



Supplement of

Aquifer recharge in the Piedmont Alpine zone: historical trends and future scenarios

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Table S1. T_{max} , P_q , AET and $P_q - AET$ trend slope for all the catchments of study area. 1959-2017 time series are considered. The bold font indicates 95% significance. The standard deviation, evaluated considering the detrended timeseries, is reported to provide a quantification of interannual variability.

Primary catchments	Cross section ID number	A [km ²]	T_{max} [K/yr]	$std(T_{max})_{detr}$ [K/yr]	P_q [mm/yr/yr]	$std(P_q)_{detr}$ [mm/yr/yr]	AET [mm/yr/yr]	$std(AET)_{detr}$ [mm/yr/yr]	$P_q - AET$ [mm/yr/yr]	$std(P_q - AET)_{detr}$ [mm/yr/yr]
Dora Riparia	30	79.8	0.059	0.591	-2.656	198.602	0.139	18.495	-2.795	193.162
	56	201.9	0.060	0.642	-1.951	157.374	0.395	18.876	-2.346	155.425
	62	259.4	0.074	0.717	-3.094	172.205	0.908	20.699	-4.002	169.340
	65	694.4	0.065	0.645	-2.869	165.184	0.525	19.195	-3.394	162.677
	66	1242.7	0.059	0.580	-2.909	193.822	0.292	19.098	-3.201	187.481
	107	628.4	0.041	0.580	0.369	251.129	0.181	20.593	0.189	245.302
Orco	109	829.3	0.042	0.567	0.155	255.245	0.235	21.002	-0.080	248.546
	150	213.9	0.043	0.595	2.057	256.799	0.464	22.453	1.593	250.081
	38	581.1	0.049	0.577	-1.623	219.811	0.172	22.367	-1.795	211.302
Pellice	39	94.8	0.078	0.718	-3.846	183.996	0.731	22.170	-4.577	181.013
	76	188.9	0.045	0.600	-0.981	222.500	0.285	21.885	-1.266	214.546
	110	213.4	0.046	0.511	0.135	228.096	0.465	17.414	-0.330	220.299
	111	948.2	0.048	0.531	-0.991	224.093	0.277	20.177	-1.268	215.237
Stura di Lanzo	158	581.8	0.043	0.656	-1.144	265.496	0.124	22.631	-1.268	257.791
	159	898.1	0.049	0.598	-1.170	264.046	0.299	23.403	-1.470	254.130
	160	232.3	0.044	0.679	-1.954	263.065	0.111	24.856	-2.065	254.321
Banna	6	262.3	0.033	0.652	-0.466	177.792	0.770	26.803	-1.236	161.041
	7	347.6	0.032	0.650	-0.588	177.725	0.748	26.386	-1.336	161.336
Chisola	35	466.4	0.050	0.585	-2.759	238.574	0.768	25.721	-3.528	224.671
Malone	94	358.2	0.054	0.653	-0.920	271.809	0.927	28.165	-1.847	260.628
	95	132.6	0.057	0.667	0.752	301.422	0.784	32.419	-0.033	289.163
Sangone	137	239.5	0.053	0.596	-2.897	250.285	0.128	28.588	-3.025	234.619
	138	145.7	0.051	0.645	-2.599	259.687	-0.052	30.312	-2.547	244.417

Table S2. Yearly trend slope of drainage projections. Bold font cells indicate trend significance.

Primary catchments	Cross section ID number	HY [mm/yr/yr]									
		CNRM-CM5 RCP4.5	EC-Earth RCP4.5	IPSL-CM5A-MR RCP4.5	HadGEM2-ES RCP4.5	MPI-ESM-LR RCP4.5	CNRM-CM5 RCP8.5	EC-Earth RCP8.5	IPSL-CM5A-MR RCP8.5	HadGEM2-ES RCP8.5	MPI-ESM-LR RCP8.5
Dora Riparia	30	0.083	-1.930	-0.529	-4.923	1.683	1.151	2.100	-2.346	-8.061	4.032
	56	1.327	-0.672	-2.467	-1.632	2.236	2.201	0.887	-4.431	-3.308	4.265
	62	0.580	-2.120	-1.785	-5.140	0.468	0.673	3.951	-6.921	-6.519	2.308
	65	0.829	-1.657	-2.159	-4.077	1.353	0.884	2.404	-5.270	-5.698	3.322
	66	1.079	-1.862	-1.332	-5.872	1.174	1.146	3.972	-4.639	-8.507	4.380
	107	1.255	-2.274	-0.124	-7.055	1.493	2.424	4.876	-6.566	-13.695	4.182
Orco	109	1.526	-2.441	-0.326	-7.649	1.666	2.502	5.053	-6.299	-15.089	4.904
	150	0.836	-2.378	-0.946	-6.451	0.928	2.276	4.717	-9.231	-12.897	3.019
	38	0.630	-3.057	-3.848	-7.876	0.741	-0.081	5.533	-8.578	-10.339	0.720
Pellice	39	-0.603	-2.427	-3.715	-5.666	0.367	0.302	3.388	-8.158	-7.451	0.172
	76	0.047	-3.275	-4.556	-7.796	0.659	-0.030	5.635	-10.842	-10.201	-0.863
	110	1.170	-3.376	-4.615	-10.036	0.593	-1.113	7.959	-12.009	-12.135	-0.556
Stura Lanzo	111	1.416	-3.239	-3.981	-8.800	0.838	-0.511	6.765	-9.143	-11.324	0.764
	158	1.009	-1.783	-0.168	-9.843	1.344	2.705	6.199	-5.487	-14.937	5.970
	159	1.714	-1.849	-0.123	-9.904	1.292	2.400	6.601	-5.192	-16.179	6.478
Banna	160	0.778	-1.509	-0.591	-9.629	0.647	3.032	6.789	-5.257	-14.074	6.726
	6	0.308	-3.243	-2.756	-2.519	0.084	1.300	3.120	-5.330	-7.308	1.681
Chisola	7	0.430	-3.167	-2.705	-2.390	0.080	1.238	2.998	-5.192	-6.942	1.829
	35	2.814	-2.791	-2.395	-6.854	0.599	2.143	7.679	-5.060	-11.663	6.284
Malone	94	2.849	-2.861	-0.894	-9.472	1.588	2.053	5.872	-4.591	-20.158	7.182
	95	3.749	-2.396	0.389	-12.051	2.370	2.479	7.287	-2.430	-22.448	9.860
Sangone	137	2.372	-2.294	-1.222	-8.119	0.682	1.125	7.281	-4.689	-12.594	5.846
	138	2.302	-2.593	-1.750	-9.336	0.591	0.641	7.852	-4.528	-12.851	5.544

Table S3. Trend slope of drainage projections in *JFM* quarter. Bold font cells indicate trend significance.

Primary catchments	Cross section ID number	JFM [mm/quar/yr]									
		CNRM-CM5 RCP4.5	EC-Earth RCP4.5	IPSL-CM5A-MR RCP4.5	HadGEM2-ES RCP4.5	MPL-ESM-LR RCP4.5	CNRM-CM5 RCP8.5	EC-Earth RCP8.5	IPSL-CM5A-MR RCP8.5	HadGEM2-ES RCP8.5	MPL-ESM-LR RCP8.5
Dora Riparia	30	0.983	0.611	1.764	-5.140	0.726	1.463	1.599	1.495	0.408	1.140
	56	0.809	-0.033	-0.458	-1.262	0.542	2.188	-0.414	-0.630	0.923	1.652
	62	1.169	0.848	1.270	-3.522	0.014	1.263	1.425	-0.078	0.112	0.796
	65	1.026	0.573	0.490	-3.173	0.244	1.528	0.829	-0.012	0.340	1.125
	66	1.289	0.998	1.938	-5.179	0.031	1.649	1.827	0.703	-0.192	1.343
	107	1.193	1.106	3.711	-7.180	0.708	1.798	1.689	0.779	-0.789	1.233
Orco	109	1.175	1.421	4.201	-7.918	0.693	1.890	1.865	0.984	-1.266	1.395
	150	0.889	1.048	3.346	-6.362	0.257	1.333	1.447	0.190	-0.846	0.490
	38	1.597	1.389	1.671	-6.295	-0.622	1.144	2.373	0.283	-0.567	0.095
Pellice	39	0.959	1.026	0.865	-3.954	-0.284	0.930	1.190	0.133	-0.291	0.233
	76	1.617	1.367	1.412	-5.893	-0.560	0.994	2.172	-0.005	-0.407	-0.266
	110	2.430	1.336	1.437	-6.579	-0.801	1.136	3.067	-0.231	-0.905	-0.144
	111	2.002	1.558	1.893	-6.897	-0.902	1.236	2.930	0.072	-0.903	0.004
Stura Lanzo	158	1.807	1.272	3.992	-8.621	0.236	1.972	2.775	1.867	-1.270	1.849
	159	1.784	1.695	4.615	-8.871	-0.147	2.154	3.044	1.795	-2.097	1.930
	160	1.876	1.335	3.779	-8.231	-0.329	1.881	3.055	2.257	-1.463	1.942
Banna	6	-0.195	1.404	2.291	-2.233	-0.025	0.942	0.902	-0.504	-0.176	-0.101
	7	-0.219	1.451	2.228	-2.251	-0.087	0.979	0.856	-0.519	-0.192	-0.080
Chisola	35	1.367	2.355	3.357	-6.097	-1.483	1.956	2.965	0.092	-1.866	1.343
	94	1.236	2.416	6.111	-10.098	0.059	2.411	2.869	1.914	-3.697	1.932
Malone	95	1.911	2.687	6.825	-13.023	0.256	3.129	3.160	3.170	-4.505	3.316
	137	1.638	1.986	3.711	-7.439	-0.944	1.898	3.169	0.579	-1.576	1.578
Sangone	138	1.992	1.758	3.359	-8.504	-0.869	1.753	3.425	0.775	-1.276	1.547

Table S4. Trend slope of drainage projections in *AMJ* quarter. Bold font cells indicate trend significance.

Primary catchments	Cross section ID number	AMJ [mm/quar/yr]									
		CNRM-CM5 RCP4.5	EC-Earth RCP4.5	IPSL-CM5A-MR RCP4.5	HadGEM2-ES RCP4.5	MPL-ESM-LR RCP4.5	CNRM-CM5 RCP8.5	EC-Earth RCP8.5	IPSL-CM5A-MR RCP8.5	HadGEM2-ES RCP8.5	MPL-ESM-LR RCP8.5
	30	P_{t+N_t-AET}	P_{t+N_t-AET}	P_{t+N_t-AET}	P_{t+N_t-AET}	P_{t+N_t-AET}	P_{t+N_t-AET}	P_{t+N_t-AET}	P_{t+N_t-AET}	P_{t+N_t-AET}	
	56	-1.647	0.417	0.573	-0.053	0.591	-2.453	-0.398	-2.070	-4.274	
Dora Riparia	62	-0.325	0.707	-1.083	0.321	0.825	-1.520	-0.677	-2.478	-2.645	
	65	-1.606	0.863	-0.327	-0.592	0.039	-1.516	2.217	-4.091	-3.454	
	66	-1.222	0.823	-0.398	-0.123	0.459	-1.739	0.755	-3.256	-3.334	
	107	-1.555	0.711	0.129	0.092	0.490	-1.997	1.052	-2.430	-4.386	
Orco	109	-1.370	0.740	-0.495	1.029	0.229	-2.759	0.788	-2.115	-6.440	
	150	-1.471	0.537	-0.583	1.483	0.470	-2.867	0.796	-1.685	-6.636	
	38	-1.164	0.945	-0.364	1.527	-0.028	-2.365	1.176	-2.609	-5.882	
	39	-1.807	0.703	-0.062	-0.253	0.000	-1.879	2.376	-3.676	-5.200	
Pellice	76	-2.008	0.767	-0.727	-0.427	-0.568	-1.494	2.215	-3.998	-3.413	
	110	-1.952	0.689	-0.526	-0.441	-0.450	-1.700	2.920	-4.488	-5.049	
	111	-1.712	0.427	-0.290	-0.935	0.034	-1.847	3.935	-4.950	-6.468	
Stura Lanzo	158	-1.644	0.457	-0.094	-0.239	0.362	-1.919	2.833	-3.673	-5.733	
	159	-2.435	1.099	0.099	0.022	0.179	-2.897	1.355	-2.377	-7.080	
	160	-2.240	0.899	0.127	0.692	0.590	-2.802	1.570	-1.621	-7.177	
Banna	6	-2.681	1.168	0.408	0.158	0.032	-2.403	1.967	-2.274	-6.601	
	7	-0.395	-0.996	-1.859	1.006	0.389	-0.411	0.281	-0.334	-2.879	
Chisola	35	-0.275	-1.000	-1.745	1.133	0.415	-0.363	0.207	-0.367	-2.776	
	94	-0.601	-0.150	-0.238	1.183	1.693	-1.030	2.304	-0.212	-5.155	
Malone	95	-1.624	-0.063	-0.813	3.083	1.223	-3.252	0.960	0.108	-7.564	
	137	-1.870	0.280	-0.165	3.640	1.464	-4.013	1.495	0.451	-8.941	
Sangone	138	-1.239	0.454	0.571	0.694	1.119	-1.791	2.195	-0.647	-5.883	
		-1.534	0.748	0.909	0.195	0.884	-2.053	2.387	-1.052	-6.646	

Table S5. Trend slope of drainage projections in *JAS* quarter. Bold font cells indicate trend significance.

Primary catchments	Cross section ID number	JAS [mm/quar/yr]									
		CNRM-CM5 RCP4.5	EC-Earth RCP4.5	IPSL-CM5A-MR RCP4.5	HadGEM2-ES RCP4.5	MPL-ESM-LR RCP4.5	CNRM-CM5 RCP8.5	EC-Earth RCP8.5	IPSL-CM5A-MR RCP8.5	HadGEM2-ES RCP8.5	MPL-ESM-LR RCP8.5
	30	0.553	-1.293	0.006	-1.054	0.715	0.673	1.105	-0.401	0.442	-0.175
	56	0.758	-0.589	-0.105	-0.826	1.107	0.555	1.351	-0.742	0.777	0.284
Dora Riparia	62	0.694	-1.787	-0.566	-1.492	0.448	1.835	1.009	-1.632	0.087	-0.225
	65	0.720	-1.318	-0.250	-1.189	0.746	1.136	1.156	-1.010	0.451	-0.104
	66	0.758	-1.416	-0.354	-1.299	0.729	1.135	1.178	-1.177	0.451	-0.225
	107	0.810	-1.657	-0.505	-1.327	1.055	1.282	1.997	-2.587	0.192	-0.567
Orco	109	0.841	-1.750	-0.453	-1.467	1.009	1.472	1.982	-2.523	0.131	-0.522
	150	1.005	-1.837	-1.055	-1.423	1.263	1.484	2.161	-3.826	0.054	-0.643
	38	0.640	-1.941	-0.988	-1.446	1.062	1.226	1.339	-2.997	-0.151	-0.726
	39	0.510	-1.764	-1.055	-1.320	1.003	1.602	1.172	-2.635	-0.384	-0.491
Pellice	76	0.522	-2.157	-1.267	-1.334	1.226	1.484	1.350	-4.061	-0.500	-0.794
	110	0.566	-2.071	-1.328	-1.571	0.478	1.283	1.484	-4.728	-0.431	-1.206
	111	0.661	-1.988	-0.942	-1.486	0.763	1.241	1.393	-3.313	-0.134	-0.781
	158	1.006	-1.475	-0.614	-1.199	1.265	1.605	1.741	-2.194	0.420	-0.586
Stura Lanzo	159	0.991	-1.522	-0.534	-1.372	0.956	1.676	1.671	-2.061	0.402	-0.487
	160	1.097	-1.430	-1.157	-1.324	1.335	1.921	1.568	-2.556	0.484	-0.575
Banna	6	0.598	-2.456	-0.351	-1.530	0.425	0.859	1.212	-1.880	-0.202	-0.488
	7	0.568	-2.424	-0.368	-1.492	0.383	0.856	1.228	-1.769	-0.057	-0.469
Chisola	35	1.015	-2.203	-0.575	-1.833	0.032	1.681	1.434	-1.998	0.041	0.174
	94	0.932	-1.909	-0.241	-1.793	0.609	2.050	1.715	-1.895	0.112	-0.311
Malone	95	1.050	-1.595	-0.118	-1.677	0.842	2.172	2.094	-1.585	0.730	-0.577
	137	0.851	-1.623	-0.412	-1.630	0.325	1.055	1.273	-1.729	0.333	-0.103
Sangone	138	0.858	-1.623	-0.532	-1.543	0.593	0.802	1.382	-1.912	0.520	-0.399

Table S6. Trend slope of drainage projections in *OND* quarter. Bold font cells indicate trend significance.

Primary catchments	Cross section ID number	OND [mm/quarter/yr]									
		CNRM-CM5 RCP4.5	EC-Earth RCP4.5	IPSL-CM5A-MR RCP4.5	HadGEM2-ES RCP4.5	MPL-ESM-LR RCP4.5	CNRM-CM5 RCP8.5	EC-Earth RCP8.5	IPSL-CM5A-MR RCP8.5	HadGEM2-ES RCP8.5	MPL-ESM-LR RCP8.5
Dora Riparia	30	1.022	-1.391	-1.621	-0.095	-0.860	0.493	0.332	0.012	-3.665	1.741
	56	0.109	-0.468	0.229	-0.492	-0.725	0.064	1.323	0.361	-1.836	0.593
	62	1.223	-1.445	-1.175	-0.422	-0.603	-1.404	-0.195	0.352	-2.297	1.316
	65	0.851	-1.278	-0.933	-0.506	-0.682	-0.727	0.203	0.314	-2.289	1.067
	66	1.271	-1.697	-1.856	-0.687	-0.893	-0.374	0.429	-0.234	-3.315	1.584
	107	1.529	-1.634	-1.695	-1.162	-1.370	1.103	1.353	-0.630	-5.494	1.844
Orco	109	1.867	-1.895	-2.242	-1.442	-1.534	1.084	1.154	-1.122	-5.848	2.134
	150	0.974	-1.525	-1.963	-1.489	-1.256	0.721	1.026	-0.844	-5.186	1.200
	38	1.329	-2.669	-3.278	-0.884	-0.670	-1.188	-0.016	0.180	-3.142	0.601
Pellice	39	1.050	-2.058	-1.915	-0.601	-0.493	-1.417	-0.664	0.226	-2.366	0.556
	76	1.268	-2.635	-3.151	-0.873	-0.474	-1.452	-0.198	0.212	-3.060	0.301
	110	1.500	-2.544	-3.411	-1.608	-0.443	-1.799	-0.136	0.583	-2.986	0.667
	111	1.582	-2.674	-3.606	-1.224	-0.602	-1.418	0.035	0.248	-3.213	0.733
Stura Lanzo	158	1.899	-2.315	-2.315	-1.706	-1.684	0.789	1.067	-0.865	-5.664	2.501
	159	2.262	-2.480	-2.941	-2.015	-1.633	0.368	0.869	-1.517	-5.640	2.529
	160	1.797	-2.270	-2.362	-1.766	-1.702	0.335	0.908	-0.929	-5.070	2.756
Banna	6	0.645	-1.124	-1.490	-0.440	-0.960	-0.332	1.002	-1.147	-2.874	1.154
	7	0.671	-1.147	-1.481	-0.433	-0.912	-0.442	0.971	-1.042	-2.808	1.231
Chisola	35	1.586	-2.148	-3.213	-1.225	-0.802	-0.699	1.283	-1.387	-3.059	1.906
	94	3.029	-2.792	-4.375	-2.490	-1.985	0.272	0.446	-3.106	-6.535	2.635
Malone	95	3.586	-3.276	-4.607	-3.092	-2.428	0.525	0.765	-3.039	-7.291	3.429
	137	1.737	-2.526	-3.595	-1.101	-1.078	-0.389	1.032	-1.189	-3.973	1.871
Sangone	138	1.654	-2.842	-4.002	-0.998	-1.287	-0.282	1.098	-0.418	-4.089	1.742