5	0.6	0.8	1	1.1	0.9	0.3	0	
OLSZTYN	-0.3	-0.4	-0.3	-0.6	-0.6	-0.6	-0.7	-0.7	-0.4	-0.2	0.1	-0.1	-0.1	-0.4	0	0.4	1	1.1	1	1.4	1.5	1	0.4	0.2	
NOWY_SĄCZ	-1.4	-1.7	-1.8	-1.9	-2.1	-2.3	-2.4	-2.4	-2	-2.1	-1.8	-1.5	-1.8	-1.8	-1.5	-1.1	-0.7	-0.7	-0.5	-0.2	-0.3	-0.7	-1	-1.3	
MŁAWA	0.1	0.2	0.2	-0.5	-0.7	-0.7	-0.9	-1	-0.5	-0.1	0.4	0.2	0.2	-0.2	-0.2	-0.2	0.3	0.8	0.8	1.1	1.4	1.1	0.5	0.2	
MIKOŁAJKI	-0.3	-0.2	-0.2	-0.4	-0.4	-0.4	-0.6	-0.7	-0.5	-0.3	0	-0.2	0.1	0.2	0.2	0.1	0.5	0.5	0.5	0.7	0.8	0.6	0.2	0.1	
ŁÓDŹ_LUBLINEK	-0.1	0	0	-0.4	-0.5	-0.4	-0.6	-0.5	-0.2	-0.1	0.2	0.1	0	-0.2	-0.1	0	0.7	1	1	1.3	1.5	1.2	0.6	0.3	
LUBLIN_RADAWIEC	0.5	0.6	0.4	0.1	-0.1	-0.1	-0.3	-0.5	-0.1	0	0.4	0.5	0.1	0.1	-0.2	-0.1	0.8	1.1	1.3	1.5	1.4	1.1	0.8	0.5	
ŁĘBORK	-0.4	-0.5	-0.5	-0.9	-0.7	-0.5	-0.6	-0.8	-0.6	-0.4	-0.2	-0.3	-0.7	-0.9	-0.9	-1	-1.2	-0.9	-0.6	-0.1	0.5	0.4	-0.3	-0.7	
LESZNO	0	0.1	0	-0.5	-0.3	-0.2	-0.5	-0.3	-0.1	0	0.1	0.1	0.3	0.6	0.4	0.9	1.5	2	2	2.2	1.9	1.8	1	0.7	
LESKO	-1.4	-1.1	-0.7	-0.5	-0.5	-0.5	-0.6	-0.7	-0.5	-1	-1.2	-1.3	-1.2	-1.3	-0.7	0	0.6	0.9	1	1.1	0.9	0.2	-0.3	-0.9	
LEGNICA	-0.4	-0.3	-0.2	-0.6	-0.5	-0.6	-1.1	-0.9	-0.5	-0.4	-0.2	-0.5	-0.4	-0.6	-0.6	-0.1	0.7	0.9	1	1.3	1.1	0.9	0.2	-0.2	
KROSNO	-0.3	-0.2	-0.2	-0.4	-0.4	-0.4	-0.6	-0.6	-0.3	-0.5	-0.3	-0.3	-1	-1.2	-1	-0.8	-0.2	0.1	0.3	0.3	0.3	-0.2	-0.5	-0.5	
KRAKÓW_BALICE	-0.6	-0.6	-0.4	-0.8	-1	-1.2	-1.2	-1	-0.7	-0.6	-0.2	-0.2	-0.4	-0.6	-0.5	-0.4	0	0.1	0.5	0.6	0.7	0.7	0.2	0.1	
KOZIENICE	-0.1	0	-0.1	-0.5	-0.5	-0.5	-0.8	-0.8	-0.6	-0.4	0	-0.1	0.3	0.3	0.3	1.1	1.9	1.9	1.9	2.4	2.3	1.8	1.1	0.6	
KOSZALIN	-0.2	-0.2	-0.3	-0.4	-0.3	-0.1	-0.2	-0.3	-0.3	-0.2	0	0	0.1	0	-0.2	-0.1	0.5	0.8	0.9	1	1.1	1	0.5	0.3	
KOŁO	0.1	0.2	0.1	-0.4	-0.3	-0.3	-0.6	-0.5	0	0	0.3	0.1	-0.1	-0.1	-0.4	-0.3	0.4	0.7	0.8	0.8	1	0.9	0.5	0.3	
KŁODZKO	-0.9	-0.9	-0.8	-1	-1	-1.1	-1.4	-1.6	-1.1	-0.9	-0.7	-0.9	-1.1	-1.4	-1.1	-0.8	-0.2	0.1	0.3	0.3	0.3	-0.2	-0.5	-0.5	
KIELCE_SUKÓW	-0.3	-0.3	-0.1	-0.6	-0.7	-0.7	-0.8	-0.7	-0.5	-0.4	0	0	-0.4	-0.6	-0.5	-0.4	0	0.1	0.5	0.6	0.7	0.7	0.2	0.1	
KĘTRZYN	-0.1	-0.1	-0.2	-0.8	-0.9	-0.7	-1	-1.1	-0.8	-0.4	0	-0.1	0.3	0.3	0.3	0.7	1.2	1.7	1.7	1.9	2.3	2.2	1.7	1	0.8
KATOWICE_MUCHOWIEC	-0.6	-0.5	-0.2	-0.5	-0.8	-0.9	-0.9	-0.7	-0.3	-0.2	-0.1	-0.2	-0.5	-0.7	-0.3	0.1	0.8	0.8	1.1	1.5	1.4	1.3	0.6	0.1	
KASPROWY_WIERCH	1.3	2.8	4.2	5	5.7	5.1	4.8	4.6	5	4	2.6	1.1	-0.6	0.6	1.6	1.2	1.8	2	2	1.7	1.9	1.4	1	-0.4	
KALISZ	0.2	0.3	0.3	-0.1	0	0	-0.3	-0.3	0	0.2	0.3	0.2	-0.3	-0.4	-0.7	-0.7	0	0.4	0.6	0.6	0.6	0.6	0.2	0	
JELENIA_GÓRA	-2	-1.9	-1.5	-1.2	-1.1	-1.1	-1.3	-1.4	-1.1	-1.5	-1.5	-1.8	0	-0.2	0.1	1	1.5	1.6	1.9	2.3	2	1.5	0.8	0.1	
GORZÓW_WIELKOPOLSKI	0.3	0.3	0.1	-0.3	0	-0.1	-0.3	-0.2	0	0.2	0.5	0.4	0.4	0.2	0	-0.1	0.5	0.6	0.6	0.9	1	1.1	0.7	0.5	
GDĄSK_ŚWIBNO	0.1	0	0.1	0	0.4	0.2	0.4	-0.1	0	0	0.4	0.2	0.7	0.6	0.1	-0.1	0.2	0.8	0.9	1.3	1.3	1.1	0.9	0.7	
ELBLĄG_MILEJEWO	0.2	-0.1	-0.2	-0.8	-0.7	-0.6	-0.5	-0.7	-0.3	0	0.3	0.4	0.5	0.1	-0.1	-0.4	0.3	0.9	0.9	1.1	1.2	1.1	0.8	0.7	
CZĘSTOCHOWA	-0.3	-0.3	0	-0.3	-0.4	-0.3	-0.4	-0.3	0	0	0.2	0	-0.8	-1.1	-0.9	-1.5	-0.9	-0.5	-0.2	0.1	0.4	0.5	0	-0.3	
CHOJNICE	0.1	0.2	0	-0.6	-0.5	-0.5	-0.7	-0.8	-0.4	0	0.4	0.3	0.1	0	-0.2	0	0.5	0.7	0.8	1.1	1	1	0.5	0.3	
BIELSKO_BIAŁA	-1.5	-1.3	-0.7	-1	-1	-1.2	-1.5	-1.4	-0.9	-0.7	-1	-1.4	-2.2	-2.6	-2.1	-2.1	-1.1	-0.8	-0.5	-0.5	-0.6	-0.8	-1	-1.4	
BIAŁYSTOK	-0.1	-0.2	-0.3	-0.6	-0.6	-0.4	-0.4	-0.5	-0.3	-0.3	0.2	0	0.2	0.1	0.3	0.9	1.6	1.8	1.9	2.4	2.3	1.6	1	0.5	

BIAS (E5L - OBS)

Q90_{t_{max}} (left), Q10_{t_{min}} (right)



Q90 t_{max}

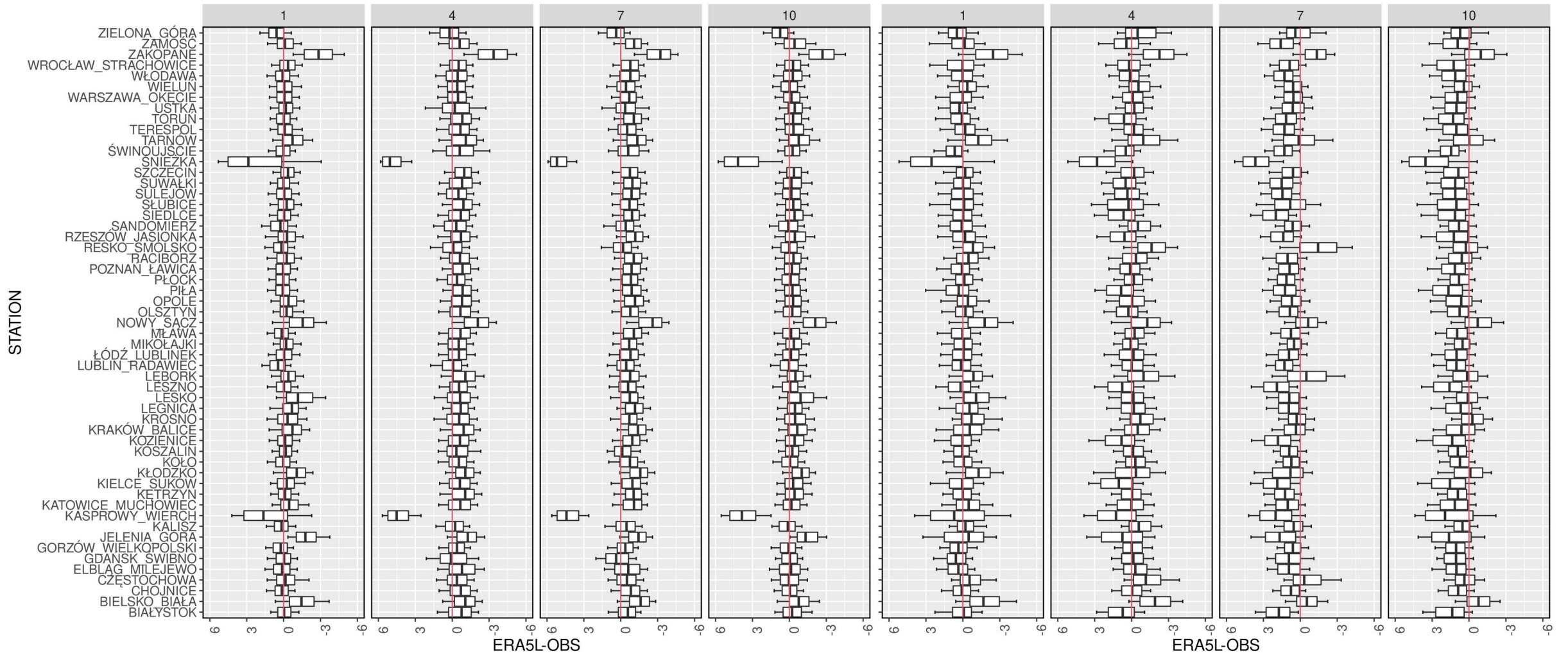
Q10 t_{min}

STATION	Q90 t _{max}												Q10 t _{min}												
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
ZIELONA_GÓRA	0.2	0	-0.3	-0.4	0.3	0.4	0.3	0.6	0.4	0.5	0.5	0.2	0.6	0.3	-0.7	-1.1	-0.5	-0.2	-0.4	0.2	0.2	0.1	0.5	0.7	
ZAMOŚĆ	-0.7	-0.4	-0.9	-1.5	-1	-1	-1.5	-1.7	-1	-1.4	-0.8	-1	-0.3	-0.1	-0.1	0.7	1	1.5	1.4	1.9	1.1	1	0.4	0.1	
ZAKOPANE	-5.3	-5	-4.9	-4.9	-3.8	-4	-4	-4	-3.6	-3.8	-4.9	-5.5	-2.7	-2.7	-2.7	-2.9	-1.9	-1.5	-1.4	-1.3	-1.3	-1.7	-2.6	-2.3	
WROCLAW_STRACHOWICE	-0.7	-0.6	-1.1	-1.2	-1	-1.1	-1.1	-0.6	-1	-0.8	-0.6	-1	0	-0.2	0	0	0.4	0.6	0.9	1.2	1	1	0.7	0.4	
WŁODAWA	0.1	0.2	-0.7	-1.2	-1	-0.8	-1.2	-1	-0.9	-0.9	-0.6	0	0.1	0.2	0.1	0.1	0.5	1.2	1.2	1.4	1.4	0.7	0.7	0.4	
WIELUŃ	-0.2	0	-0.8	-1.3	-0.9	-0.9	-0.7	-0.8	-0.5	-0.6	-0.5	-0.2	-0.3	0.1	-0.3	-0.8	0.2	0.7	0.7	0.8	0.3	0.4	0.4	0.1	
WARSZAWA_OKĘCIE	-0.8	-0.4	-0.9	-1.4	-0.9	-0.9	-0.8	-0.6	-0.8	-0.7	-0.1	-0.3	-0.1	0.1	-0.2	-0.2	0.1	0.2	0.5	0.7	1.1	0.7	0.5	0.2	
USTKA	-0.3	-1.2	-0.9	-1.5	-0.9	-0.4	-0.6	-1.1	-1.4	-0.8	-0.2	-0.3	0	-0.1	-0.2	-0.6	0.3	-0.1	0.5	0.6	0.6	0.3	0.4	0	
TORUŃ	0.1	-0.5	-1.4	-1.7	-1.7	-1.4	-1.8	-1.6	-1.3	-1.1	0	-0.4	0	-0.1	0.1	0.5	0.2	0.5	0.7	0.6	0.9	1	0.4	0.2	
TERESPOL	-0.1	-0.2	-1	-1.7	-1	-0.8	-0.7	-0.6	-0.9	-1	-0.5	-0.3	-0.1	-0.2	-0.2	-0.4	0.5	0.9	1	1.5	1.1	0.7	0.3	-0.1	
TARNÓW	-1.4	-1	-1.6	-2.2	-1.7	-1.9	-1.7	-2.1	-1.6	-1.6	-1.7	-1.6	-1.6	-1.6	-1.7	-1.8	-2.4	-1.5	-0.7	-0.4	-0.3	-0.1	-0.7	-0.9	
ŚWINOUJŚCIE	-0.3	-1	-1.2	-2.6	-1.5	-0.9	-1.2	-1.1	-1	-0.5	-0.1	0	0.2	0.2	-0.2	-0.2	0.6	0.8	1	1.2	1	0.9	0.9	0.8	0.4
SNIEŻKA	1.1	2.8	5	6.8	6.4	6.6	6.3	6.4	6.6	4.6	2.1	0.1	1.5	1.3	1.1	1.7	2.3	2.8	2.8	2.4	2.7	1.9	1.6	0.9	
SZCZECIN	-0.4	-0.7	-0.8	-1.7	-1.1	-1.1	-1.2	-1.2	-0.9	-0.5	-0.5	-0.3	-0.6	-0.4	-0.6	-0.1	0.2	0.4	0.4	0.7	0.9	0.6	-0.1	-0.3	
SUWAŁKI	0	0.2	-0.9	-1.7	-1.5	-1.3	-1.5	-1.5	-1	-0.4	0.2	0.1	-0.1	0	0.1	0	1	1.1	1.1	1.3	1.1	0.7	0.3	0.1	
SULEJÓW	-0.1	-0.1	-0.6	-1.3	-0.9	-0.8	-1.1	-1.2	-0.7	-0.9	-0.5	-0.2	0.1	0.3	0	0.5	1.1	1.4	1.4	1.4	1.3	0.8	0.9	0.1	
ŚLUBICIE	-0.6	-1	-1.4	-1.4	-1.1	-0.5	-1.2	-0.7	-1	-0.9	-0.7	-0.7	-0.5	-0.7	-0.3	-0.4	-0.3	-0.1	0.4	0.9	0.9	1	0.4	0.2	-0.4
SIEDLCE	-0.4	-0.4	-1	-1.5	-1	-0.7	-1.4	-1.2	-0.9	-0.9	-0.4	-0.3	-0.1	0	-0.2	0.5	1.3	1.4	1.7	1.6	1.8	0.9	0.5	0.2	
SANDOMIERZ	0.2	0.3	-0.7	-1	-0.7	-0.8	-0.6	-0.6	-0.4	-0.4	-0.3	0.1	0.4	0.2	-0.3	-0.8	-0.2	0.6	0.6	0.5	0.6	0.6	0.5	0.4	
RZESZÓW_JASIONKA	-0.7	-0.5	-1.1	-1.3	-0.9	-1.3	-1.3	-1.3	-1.1	-1	-1.1	-0.7	-0.2	0	-0.3	1	1	1.1	1	1.4	1.4	1	0.6	0.4	
RESKO ŚMÓLSKO	0.1	0	-0.1	-1.2	-0.6	-0.4	-0.6	-0.9	-0.6	-0.1	0.1	0.1	-1.1	-1.2	-1.1	-1.9	-2.5	-2.5	-2.4	-1.1	-0.2	-0.3	-0.4	-0.8	
RACIBÓRZ	-0.5	-0.3	-0.6	-1.5	-1.4	-1.2	-1.4	-1.5	-1	-0.9	-0.6	-0.8	0.1	-0.3	-0.2	-0.2	0.1	0.7	1	1.1	0.8	0.7	0.7	0	
POZNAŃ_ŁAWICA	-0.2	-0.4	-0.8	-1.7	-1.3	-1.1	-1.4	-1.2	-1.1	-0.8	-0.3	-0.6	-0.1	0	-0.1	0	0.3	0.1	0.9	0.8	0.9	0.8	0.6	0.2	
PŁOCK	-0.1	-0.1	-0.6	-1.3	-0.9	-0.8	-1.2	-1.2	-1	-0.6	-0.1	-0.2	-0.3	-0.1	-0.1	-0.3	-0.4	0.4	1	0.9	0.8	0.9	0.4	0.2	0
PILA	0	-0.3	-0.7	-1.6	-1.2	-1	-1.5	-1.4	-1.1	-0.8	-0.1	-0.1	-0.2	0.4	0.3	0.6	0.7	0.8	0.9	0.8	1.2	1.1	0.8	0.2	0.2
OPOLE	-0.6	-0.7	-1.2	-1.3	-1.5	-1.2	-1.5	-1.2	-1.1	-0.6	-0.8	-0.6	-0.2	-0.2	-0.5	-0.3	-0.2	0	0.5	0.7	0.8	0.8	0.2	0.4	-0.1
OLSZTYN	-0.5	-0.5	-1	-1.3	-1.3	-1	-1.3	-1	-0.9	-0.6	-0.1	-0.5	-0.4	-0.4	-0.3	0.1	0.8	0.6	0.6	0.6	0.8	0.3	0.3	-0.2	-0.2
NOWY_SĄCZ	-2.4	-2.5	-2.7	-2.9	-2.9	-2.8	-3.2	-3	-2.8	-2.7	-3.2	-2.8	-1.7	-2	-2.1	-1.2	-0.9	-1	-0.6	-0.3	-0.4	-1.2	-1.6	-1.3	
MŁAWA	0.2	0.2	-0.5	-1.4	-1.4	-1.3	-1.4	-1.3	-1.2	-0.5	0.1	-0.1	0	0.1	-0.1	-0.6	-0.2	0.2	0.3	0.6	1	0.7	0.3	0.1	
MIKOŁAJKI	-0.5	-0.3	-1	-1	-0.5	-0.8	-0.8	-1	-0.9	-0.5	-0.2	-0.5	-0.4	-0.2	-0.3	-0.3	0.1	0.2	0.6	0.3	0.5	0.6	0.4	0.1	-0.3
ŁÓDŹ_LUBLINEK	-0.1	-0.2	-0.9	-1.5	-1.3	-1	-1.5	-1	-0.7	-0.6	-0.2	-0.4	-0.1	0.2	0.2	-0.2	-0.1	0.4	0.5	0.6	0.7	1.1	0.7	0.8	0
LUBLIN_RADAWIEC	0.4	0.7	-0.3	-1.1	-0.5	-0.5	-1	-1.4	-0.7	-0.4	-0.4	0.4	0.5	0.3	0.2	-0.2	0.6	1	1.1	1	1.3	1	0.8	0.4	0.4
ŁĘBORK	-0.5	-1	-1.1	-2.2	-1.6	-1.4	-1.3	-1.5	-1.2	-0.8	-0.5	-0.5	-1	-1.3	-1	-1.5	-2	-2.1	-1.7	-1	-0.3	-0.4	-0.7	-0.9	
LESZNO	-0.3	-0.4	-0.9	-1.3	-0.8	-0.2	-0.8	-0.8	-0.4	-0.4	-0.3	-0.6	0.2	0.2	0.2	0.8	0.9	1.3	1.7	1.3	1.5	1.1	1.2	0.6	
LESKO	-2.5	-2.1	-1.4	-1.7	-1.2	-1.2	-1.2	-1.4	-1.2	-1.8	-2.6	-2.2	-0.8	-0.9	-0.9	-0.9	-0.1	0.2	0.6	0.9	1	0.6	-0.2	-0.5	-0.9
LEGNICA	-1.1	-0.9	-1	-1.3	-0.7	-0.9	-1.6	-1.2	-1.1	-1	-0.5	-1.3	-0.3	-0.6	-0.6	-0.1	0.3	0.7	0.9	1.1	0.6	0.4	0.4	-0.2	
KROŚNO	-0.7	-0.6	-0.8	-1.4	-1	-1.1	-1.2	-1	-0.8	-1	-1.5	-1	-0.6	-1	-1.5	-1	-0.3	-0.1	0.3	0	0.2	-0.8	-0.8	-0.7	
KRAKÓW_BALICE	-0.8	-0.8	-1.3	-1.6	-1.9	-1.9	-1.7	-1.8	-1.1	-1.5	-1.1	-0.8	0.2	-0.4	-0.4	-0.7	-0.2	-0.3	0.2	0.4	0.4	0.1	0.2	0.3	
KOZIENICE	-0.5	-0.6	-1.4	-1.5	-0.8	-1.1	-1.4	-1.4	-1.1	-1	-0.6	-0.5	-0.1	-0.1	-0.1	0.9	1.7	1.5	1.7	2	1.6	1	0.6	0.3	
KOSZALIN	-0.4	-0.6	-0.9	-1.5	-1.3	-1.1	-1.1	-1.2	-1	-0.6	-0.3	-0.3	-0.2	0	-0.2	-0.2	-0.3	0	0.3	0.5	0.4	0.6	0.4	0.3	0
KOŁO	-0.3	-0.4	-0.9	-1.2	-0.9	-0.9	-1.1	-0.9	-0.9	-0.6	0	-0.3	0	-0.2	-0.2	-0.2	-0.3	0.4	0.7	0.7	0.7	0.7	0.6	0.6	0.2
KŁODZKO	-1.6	-1.4	-1.2	-1.7	-1.3	-1.4	-2.1	-2.3	-1.8	-1.5	-1.3	-1.6	-1.1	-1.9	-1.9	-1.5	0	0.2	0.6	1.3	1	0.3	-0.5	-0.7	-1.1
KIELCE_SUKÓW	-0.2	-0.2	-0.8	-1.6	-1.5	-1.3	-1.2	-1.1	-1	-1.2	-0.5	-0.3	0.4	0.6	0.4	0.8	1.2	1.2	1.5	1.9	1.6	1.3	1	0.5	
KĘTRZYN	-0.3	-0.3	-1.1	-1.8	-1.5	-1.2	-1.6	-1.8	-1.3	-0.9	-0.3	-0.3	-0.3	-0.2	-0.2	-0.3	-0.3	0.2	0.8	1	1	1	0.6	0.1	0
KATOWICE_MUCHOWIEC	-0.6	-0.6	-0.9	-1.5	-1.8	-1.7	-1.7	-1.3	-0.6	-1.1	-0.9	-0.8	-0.1	-0.6	-0.6	-0.4	-0.3	0.2	0.6	1.1	1	1.1	0.7	0.7	0.2
KASPROWY_WIERCH	0.3	2.4	4	4.8	4.8	3.8	3.7	3.9	4.6	4.2	2.6	-0.4	-0.6	0.2	0	-0.1	0.2	0.9	1	0.4	0.8	-0.2	-0.4	-0.8	
KALISZ	0	-0.1	-0.3	-0.7	-0.8	-0.6	-0.6	-0.5	-0.3	-0.2	-0.3	-0.2	-0.2	0	-0.5	-0.6	0	0.1	0.4	0.5	0.4	0.2	0.5	0.1	
JELENIA_GÓRA	-2.9	-2.5	-2.7	-2.1	-1.5	-1.9	-2.1	-2.1	-1.8	-2.1	-2.1	-2.8	-0.8	-1	-0.5	0.6	0.6	1.3	1.8	1.6	1	0.8	0.1	-0.8	
GORZÓW_WIELKOPOLSKI	0.1	-0.4	-0.3	-1	-0.4	-0.3	-0.8	-0.6	-0.5	-0.2	0	0	0.4	0.6	-0.1	-0.2	0.6	0.5	0.5	0.7	0.8	0.9	0.8	0.5	
GDAŃSK ŚWIBNO	0.2	-0.2	-0.2	-0.8	-0.2	-0.3	0.7	-0.3	0	-0.7	0.5	0	0.3	0.5	0	-0.4	0.1	0.6	-0.3	0.5	0.6	0.9	0.7	0.8	
ELBLĄG_MILEJEWÓ	0.2	-0.2	-0.6	-1.7	-1.9	-1	-1.3	-1.1	-0.8	-0.3	0.2	0.3	0.2	0	-0.4	-1.1	-0.6	0.4	0.2	0.2	0.6	0.4	0.5	0.6	
CZĘSTOCHOWA	-0.3	-0.6	-0.5	-1.2	-1.2	-0.9	-1	-0.5	-0.2	-0.8	-0.9	-0.4	-0.5	-0.9	-0.6	-1.8	-2.4	-1.4	-1.2	-0.6	0	0.1	0.3	-0.1	
CHOJNICE	0.1	-0.1	-0.5	-1.5	-1.2	-1.3	-1.8	-1.6	-1.3	-0.3	0.5	0	0.1	0.3	0.1	-0.2	0.2	0.6	0.6	0.4	0.8	0.5	0.3	0.6	
BIELSKO_BIAŁA	-2.8	-2.6	-1.3	-1.9	-1.8	-2	-2.1	-1.9	-1.5	-1.3	-2.4	-2.7	-2.2	-2.5	-2.1	-2.5	-1.8	-0.9	-0.8	-0.9	-1.2	-1.5	-1.7	-1.8	
BIAŁYSTOK	-0.1	-0.3	-1	-1.6	-1.6	-0.8	-0.9	-0.6	-0.6	-0.5	0	-0.2	-0.1	-0.2	-0.2	0.4	0.5	1.4	1.3	1.7	1.8	1.5	1.2	0.3	0

Overall range of deviations (box-whisker-plots) - for selected months (Q10, Q25, Q50, Q75, Q90)

TMAX E5L-OBS

TMIN E5L-OBS

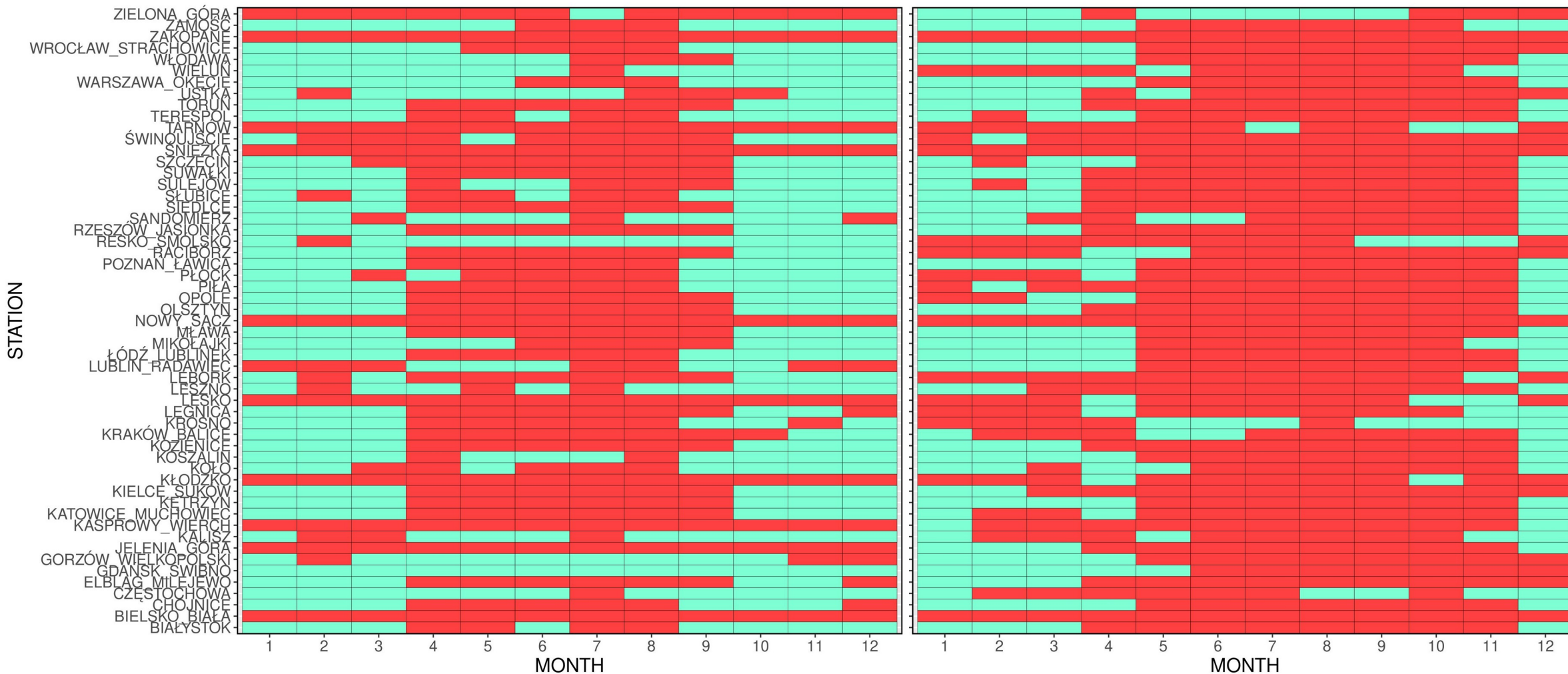


Kolmogorov-Smirnoff Test (CDF comparison) - red - significant differences between CDFs



TMAX KS TEST

TMIN KS TEST

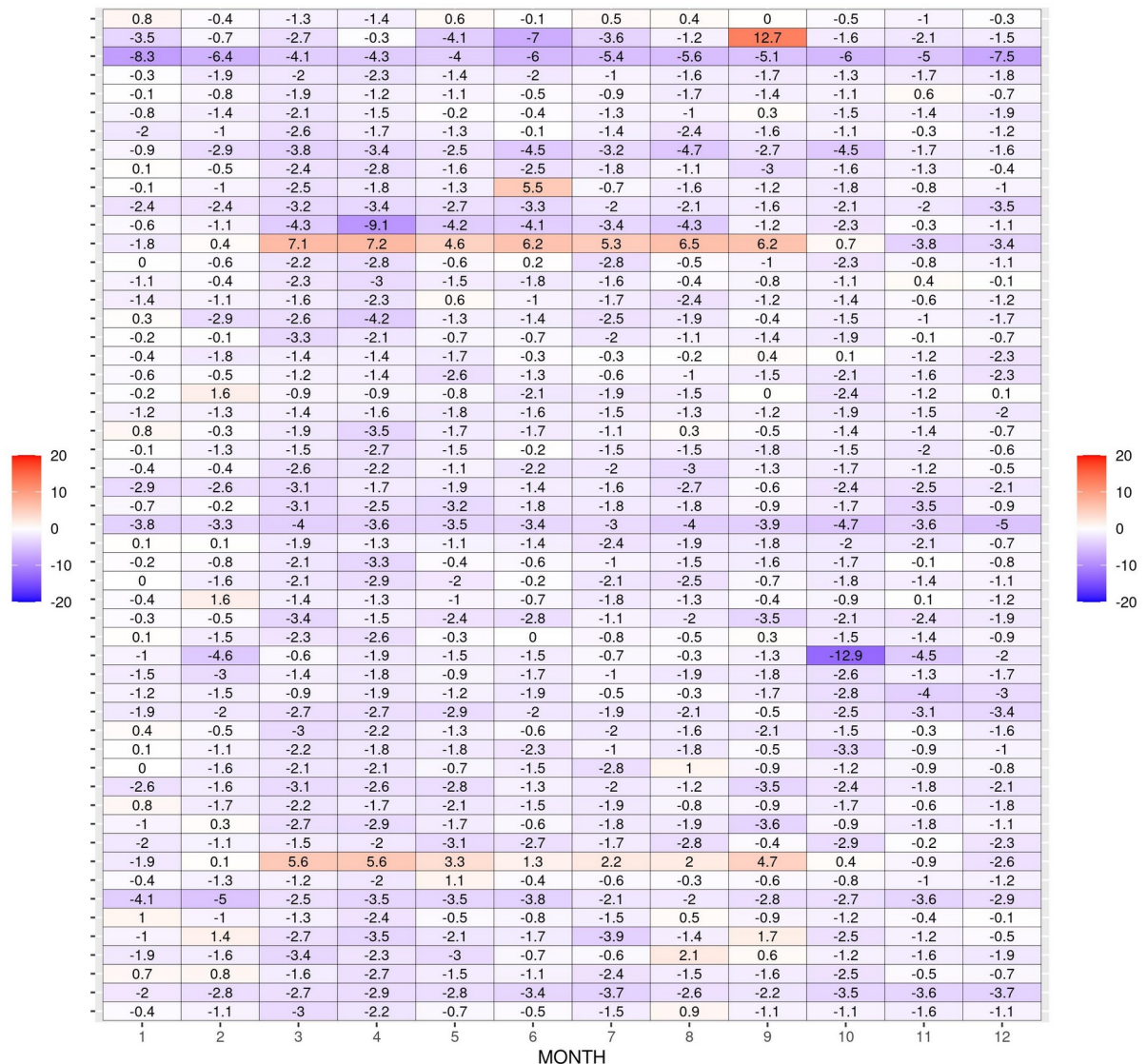
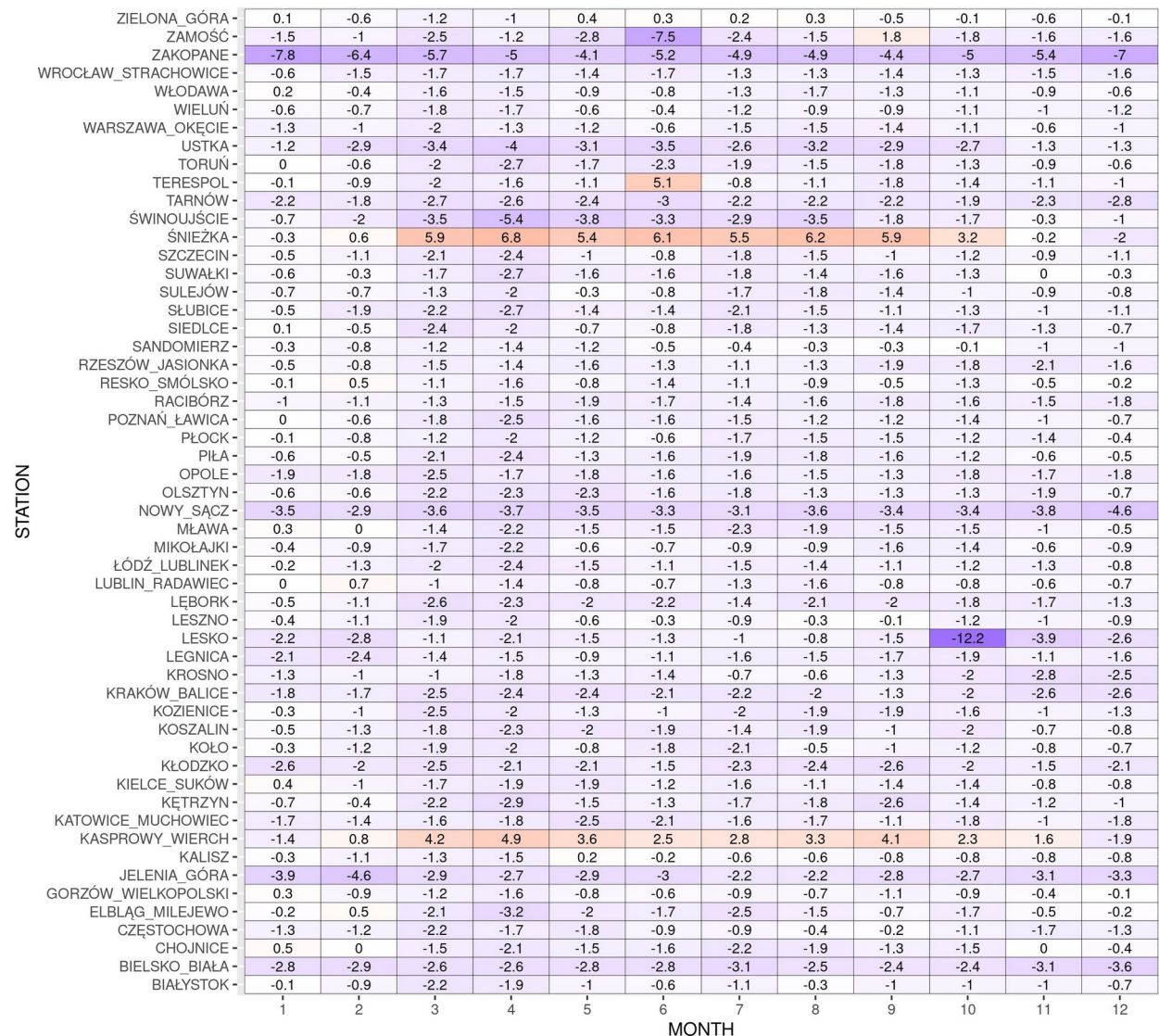


Return Levels (10y, 50y) - GEV estimation - E5L-OBS - t_{max}



10y

50y



Return Levels (10y, 50y) - GEV estimation - E5L-OBS - t_{min}



10y

50y

STATION	1	2	3	4	5	6	7	8	9	10	11	12
ZIELONA_GÓRA	1.4	0.7	-0.6	-1.2	0	-0.1	0.1	-0.7	-0.4	0.1	1.3	1.2
ZAMOŚĆ	1	2.8	0.1	0.4	1.5	0.7	1.3	2.8	2.4	1	2.3	-6.7
ZAKOPANE	-1.7	-2.6	-0.8	-2.4	-0.7	-1.6	-0.8	0.2	0.5	0	1	-0.5
WROCLAW_STRACHOWICE	1.7	0.8	1.5	1.4	1.5	1.6	1.1	1.8	2.8	1.6	1.4	1.8
WŁODAWA	1.7	-0.8	-0.1	0.2	1.7	1.3	0.4	2	2.7	2.5	2.1	1.7
WIELUŃ	0.9	-0.9	-1.1	-0.8	0.6	1.1	0.8	0.3	0.6	1.1	0.1	0.3
WARSZAWA_OKĘCIE	2.2	-1.1	0	0.6	1.1	1	1.3	1	-0.8	1.7	2	1.1
USTKA	0.7	0.2	0.4	1.2	0.1	0.9	-2.2	2	-2	1.5	1.3	1.3
TORUŃ	2.3	1.1	2.9	1.9	3.1	2.6	1.9	2.8	3.7	2.1	0.5	3.1
TERESPOL	1	-0.5	-0.1	-0.1	1.6	1.6	1.6	2.5	2.9	1.7	1.8	0.7
TARNÓW	0.6	0	0.4	-0.9	-1.9	-0.4	-1.5	-0.3	0.8	1.6	-0.2	2.1
ŚWINOUJŚCIE	1	0.7	0.9	-4.1	2.4	1.8	3.9	2	2.7	1.9	1.4	0.5
ŚNIEŻKA	1.3	2.2	2.3	3.9	3.5	4.9	5.1	4.4	4.4	3.7	2.8	1.8
SZCZECIN	-0.2	0.8	0.1	-3.7	1.2	1.3	1.1	2.3	3	2.5	1	0
SUWAŁKI	0.7	1.5	0.5	1	2	2.7	1.4	2.9	3.2	2.4	1.5	1.5
SULEJÓW	-0.1	0.7	-0.6	0.6	2.2	2.5	1.9	8.1	2.9	2	1.5	1
ŚLUBICE	1.6	0.7	1	1.2	0.4	1.7	0.6	1.7	3.2	2.7	2.8	0.6
SIEDLCE	0.9	1.3	1.6	1.5	3.5	2.8	2.9	4	-0.4	2.8	1.9	1.8
SANDOMIERZ	2.4	1	-1.4	0.1	0.3	0.4	3.5	1.2	1.9	1.4	1.5	1.2
RZESZÓW_JASIONKA	1.2	1.7	1.5	1	1.6	1.7	2	2.1	3.6	2	3.7	1.6
RESKO_SMÓLSKO	0.6	-0.7	0.8	-1.6	-3	-2.1	-3.3	-0.6	1.2	2.1	1.3	0.2
RACIBÓRZ	0.1	-0.8	-1.4	0.4	1	1.3	1.6	1.9	2	1.3	0.1	-0.5
POZNAŃ_ŁAWICA	2	1.6	0.5	0.9	2	1.6	1.6	2	1.9	1.5	0.8	1.2
PŁOCK	0.2	-0.5	-0.7	0.3	1	2.1	1.4	1.8	2.2	1	0.6	0.6
PIŁA	3.2	2.2	1.6	2	2.3	2	2.2	2.5	3.4	3.3	1.8	1.4
OPOLE	1.2	0.3	0.3	1.1	1.3	1.9	14	1.4	2	2.4	1.2	0.5
OLSZTYN	0.8	1.4	0.6	-5.9	1.5	1.6	2	2.3	2.2	2.5	1.4	0.4
NOWY_SĄCZ	-0.9	-1.3	-0.7	-0.7	0.3	-0.4	0	0	0.2	0.2	-0.3	-0.5
MŁAWA	1.6	0.7	-0.1	0.5	0.9	2.7	1.3	1.8	-1.9	1.5	0.5	0.7
MIKOŁAJKI	1.3	1.1	0.3	0.1	0.9	0.7	0.8	1.6	1	1.4	0.8	0.4
ŁÓDŹ_LUBLINEK	1.4	0.9	0.1	0.6	1.5	2.3	1.3	2.4	2.8	1.9	1.5	0.9
LUBLIN_RADAWIEC	1.9	1	0.3	-0.3	1.6	1.4	1.5	2.1	2	2	2.1	0.9
ŁĘBÓRK	0.4	0.5	0	-5.6	-2.3	-2.1	-1.3	0	1.4	2.7	1	0.1
LESZNO	1.1	1.2	0.4	1.6	2.9	3.7	3.1	3	2.5	2.4	1	1.9
LESKO	-0.8	-0.9	0.3	0.7	0.6	1.3	1.3	1.4	0.9	1.2	0.2	-1.8
LEGNICA	-0.1	0.3	-0.2	0.9	1.5	1.8	1.6	2	1.9	1.3	0.6	0.6
KROSNO	-0.4	-1.4	-0.2	-0.2	-0.1	0.3	0.4	0.8	1.2	-0.1	0.9	-0.5
KRAKÓW_BALICE	1.5	0	0.4	-0.3	0.3	0.4	0.2	0.5	1.4	1.5	0.2	1.5
KOZIENICE	0.9	1.2	1.1	1.8	3.2	2.9	2	4.2	3.1	3.1	2.1	1.4
KOSZALIN	0.6	0.2	0.3	0.2	0.6	1.6	1.8	1.8	1.3	1.1	0.7	0.8
KOŁO	1.1	-0.1	-0.7	-0.4	0.6	0.6	16.4	0.7	1.7	1.1	0.4	0.6
KŁODZKO	-1.6	-1.3	0	0.6	1	2.7	1.6	2.2	2.5	0.5	0	0.8
KIELCE_SUKÓW	2.7	1.6	0.6	1.8	2.8	2.9	2.3	4.1	3.9	2.7	2.3	2.8
KĘTRZYN	0.2	1.4	0.3	0.4	1.7	1.6	2.8	5.4	1.8	2.6	2	1.3
KATOWICE_MUCHOWIEC	1.3	0.1	0.3	0.6	2.1	1.4	1.8	1.9	2.8	1.9	1.5	1.9
KASPROWY_WIERCH	-0.4	-0.2	3	1.7	1.5	2.6	2.5	2.8	3.1	2.6	3.3	0.8
KALISZ	0.4	-0.3	-0.7	-0.5	0.3	0.9	9.5	0.8	0.7	0.8	0.1	-0.5
JELENIA_GÓRA	1.3	1.8	0	1.7	2.7	4.2	3.3	3	3.1	2.7	1.9	1.7
GORZÓW_WIELKOPOLSKI	1.5	0.8	-0.1	0.4	0.8	0.9	0.9	1	1.4	1.1	1.1	0.7
ELBLĄG_MILEJEWO	1.5	1.1	-0.5	0.6	1.4	1.3	2.2	1.8	1.7	2	1	0.7
CZĘSTOCHOWA	0.2	-0.6	-1.9	-1	-2.3	-0.7	-1.7	-1.2	0.7	1.1	0.1	0.3
CHOJNICE	2.5	0.8	0	0	1	1.2	1.4	1.6	-5.1	1.3	0.6	0.5
BIELSKO_BIAŁA	-1.5	-2	-1.7	-1.1	-1	-0.2	-0.5	-0.1	0	-0.3	-1.2	-0.8
BIAŁYSTOK	2	1.3	0.8	0.5	2.5	2.7	2.6	2.8	3.5	2.1	0.9	1.5
	1	2	3	4	5	6	7	8	9	10	11	12

STATION	1	2	3	4	5	6	7	8	9	10	11	12
ZIELONA_GÓRA	0.5	1.2	-1.3	-2	-0.2	-2.1	0.1	-0.7	0.2	-0.4	1.6	1.5
ZAMOŚĆ	1.6	1.6	-1	-0.4	-1.5	-0.7	-1.4	3	2	-6.5	2.6	-24.1
ZAKOPANE	-2.1	-2	-0.5	-2.5	0.1	-2.5	-0.7	1.4	1.3	-0.5	1.5	1.6
WROCLAW_STRACHOWICE	-0.3	1	2.4	2.6	1.8	1.8	0.1	1.7	2.3	0	0.9	1.8
WŁODAWA	0.9	-2.4	0	-0.3	0.3	0.6	-1.3	1.8	2.8	6.3	3.1	-0.3
WIELUŃ	0.4	-0.4	-1.6	-0.1	0.2	1.7	0.6	-1.2	0.1	0.8	-0.3	0.1
WARSZAWA_OKĘCIE	1	-2.2	-1.5	0.5	1.2	0.3	1.4	0.7	0.5	1.7	2.5	-0.8
USTKA	-1	0	0.4	1.5	-0.8	1	-2.7	2.6	-2.1	0.2	1.6	1.3
TORUŃ	1	0.7	3.1	2.1	3.4	2.3	1.5	2.5	3.9	1.9	0	4.4
TERESPOL	-0.9	-2.3	0	-0.8	1.6	1.2	1.3	2.4	2.2	1.7	2.3	0.2
TARNÓW	2.3	0.1	0.4	-4.2	-4.2	-0.8	-4.8	-1	0.3	1.8	-0.9	1.2
ŚWINOUJŚCIE	0.7	0.8	0.7	-4.5	2.4	0.9	4.5	1.5	2.3	0.4	1.1	0.5
ŚNIEŻKA	2.7	2.4	0.4	2.1	1.5	4.1	4.7	4.1	5.8	3	1.5	3.8
SZCZECIN	-0.3	1.4	-1.2	-4.7	1	0.8	1	3.5	3	1.8	0.7	-0.8
SUWAŁKI	0.2	1.5	-0.3	0.6	1.2	3.4	-0.9	3.3	2.5	1.8	1.5	0.7
SULEJÓW	-0.2	0.1	-0.5	0.6	2.8	3.1	0.8	9.5	2.8	1.5	2.2	-0.3
ŚLUBICE	0.4	-0.3	0.7	1.1	-2.4	1.7	0.2	2.2	2.1	2.1	3.4	0
SIEDLCE	0.7	-0.3	1.8	1.2	4.7	3.2	2.8	4.2	-1.8	2.5	2.4	2.2
SANDOMIERZ	2.6	0.9	-2	0.9	0.6	0.3	4.5	1.1	2.7	0.6	1.9	0
RZESZÓW_JASIONKA	1.6	1.7	1	1.1	1.5	1.6	2.1	2	4.3	1.9	5.2	1.8
RESKO_SMÓLSKO	-1.2	-1.7	0.1	-2.7	-1.8	-0.7	-4.1	0.1	1.5	1.9	2	-0.6
RACIBÓRZ	-0.8	-2	-1.6	0.8	1.3	1.1	1.9	1.1	2	1.3	0.8	-1.1
POZNAŃ_ŁAWICA	1.4	1.8	-0.4	-0.3	2.2	1.4	1.5	2	1.2	0.4	0	1.5
PŁOCK	-1	-2.4	-0.9	0.6	0.6	3.1	1	2.6	0.8	1.3	0.3	0.1
PIŁA	3.5	2	1.3	2.2	2.1	1.8	1.2	0.2	2.6	4.2	1.5	0.6
OPOLE	0.1	1.3	0.4	2	1.3	3.5	13.4	0.8	1.7	2.2	1.2	0.2
OLSZTYN	0.3	1.5	-0.3	-6	0.4	1	2.6	2.3	1.6	2.2	1.3	-0.2
NOWY_SĄCZ	1.6	-2.2	-0.4	-1.3	1	-0.7	-0.2	-0.1	-0.5	0.2	-1.1	-1.9
MŁAWA	-0.1	-0.2	-0.9	0.4	0.3	3.5	1	1.3	-3.9	2.1	0.5	0.3
MIKOŁAJKI	-3.3	0.7	-0.4	0.1	1.4	0.3	-0.2	2.2	0.5	0.9	1.1	0.2
ŁÓDŹ_LUBLINEK	1.7	1.4	0	0.4	2.1	2.1	0.7	3	2.6	2.3	1.8	-1.6
LUBLIN_RADAWIEC	0	0	0.7	-1	2.3	1.3	0.8	2.1	1.3	2.6	3.1	-0.9
ŁĘBÓRK	0.8	0.1	-1.1	-6.3	-2.9	-4	-1.7	0.6	-0.1	4.4	2	-1
LESZNO	1.4	0.7	0	1	3.3	4.5	2.4	3.2	1.3	1.7	0.5	2.1
LESKO	0.9	-1	0	0.5	0.1	1.9	0.7	0.9	-0.2	1.9	1.2	-1
LEGNICA	-0.3	1.3	0.1	2.4	0.9	2.1	0.9	1.2	1.5	-0.6	0.9	-0.8
KROSNO	-0.2	-1.3	-0.7	-0.8	-0.3	0.3	-0.4	0.8	1.1	-0.6	1.8	1.9
KRAKÓW_BALICE	3.4	-0.9	0.4	-1	0.2	0	-1	-0.1	1.6	0.7	-0.7	1.3
KOZIENICE	1.1	1.8	0.9	2.1	3.7	3.2	1.4	4.8	1.3	1.4	2.9	-1.6
KOSZALIN	0.3	-0.3	0	-0.2	0.8	1.6	1.8	2.3	0.4	-0.4	1	0.7
KOŁO	-0.4	0.8	-1	-0.5	0.5	0.7	16.2	0.3	1.7	1.3	0	0.4
KŁODZKO	-3.1	-2.2	0.5	0.7	-0.5	4	0.9	1.3	2.7	-0.9	-0.5	1.9
KIELCE_SUKÓW	3.7	0.4	0.5	2.2	2.2	2.8	0.2	5	4.1	2.7	3.5	2.4
KĘTRZYN	-0.4	0.8	0	0.4	2.3	1.1	3.2	6.3	0.3	3	2.6	0.1
KATOWICE_MUCHOWIEC	3	0.3	0.3	-1	1.4	0.4	1.5	2.3	2.6	2	2	0.5
KASPROWY_WIERCH	0.2	0.5	2.8	-1.7	1.3	0.9	1.9	3.3	2.6	1.4	3.4	4.5
KALISZ	-0.2	-1.1	-0.9	0	0.3	0.1	9.6	0.3	-0.6	1	-0.2	-2.4
JELENIA_GÓRA	1.7	1.1	0.2	1.5	2.1	5.6	3.7	2.2	3.1	1	1.2	3.3
GORZÓW_WIELKOPOLSKI	0.9	1.6	0	0.7	0.8	0.3	1.2	1.2	0.5	0.6	1.1	0.2
ELBLĄG_MILEJEWO	0.6	0.9	-1.2	-0.1	1.6	-0.1	2.4	2	0.6	2.5	1	0.5
CZĘSTOCHOWA	1	-0.6	-3.1	-1.5	-4.1	-0.3	-1.6	-1.8	0.5	0.8	0.4	-0.3
CHOJNICE	1.6	0.9	-0.9	-0.4	0.7	1.8	1.4	1.4	-5.5	1.4	0.9	0.2
BIELSKO_BIAŁA	1.3	-0.6	-2.1	-1.1	-2.6	0.1	-0.5	-0.5	-0.2	0.3	-1.9	-0.5
BIAŁYSTOK	-1.1	0.9	-0.8	-1.3	3.4	2.3	2.8	1.4	2.7	0.8	0.6	1.1
	1	2	3	4	5	6	7	8	9	10</		

- ✗ ERA5L reanalysis provides a decent overall characteristics of extreme daily temperatures.
- ✗ Very high concordance in variability is noted – high correlation coefficients.
- ✗ In the case of t_{\max} ERA5L tends to underestimate the temperature values during the warm season while showing little BIAS in cold season. The situation reverses for t_{\min} .
- ✗ There is an overall spatial consistency of ERA5L quality, with some exceptions for upland stations and those located in mountainous regions.
- ✗ KS test confirms very good CDF agreement for t_{\max} during cold (X-III) season. The agreement is much less apparent in the case of t_{\min} where only DJFM season exhibits similar CDF for most of the stations.
- ✗ Estimated return levels for E5L and OBS show relatively good agreement, larger differences are found in the warm part of the year.
- ✗ As an overall remark one might state that ERA5L reanalysis is a valid source of thermal variability data over Poland. Additionally when there is a need it would also possible to use it as a tool to amend for occasional gaps in the observational data, with dedicated models calibrated for this purpose (e.g. using machine learning approach: random forest, neural networks or even simpler approaches).

Thank you

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