

# Factors Affecting Water Drainage Long-Time Series in the Salinized Low-Lying Coastal Area of Ravenna (Italy)

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**Table S1.** Yearly values of precipitation (P), temperature (average—Tmean; maximum—Tmax; minimum—Tmin; mean corrected for precipitation and used to calculate actual evapotranspiration by Turc equation—Tc), evapotranspiration (potential—ETP; actual—ETR), drainage, runoff (expressed as P-ETR), ratio of drainage to precipitation.

Year	P (mm)	Tmean (°C)	T max (°C)	Tmin (°C)	Tc (°C)	ETR (mm)	ETP (mm)	Drainage (mm)	Runoff (mm)	Drainage /P
1971	552.4	12.5	16.9	8.0	11.6	438.5	749.6	59.42	113.9	0.11
1972	920.4	11.9	15.5	8.2	11.5	548.9	690.1	244.32	371.5	0.27
1973	759.0	12.8	17.6	12.8	13.0	540.2	776.6	289.24	218.8	0.38
1974	494.2	13.0	17.6	8.4	14.6	440.2	779.9	74.48	54.0	0.15
1975	639.8	13.5	17.9	9.0	15.8	538.1	810.1	56.71	101.7	0.09
1976	715.3	12.0	16.4	7.6	13.1	528.0	703.5	166.81	187.3	0.23
1977	515.0	13.1	17.7	8.3	13.8	444.9	754.2	132.49	70.1	0.26
1978	600.6	11.8	16.0	7.5	11.0	450.3	710.6	186.74	150.3	0.31
1979	661.8	12.1	16.5	7.7	12.8	502.8	735.6	246.92	159.0	0.37
1980	647.4	12.1	16.2	7.9	9.3	438.7	732.3	329.36	208.7	0.51
1981	663.5	11.4	15.6	7.3	13.3	511.9	702.7	125.29	151.6	0.19
1982	686.0	12.3	16.8	7.9	12.8	512.3	742.9	174.45	173.7	0.25
1983	300.2	12.2	17.2	7.3	12.9	290.3	747.8	113.58	9.9	0.38
1984	602.6	12.1	16.4	7.8	13.0	480.6	728.6	98.05	122.0	0.16
1985	390.2	13.2	18.2	8.3	11.4	349.2	793.9	115.62	41.0	0.30
1986	526.0	13.0	17.9	8.1	13.2	444.3	789.8	150.74	81.7	0.29
1987	575.5	10.8	15.5	6.1	8.7	407.9	687.6	112.05	167.6	0.19
1988	411.6	13.1	19.5	7.0	15.2	387.2	775.6	57.25	24.4	0.14
1989	600.7	12.4	18.4	7.0	17.2	532.2	749.7	78.88	68.5	0.13
1990	448.0	13.1	19.9	6.7	13.6	401.9	773.9	64.99	46.1	0.15
1991	707.3	12.1	18.7	6.1	12.4	513.1	747.5	172.01	194.2	0.24
1992	574.0	13.4	19.8	7.4	13.5	473.6	788.5	87.99	100.4	0.15
1993	610.0	13.3	19.9	6.7	15.5	518.5	798.5	70.44	91.5	0.12
1994	693.3	13.9	20.2	8.4	14.7	546.8	804.5	132.79	146.5	0.19
1995	706.0	12.6	19.4	7.1	14.4	547.6	749.5	126.56	158.4	0.18
1996	973.4	12.8	19.6	7.1	12.3	578.5	757.8	433.71	394.9	0.45
1997	728.3	13.2	20.2	7.8	11.6	504.3	769.8	283.88	224.0	0.39
1998	595.2	13.1	18.9	7.5	13.0	477.2	784.4	136.49	118.0	0.23

1999	1057.7	13.4	18.9	8.4	13.7	634.8	796.3	325.72	422.9	0.31
2000	573.0	14.1	19.9	8.7	13.5	473.1	821.0	116.91	99.9	0.20
2001	718.2	13.5	19.1	8.4	13.3	533.0	803.1	204.45	185.2	0.28
2002	829.7	13.7	19.0	9.0	14.6	597.4	794.9	268.04	232.3	0.32
2003	485.0	14.1	19.8	8.8	11.6	405.5	851.8	171.73	79.5	0.35
2004	749.1	13.4	19.0	8.2	10.6	488.9	785.3	162.24	260.2	0.22
2005	798.2	12.8	18.5	7.7	12.5	543.7	773.4	372.58	254.5	0.47
2006	502.8	13.6	19.9	8.1	14.4	443.2	798.9	180.74	59.6	0.36
2007	641.1	14.2	20.3	8.6	15.2	530.3	829.1	134.21	110.8	0.21
2008	554.0	14.3	20.3	8.7	12.4	450.2	825.9	156.33	103.8	0.28
2009	502.8	14.9	18.6	11.3	11.6	415.3	861.7	185.35	87.5	0.37
2010	872.4	13.4	17.9	9.2	12.5	561.1	785.1	469.66	311.3	0.54
2011	387.8	14.8	18.9	11.1	13.6	360.5	854.1	309.77	27.3	0.80
2012	571.4	14.8	18.7	11.1	13.0	466.5	874.7	151.12	104.9	0.26
2013	788.8	14.5	18.1	11.0	12.3	536.1	830.3	462.69	252.7	0.59
2014	755.4	15.5	19.0	12.0	14.9	577.9	839.1	309.66	177.5	0.41
2015	773.2	15.1	18.8	11.6	14.9	584.3	865.5	326.21	188.9	0.42
2016	650.6	14.9	19.0	11.1	14.5	524.8	841.2	269.84	125.8	0.41
Mean	641.5	13.2	18.4	8.5	13.1	488.6	781.9	193.4	152.9	0.30
max	1057.7	15.5	20.3	12.5	17.2	634.8	874.7	469.7	422.9	0.80
min	300.2	10.8	15.5	6.1	8.7	290.3	687.6	56.7	9.9	0.09

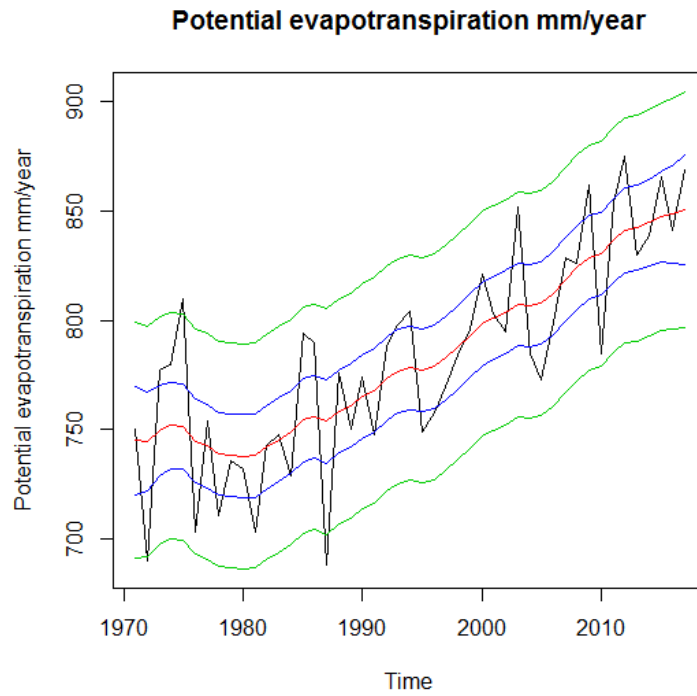
**Table S2.** Correlation values between rainfall and drainage at different time lags for each year (from 1971 to 2016).

Year	r (lag0)	r (lag1)	r (lag2)	r (lag3)	r (lag4)	r (lag5)	r (lag6)
1971	0.11	0.06	0.06	0.03	0.15	0.04	0.08
1972	0.43	0.47	0.26	0.13	0.07	0.03	0.05
1973	0.57	0.51	0.35	0.24	0.23	0.17	0.15
1974	0.18	0.48	0.32	0.22	0.21	0.17	0.14
1975	0.21	0.05	0.09	0.05	-0.03	0.03	0.11
1976	0.21	0.23	0.12	0.07	0.05	0.11	0.04
1977	0.26	0.36	0.32	0.21	0.16	0.08	0.11
1978	0.24	0.41	0.32	0.16	0.07	0.06	0.05
1979	0.18	0.31	0.25	0.15	0.13	0.12	0.06
1980	0.10	0.33	0.27	0.22	0.16	0.09	0.04
1981	0.10	0.45	0.32	0.13	0.07	0.10	0.05
1982	0.16	0.30	0.27	0.29	0.26	0.15	0.03
1983	0.08	0.13	0.01	-0.02	-0.03	-0.03	-0.06
1984	0.30	0.43	0.27	0.18	0.10	0.18	0.13
1985	0.07	0.08	0.06	0.04	0.06	0.03	0.02
1986	0.16	0.31	0.23	0.15	0.05	0.04	0.11
1987	0.29	0.51	0.34	0.37	0.22	0.22	0.27
1988	0.09	0.00	0.15	0.18	0.11	-0.01	0.05
1989	0.55	0.48	0.36	0.27	0.21	0.16	0.15
1990	0.34	0.18	0.07	0.07	-0.02	0.01	0.02
1991	0.49	0.36	0.21	0.22	0.14	0.15	0.13
1992	0.19	0.29	0.26	0.21	0.22	0.16	0.08
1993	0.19	0.19	0.09	0.03	-0.03	0.04	0.06
1994	0.35	0.55	0.30	0.22	0.12	0.09	0.10
1995	0.37	0.52	0.30	0.20	0.08	0.05	0.08
1996	0.14	0.24	0.22	0.20	0.19	0.19	0.20

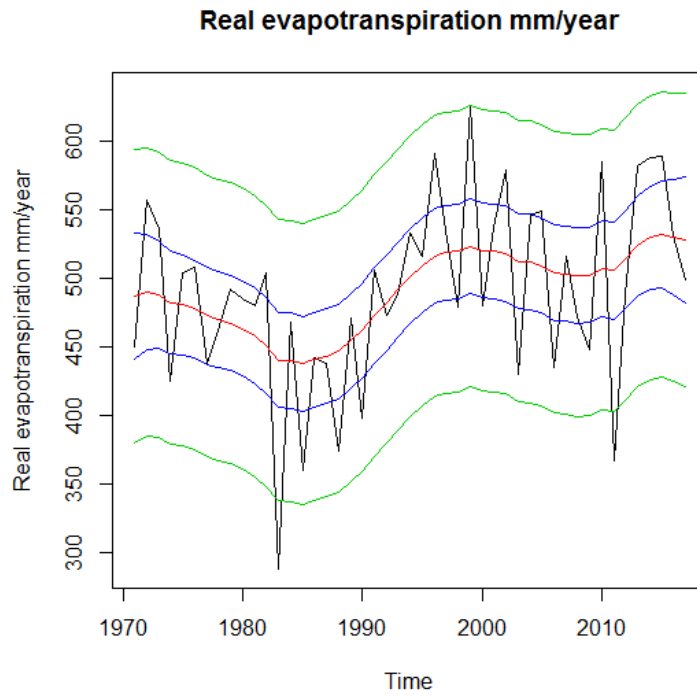
1997	0.22	0.50	0.44	0.30	0.16	0.09	0.04
1998	0.35	0.20	-0.02	-0.02	-0.01	-0.04	-0.08
1999	0.34	0.40	0.33	0.26	0.23	0.26	0.16
2000	0.19	0.29	0.19	0.10	0.07	0.00	0.04
2001	0.18	0.35	0.20	0.11	0.07	0.06	0.09
2002	0.31	0.52	0.30	0.19	0.17	0.15	0.14
2003	0.21	0.28	0.17	0.17	0.10	0.07	-0.01
2004	0.33	0.45	0.29	0.19	0.11	0.13	0.08
2005	0.40	0.59	0.50	0.30	0.20	0.14	0.10
2006	0.24	0.33	0.18	0.09	0.02	0.01	0.03
2007	0.24	0.27	0.24	0.19	0.12	0.13	0.14
2008	0.25	0.42	0.24	0.20	0.09	0.05	-0.01
2009	0.31	0.42	0.21	0.16	0.07	0.00	-0.01
2010	0.25	0.50	0.22	0.14	0.10	0.08	0.08
2011	0.41	0.48	0.54	0.38	0.29	0.29	0.29
2012	0.24	0.13	0.05	0.02	-0.01	-0.05	-0.04
2013	0.35	0.53	0.38	0.32	0.20	0.19	0.14
2014	0.24	0.36	0.22	0.16	0.16	0.11	0.09
2015	0.35	0.45	0.35	0.19	0.11	0.06	0.04
2016	0.34	0.23	0.20	0.13	0.15	0.14	0.10
mean	0.26	0.35	0.24	0.17	0.12	0.09	0.08
max	0.57	0.59	0.54	0.38	0.29	0.29	0.29
min	0.07	0.00	-0.02	-0.02	-0.03	-0.05	-0.08

**Table S3.** Variations in water budget during the period 1971-2017 by considering three subperiods (1971–1986; 1986–2000, and 2000–2017).

(mm/year)	1971–1986	1986–2000	2000–2017	1971–2017
$\Delta P$	-60	110	-10	40
$\Delta ETR$	-55	85	5	40
$\Delta Pu$	-20	80	70	130
$\Delta Q_v$	-15	55	85	125



**Figure S1.** Potential evapotranspiration (black line) computed with the Thornthwaite and Mather method ([44]). The red line is the potential evapotranspiration trend space state model obtained by Kalman filtering ([46,47]). The blue lines indicate the 90% confidence interval and the green lines indicate the 90% prediction interval for the original model object.



**Figure S2.** Real evapotranspiration (black line) computed with the Turc method ([45,52]). The red line is the real evapotranspiration trend space state model obtained by Kalman filtering ([46,47]). The blue lines indicate the 90% confidence interval and the green lines indicate the 90% prediction interval for the original model object.