

## Supplementary Materials

**Table S1.** Annual cumulated precipitation (mm) for each meteorological station for the period 1974-2021.

Station name year	Città di Castello	Marsciano	Orvieto	Perugia	Spoletto	Terni	Todi	Umbertide
1974	698.7	660.9	593	677.4	753.7	761.9	753.7	737.9
1975	746.4	727.2	740.8	842.4	921	827.4	921	843
1976	1079.5	912.2	919.6	1015.5	1193.4	1067.4	1193.4	1202
1977	762.7	579	717	854.3	1071.1	923.4	1071.1	822
1978	1065.4	654.9	777.2	940	1093.3	1070.2	1093.3	1098.7
1979	796.8	677.4	883.3	859.6	1182.2	1123	1182.2	262.8
1980	950.8	886.9	921	831.2	1148.2	935.6	1148.2	984.2
1981	789.3	568	647.8	692.2	903	900	903	806.8
1982	945.6	777.3	793.8	999.6	1066	818.4	1066	1033.7
1983	664.4	617.9	615.6	627.8	1087.5	711.2	1087.5	718.7
1984	1018	1092.1	839.4	1064.6	1053	1043.2	1053	1094.7
1985	640.6	576.7	461.4	531.4	714.2	831.8	714.2	588
1986	875.3	813.4	909.5	797.9	1016.2	1073.4	1016.2	967.6
1987	897.9	847	932.4	839	1127.8	886.8	1127.8	918.8
1988	594.9	632.4	756.4	679	779.4	691.6	779.4	723
1989	881.4	688	696.4	802.3	926.6	718.4	926.6	862.8
1990	608.6	626.5	846.4	746.6	771	797.6	771	683.3
1991	901.3	841.7	897.4	1050	931.8	1027.6	931.8	1002.5
1992	859.5	747	760.6	968.4	990.4	692.8	990.4	864
1993	720.4	670.8	671.4	806.7	957.6	791.4	957.6	791.1
1994	689.1	673.3	573.9	722	682.7	683.2	682.7	642
1995	884.1	705.9	525.6	803.5	892	702.9	892	787
1996	902.6	913.7	941.6	1072.8	1229.2	1196.2	1229.2	1029.8
1997	978.9	800.6	682.2	925.3	803.5	839.8	803.5	968.9

1998	754.9	783.2	650.8	1044.2	1036.5	910.6	1036.5	933.9
1999	953.4	791.2	992.6	1017.5	1073.8	946.6	1073.8	944.2
2000	956.3	746.2	833.8	864.8	837.4	782	837.4	951.2
2001	640.8	650.4	636.4	698.6	726	573	726	726.6
2002	973.2	898.8	952.3	973.9	931.5	810.7	931.5	934.9
2003	732.4	593.8	586.2	632.3	646	630	646	747.2
2004	1031.6	1065.6	1338.6	1155.7	1095	1177.4	1095	1105.4
2005	931.7	841.6	987.1	971.4	1169.8	1173.6	1169.8	1002.2
2006	702.4	580.8	618.2	705.4	639.8	650.8	639.8	817
2007	564.8	558.8	488	599.2	619.6	517	619.6	551.2
2008	864	852	1060.6	978.6	952.8	912	952.8	979.4
2009	769	715	924.6	730.2	818.6	850.8	818.6	769
2010	1129.7	1049.3	1211.8	1283.2	1268	1020.7	1268	1360.6
2011	559.3	489.9	612.8	560	572.4	611	572.4	599
2012	963.2	1016.7	993.4	982	875	830.4	875	861.2
2013	1081.1	907.3	946.8	1144.6	1167.2	1145.4	1167.2	1275.6
2014	1095.7	1086.7	1118.6	1085.2	1236	957.5	1236	1235.4
2015	704.5	633.2	739.1	547.6	880.6	700.6	880.6	686.6
2016	1050.8	875.3	904.6	995.6	1007.4	903.8	1007.4	942.8
2017	650	471.8	518.6	578	853.4	727.2	853.4	633.4
2018	791.2	834	1006.6	717	1036.7	900.2	1036.7	946.8
2019	1017.2	763.2	924.2	956	959	842.8	959	893.6
2020	809.2	745.4	856.4	942	1048.4	755.5	1048.4	966.8
2021	633.8	585.9	609.1	654.5	837.8	778.9	837.8	756.7

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**Table S2.** Monthly precipitation (mm) for each meteorological station for the period 1974-2021

Station Name	Monthly cumulated precipitation (mm)											
	January	February	March	April	May	June	July	August	September	October	November	December
<b>Città di Castello</b>	61	66	68	75	71	61	37	53	73	88	118	86
Umbertide	60	69	73	75	75	63	37	57	81	93	121	88
Perugia	56	66	68	75	76	63	41	56	79	91	117	84
Todi	56	67	68	71	76	55	30	44	70	89	111	82
Marsciano	54	60	62	62	64	49	35	51	70	83	106	77
Spoletto	65	77	77	84	85	62	43	59	81	104	129	105
Terni	59	68	67	79	79	53	37	47	83	97	123	85
Orvieto	62	70	68	69	65	50	28	40	69	95	118	90

**Table S3.** Minimum and maximum monthly cumulated precipitation (mm) for each meteorological station for the period 1974-2021

Station name	Città di Castello		Marsciano		Orvieto		Perugia		Spoletto		Terni		Todi		Umbertide	
	min	Max	min	Max	min	Max	min	Max	min	Max	min	Max	min	Max	min	Max
January	5.2	157.8	1.6	167.7	1	194	3.6	190.2	1.2	186.8	4	167.2	1.2	186.8	1.4	215.8
February	4.9	157	1.5	194.4	6.8	192.9	8.3	141.8	6.4	200.7	6.4	187	6.4	200.7	9.6	173.2
March	2.2	157.1	1.8	162.2	1	214	1.5	177	1.3	215.4	0	164.6	1.3	215.4	0	209.4
April	10	147	1.5	134	10	130.2	2	134.6	11.8	165.4	13.2	189	11.8	165.4	4	134.9
May	5.6	150.2	0.5	158.4	4.8	181.2	16.2	224.6	1.4	172.6	3.4	163.8	1.4	172.6	1	160.1
June	1.2	146.9	0	158.1	0.2	164.8	1.8	146.4	2.2	188.6	0.8	161.2	2.2	188.6	0.4	203.4
July	1.4	158.2	0	186.3	0	123.4	2.2	149	0.2	165.2	0	175.8	0.2	165.2	0	187.8
August	2.9	132	0.2	246.6	0	206.3	0	203.9	2	202.6	0	195.4	2	202.6	0	178.8
September	3	212.5	0	241.2	4.8	174.8	0	192.8	13	206.1	8.2	247	13	206.1	3.6	213.7
October	3.2	208.2	8.6	165.4	3.8	231.6	5.4	236	7.2	228.8	5.2	230	7.2	228.8	9.1	217.4

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Novem ber	15.3	267	0	334.8	2.2	340.6	3	321.6	6.6	319.6	9	318.4	6.6	319.6	8.1	275.6
Decem ber	3.4	189.2	1.5	221.2	2.5	308.8	2.2	223.6	1.4	254.6	1.2	214.6	1.4	254.6	3.2	192.2

**Table S4.** Annual maximum temperatures (T. max), monthly maximum temperatures (47 years averages) and standard errors per meteorological station and month

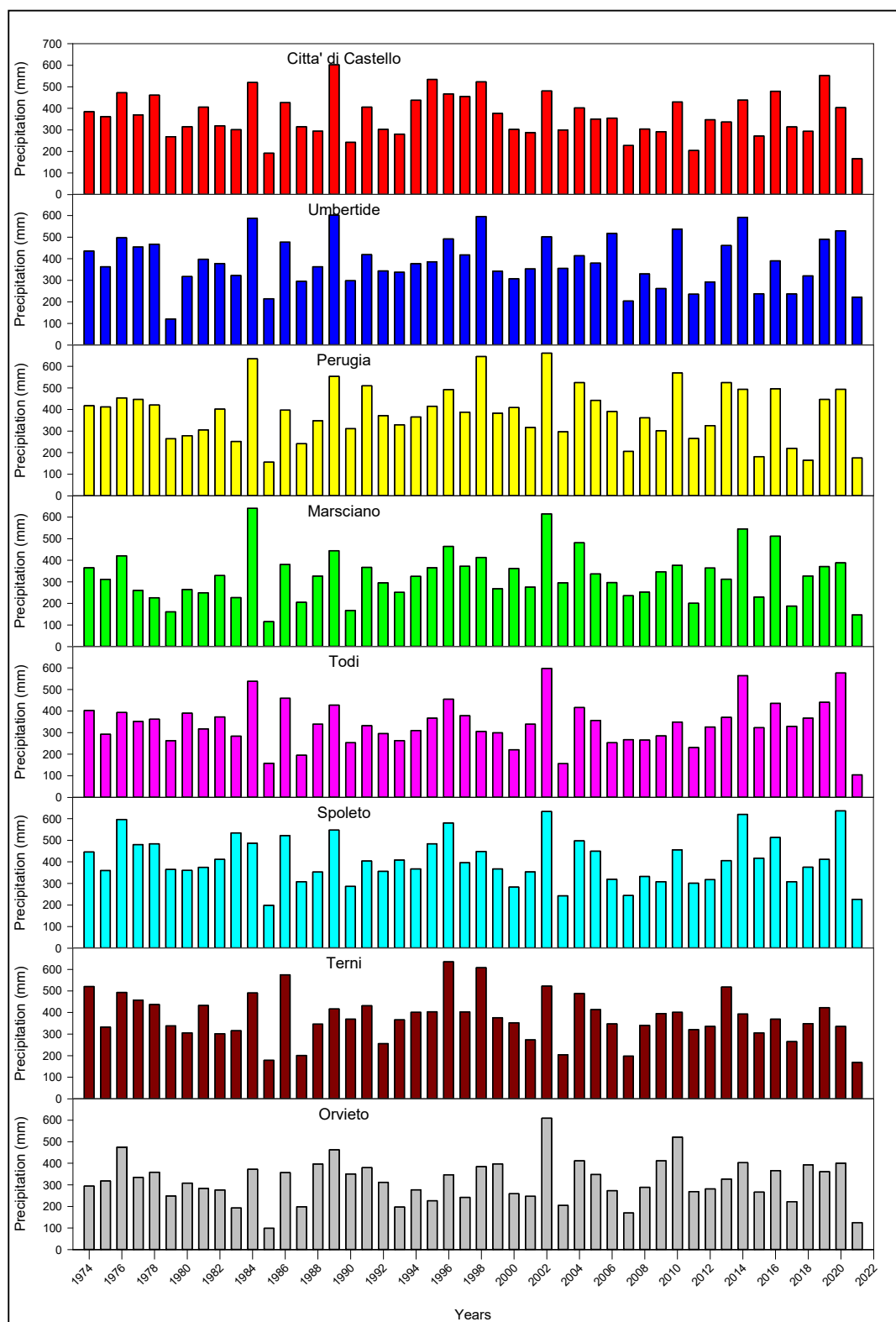
		Monthly maximum temperatures °C											
Station name	Annual T. max	January	February	March	April	May	June	July	Aug ust	Septem ber	October	November	December
Città di Castello	19.4	8.8 ±0.6	10.4±0.8	14.3±0.8	17.9±0.8	22.9±0.8	27.5±0.8	31.1±0.7	31.0±0.7	25.7±0.7	19.9±0.7	13.5±0.7	9.5±0.6
Umbertide	20.5 ±0.5	9.7±0.6	11.5±0.8	15.5±0.8	18.9±0.8	23.9±0.8	28.6±0.8	32.2±0.7	32.1±0.7	26.8±0.7	20.9±0.7	14.5±0.7	10.4±0.6
Perugia	19.1±0.5	8.7±0.6	10.3±0.7	13.9±0.8	17.4±0.8	22.4±0.8	27.1±0.8	30.8±0.7	30.6±0.7	25.3±0.7	19.6±0.7	13.3±0.7	9.6±0.6
Todi	19.6±0.5	8.9±0.6	11.0±0.7	14.5±0.7	18.0±0.8	22.9±0.8	27.6±0.8	31.4±0.6	31.1±0.7	25.8±0.7	20.1±0.7	13.5±0.7	9.4±0.6
Marsciano	20.1±0.5	9.3±0.6	11.4±0.7	15.0±0.8	18.5±0.8	23.4±0.7	28.2±0.8	32.1±0.6	31.9±0.7	26.6±0.7	20.7±0.7	14.0±0.7	9.8±0.6
Spoleto	20.1±0.5	9.4±0.6	11.4±0.7	15.0±0.7	18.5±0.8	23.4±0.8	28.1±0.8	31.8±0.6	31.7±0.7	26.4±0.7	20.6±0.7	14.0±0.7	9.9±0.6
Terni	21.0±0.4	11.2±0.5	13.1±0.6	16.3±0.7	19.4±0.7	24.0±0.7	28.4±0.7	31.6±0.6	31.6±0.6	26.9±0.6	21.7±0.6	15.7±0.6	11.8±0.4
Orvieto	20.5±0.5	9.9±0.6	11.6±0.8	15.1±0.8	18.6±0.8	23.6±0.8	28.5±0.8	32.3±0.7	32.3±0.7	26.9±0.7	21.1±0.7	14.7±0.7	10.7±0.6

**Table S5.** Annual minimum temperatures (T. min), monthly minimum temperatures (47 years averages) and standard errors per meteorological station and month

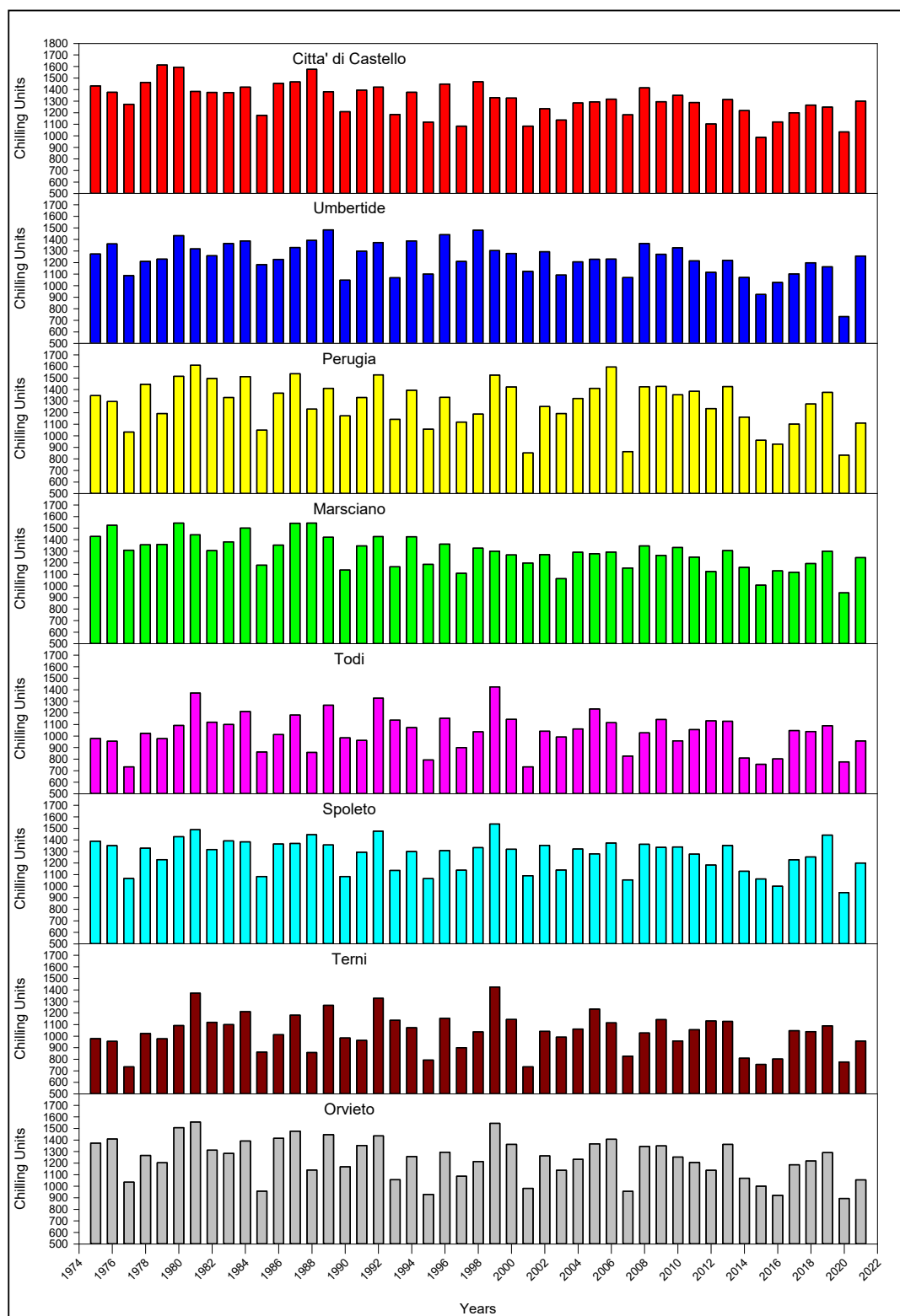
Station name	Annual T. min	Monthly minimum temperatures °C											
		January	February	March	April	May	June	July	August	September	October	November	December
Città di Castello	7.3±0.3	0.0±0.7	0.3±0.7	2.5±0.7	5.3±0.6	9.4±0.5	12.9±0.5	15.2±0.4	15.2±0.4	11.9±0.5	8.6±0.6	4.5±0.7	1.3±0.7
Umbertide	7.8±0.3	0.6±0.7	1.0±0.8	3.4±0.7	6.0±0.6	9.9±0.5	13.4±0.5	15.6±0.5	15.6±0.5	12.4±0.6	9.1±0.6	5.0±0.8	1.8±0.8
Perugia	10.2±0.3	2.6±0.6	3.1±0.6	5.3±0.6	8.0±0.5	12.1±0.5	15.9±0.5	18.6±0.4	18.7±0.5	15.2±0.5	11.4±0.5	7.0±0.6	3.6±0.6
Todi	9.0±0.3	1.4±0.7	2.0±0.7	4.3±0.6	7.0±0.5	11.1±0.5	14.8±0.5	17.4±0.4	17.5±0.5	14.0±0.5	10.2±0.6	5.8±0.7	2.5±0.7
Marsciano	7.5±0.3	0.0±0.7	0.5±0.7	2.7±0.6	5.4±0.5	9.4±0.5	13.0±0.5	15.5±0.4	15.7±0.4	12.5±0.5	8.8±0.6	4.5±0.7	1.2±0.7
Spoletto	8.9±0.3	1.4±0.7	2.1±0.7	4.3±0.6	7.0±0.5	11.0±0.5	14.6±0.5	17.1±0.5	17.2±0.5	13.8±0.5	10.1±0.6	5.7±0.7	2.5±0.7
Terni	10.7±0.3	3.0±0.7	3.7±0.7	6.1±0.6	8.6±0.5	12.7±0.5	16.5±0.5	19.0±0.4	19.1±0.4	15.7±0.5	11.8±0.6	7.4±0.7	4.1±0.7
Orvieto	9.7±0.3	2.2±0.6	2.7±0.7	4.8±0.6	7.5±0.5	11.5±0.5	15.2±0.5	17.9±0.4	18.0±0.4	14.7±0.5	11.0±0.6	6.6±0.7	3.4±0.6

**Table S6.** Annual mean temperatures (T. mean), monthly mean temperatures (47 years averages) and standard errors per meteorological station and month

Station name	Annual T. mean	Monthly mean temperatures °C											
		January	February	March	April	May	June	July	August	September	October	November	December
Città di Castello	13.4 ±0.1	4.4±0.1	5.4±0.1	8.4±0.1	11.6±0.1	16.1±0.1	20.2±0.1	23.2±0.1	23.1±0.1	18.8±0.1	14.2±0.1	9.0±0.1	5.4±0.1
Umbertide	14.2±0.1	5.2±0.1	6.2±0.1	9.4±0.1	12.4±0.1	16.9±0.1	21.0±0.1	23.9±0.1	23.8±0.1	19.6±0.1	15.0±0.1	9.8±0.1	6.1±0.1
Perugia	14.7±0.1	5.6±0.1	6.7±0.1	9.6±0.1	12.7±0.1	17.3±0.1	21.5±0.1	24.7±0.1	24.7±0.1	20.2±0.1	15.5±0.1	10.2±0.1	6.6±0.1
Todi	14.3±0.1	5.1±0.1	6.5±0.1	9.4±0.1	12.5±0.1	17.0±0.1	21.2±0.1	24.4±0.1	24.3±0.1	19.9±0.1	15.2±0.1	9.7±0.1	5.9±0.1
Marsciano	13.8±0.1	4.7±0.1	6.0±0.1	8.9±0.1	11.9±0.1	16.4±0.1	20.6±0.1	23.8±0.1	23.8±0.1	19.5±0.1	14.7±0.1	9.2±0.1	5.5±0.1
Spoletto	14.5±0.1	5.4±0.1	6.7±0.1	9.6±0.1	12.7±0.1	17.2±0.1	21.3±0.1	24.5±0.1	24.4±0.1	20.1±0.1	15.4±0.1	9.9±0.1	6.2±0.1
Terni	15.9±0.1	7.1±0.1	8.4±0.1	11.2±0.1	14.0±0.1	18.4±0.1	22.4±0.1	25.3±0.1	25.4±0.1	21.3±0.1	16.8±0.1	11.6±0.1	7.9±0.1
Orvieto	15.1±0.1	6.0±0.1	7.1±0.1	10.0±0.1	13.1±0.1	17.5±0.1	21.8±0.1	25.1±0.1	25.1±0.1	20.8±0.1	16.1±0.1	10.6±0.1	7.0±0.1

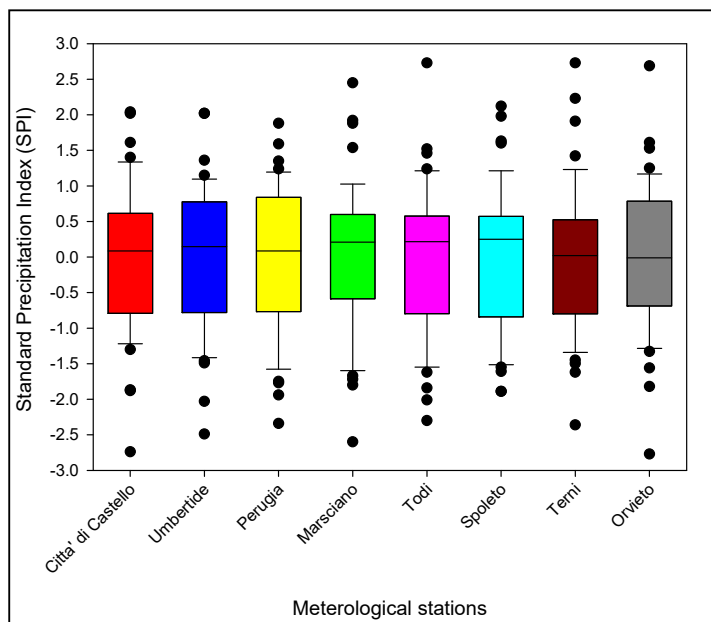


**Figure S1.** Precipitations from April to September recorded from 1974 to 2021 in each meteorological station represented by different colors and per year

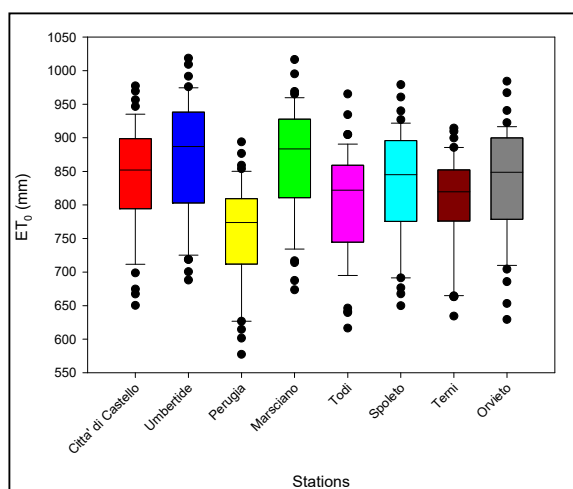


**Figure S2.** Chilling units recorded from 1974 to 2021 in each meteorological station represented by different colors and per year

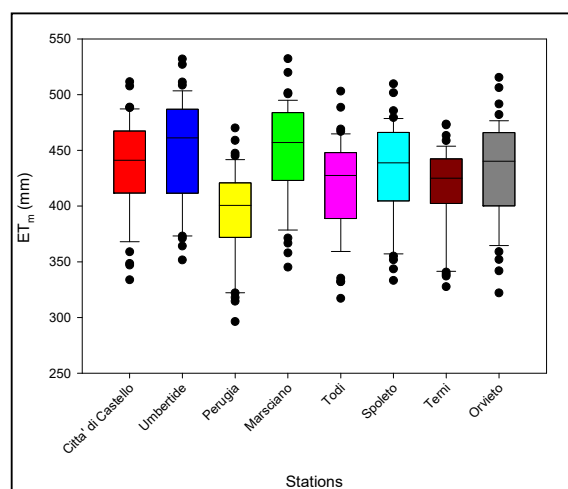




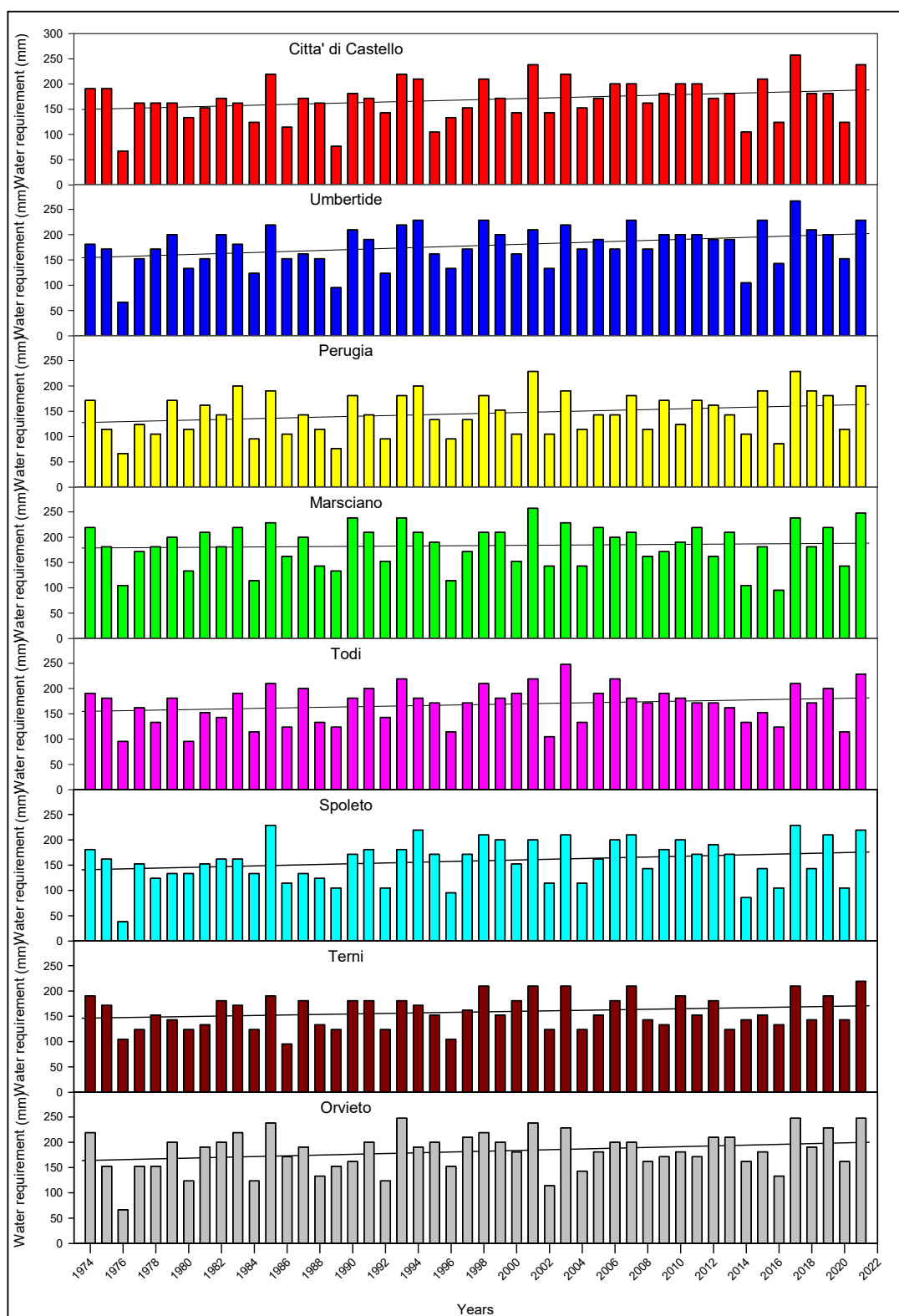
**Figure S3.** Box plots of Standard Precipitation Index (SPI) from 1974 to 2021 at 4-month time scales (June-August) from the different meteorological stations represented by different colors. Whiskers (error bars) above and below the box indicate the 90<sup>th</sup> and 10<sup>th</sup> percentiles. The horizontal line shows the median value. Black dots display extreme data points.



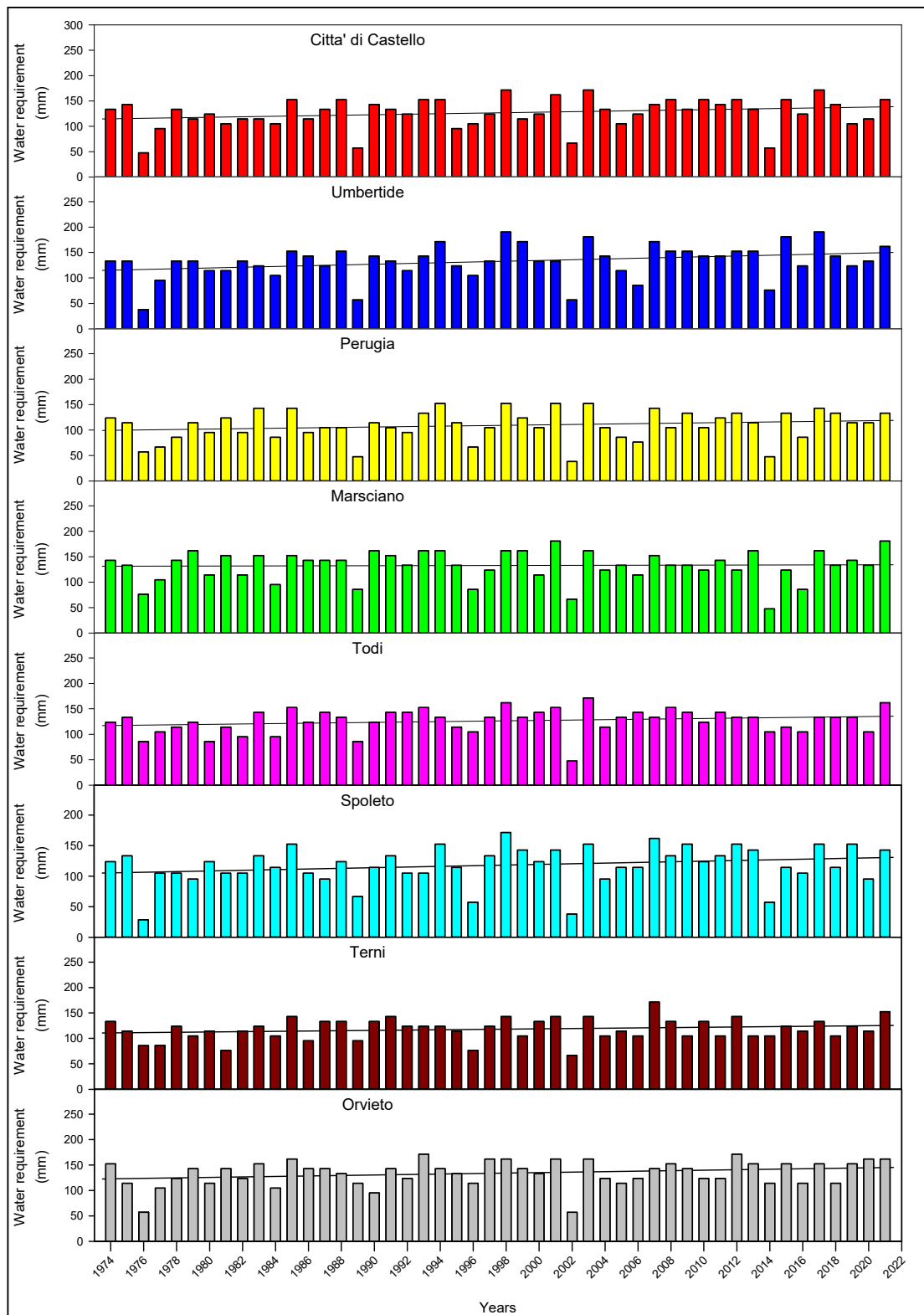
**Figure S4.** Box plots of ET<sub>0</sub> from April to September, from 1974 to 2021, per each meteorological station represented by different colors. Whiskers (error bars) above and below the box indicate the 90<sup>th</sup> and 10<sup>th</sup> percentiles. The horizontal line shows the median value. Black dots display extreme data points.



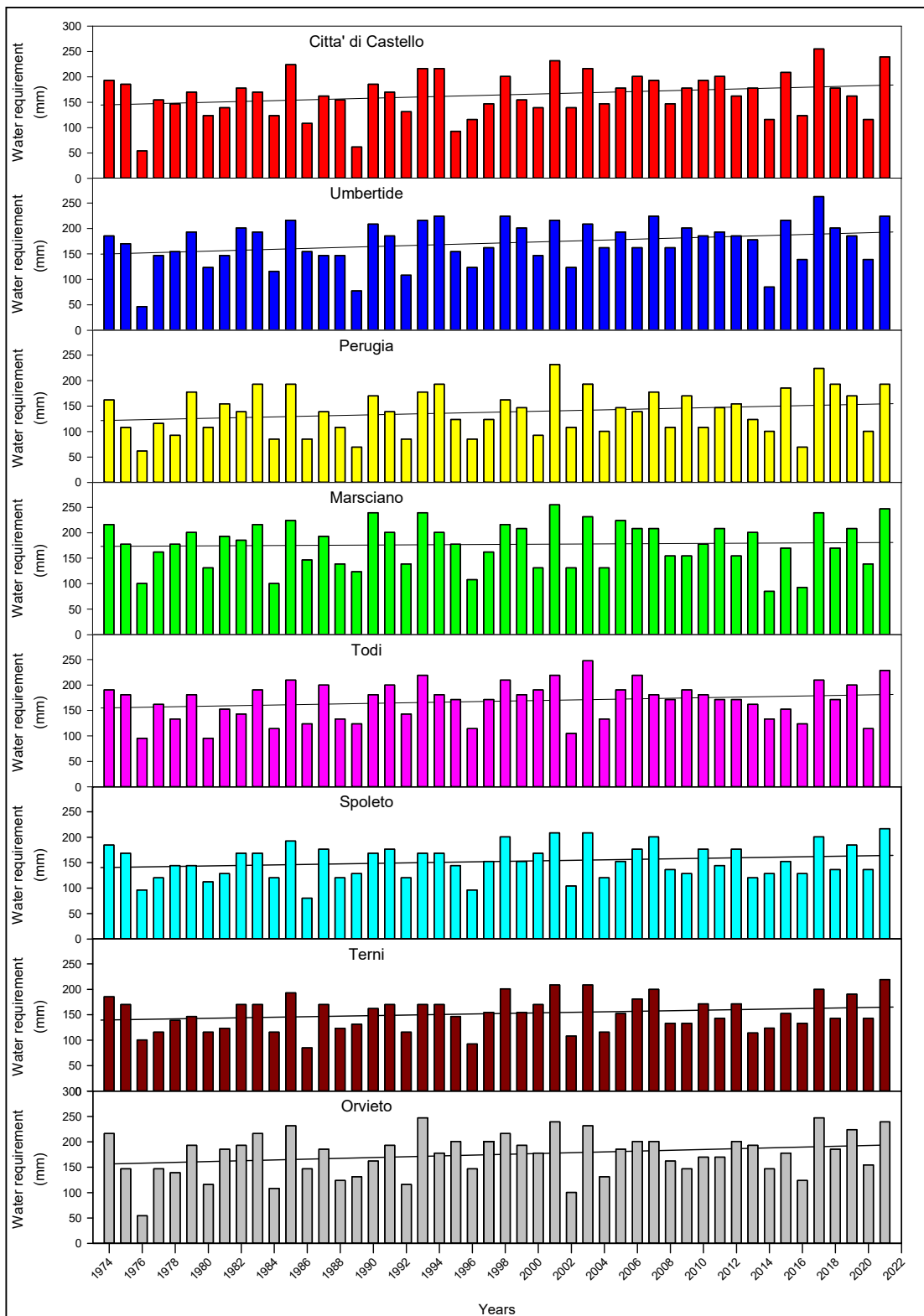
**Figure S5.** Box plots of ET<sub>m</sub> from April to September, from 1974 to 2021, per each meteorological station represented by different colors. Whiskers (error bars) above and below the box indicate the 90<sup>th</sup> and 10<sup>th</sup> percentiles. The horizontal line shows the median value. Black dots display extreme data points.



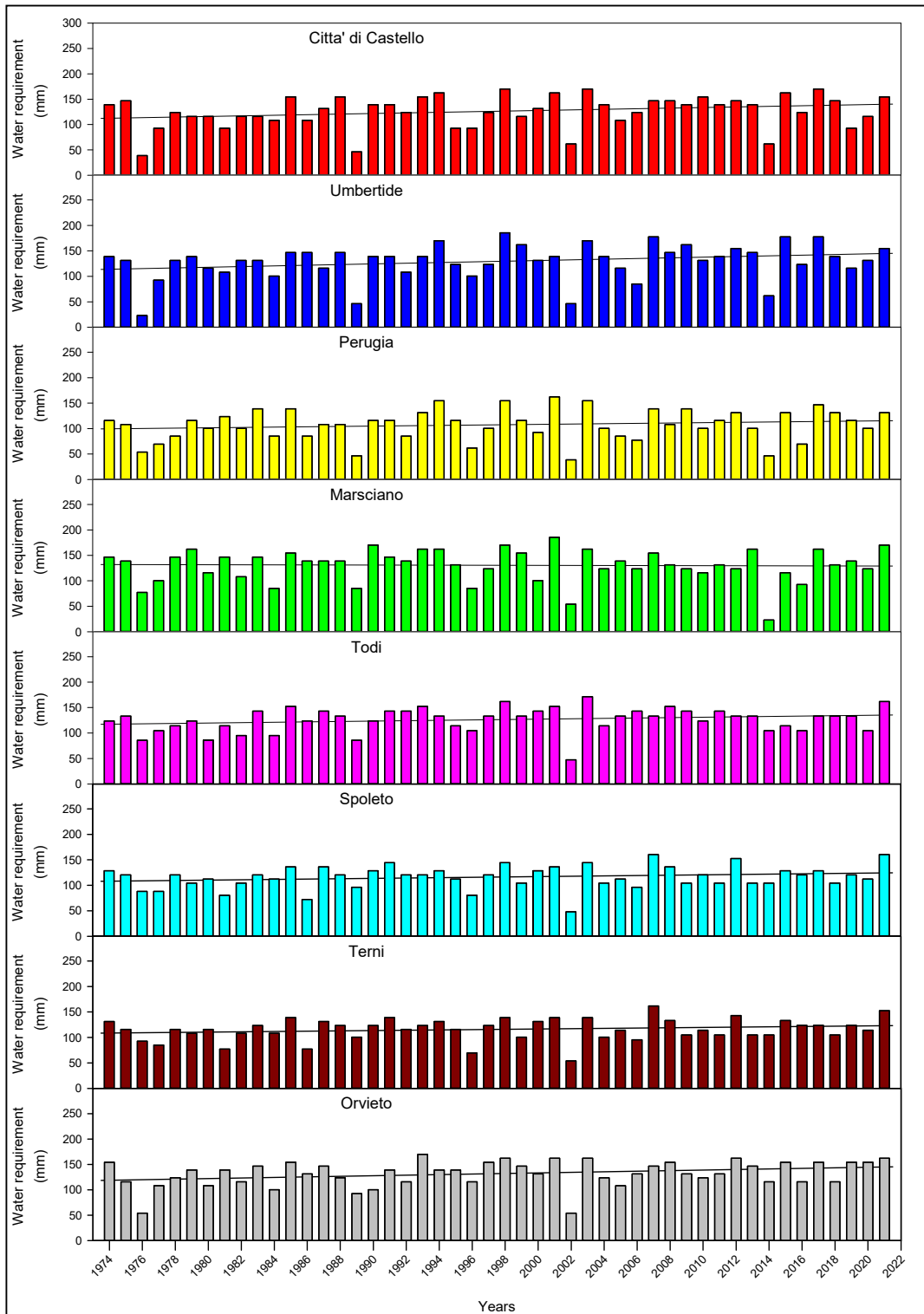
**Figure S6.** Water requirements from June to August per loam soil, recorded from 1974 to 2021 in each meteorological station represented by different colors. The black lines indicate the trend.



**Figure S7.** Water requirements from July to August per loam soil, recorded from 1974 to 2021 in each meteorological station represented by different colors. The black lines indicate the trend.



**Figure S8.** Water requirements from June to August per silty clay soil, recorded from 1974 to 2021 in each meteorological station represented by different colors. The black lines indicate the trend.



**Figure S9.** Water requirements from July to August per silty clay soil, recorded from 1974 to 2021 in each meteorological station represented by different colors. The black lines indicate the trend.

