Table 1.The geographical locations and associated annual climatic parameters

Station	Longitude	Latitude	Altitude (m)	Temperature (°C)	Precipitation (mm)
HEB	126°46′E	45°45′N	142.3	4.17	524.3
ALT	108°05′E	47°44′N	735.3	4.54	191.3
MQ	103°05′E	38°38′N	1367	8.33	113
BJ	116°28′E	39°48′N	31.3	12.20	571.9
LSA	91°08′E	29°40′N	3648.7	7.82	426.4
CQ	106°28′E	29°35′N	259.1	18.04	1104.5
HZ	120°10′E	30°14′N	41.7	16.45	1454.6
HK	110°21′E	20°02′N	13.9	24.08	1651.9

Table 2.Monthly statistical parameters of each data set for each station

Station	Dataset	x_{mean}	S_x	C_v	C_x	x_{min}	x_{max}	*R*
HEB	***Rg***	12.98	5.35	0.41	0.00	3.68	28.71	0.89
	Ta	4.17	14.52	3.48	-0.25	-24.71	25.25	0.86
	Hs	7.02	1.59	0.23	-0.25	2.82	10.89	0.79
	RH	65.44	11.01	0.17	-0.44	36.23	85.06	-0.36
	Ws	3.69	0.97	0.26	0.61	1.88	6.69	0.26
	E_P	4.35	3.27	0.75	0.44	0.16	12.96	1
ALT	***Rg***	15.13	7.21	0.48	-0.06	2.34	27.69	0.92
	Ta	4.54	13.95	3.07	-0.25	-25.08	24.87	0.93
	Hs	8.2	2.52	0.31	-0.25	1.92	12.66	0.90
	RH	57.99	13.41	0.23	0	30.1	86.77	-0.89
	Ws	2.40	0.99	0.41	0.05	0.31	5.46	0.69
	E_P	4.72	3.84	0.81	0.33	0.15	13.79	1
MQ	***Rg***	16.41	4.98	0.30	0.07	7.21	26.9	0.92
	Ta	8.33	11.32	1.36	-0.19	-15.46	25.72	0.93
	Hs	8.37	1.12	0.13	0.30	5.47	11.38	0.72
	RH	44.82	9.06	0.2	0.12	24.3	74.58	-0.29
	Ws	2.68	0.55	0.20	0.08	1.23	4.32	0.55
	E_P	7.26	4.45	0.61	0.10	0.42	15.89	1
BJ	***Rg***	14.61	4.94	0.34	0.05	5.14	25.59	0.91
	Ta	12.20	10.74	0.88	-0.17	-7.6	29.56	0.75
	Hs	7.41	1.42	0.19	0.06	3.79	11.21	0.76
	RH	57.29	13.70	0.24	0.02	21.86	85.52	0.09
	Ws	2.50	0.67	0.27	0.49	1.07	4.65	0.14
	E_P	5.09	2.83	0.56	0.70	0.85	15.63	1
LSA	***Rg***	20.41	4.20	0.21	0.11	10.39	30.69	0.68
	Ta	7.82	6.37	0.81	-0.21	-5.16	18.19	0.75
	Hs	8.19	0.96	0.12	-0.59	4.66	10.55	0.18
	RH	44.39	15.10	0.34	0.30	15.36	76.61	0.19
	Ws	1.90	0.46	0.24	0.30	0.92	3.41	0.34
	E_P	6.35	2.23	0.35	0.36	2.15	13.28	1
CQ	***Rg***	8.80	4.69	0.53	0.43	0	21.32	0.92
	Ta	17.93	7.46	0.42	-0.10	0.64	30.90	0.85
	Hs	2.83	2.02	0.71	0.91	0	9.19	0.94
	RH	79.15	8.55	0.11	-4.66	6.97	90.30	-0.40
	Ws	1.36	0.34	0.25	-0.12	0.64	2.13	0.58
	E_P	2.86	1.94	0.68	0.87	0.54	9.32	1
HZ	***Rg***	11.63	4.20	0.36	0.54	3.93	24.83	0.94
	Ta	16.45	8.46	0.51	-0.06	-0.01	31.03	0.88
	Hs	4.99	1.74	0.35	0.63	1.19	11.25	0.80
	RH	78.04	5.63	0.07	-0.80	53.74	90.42	-0.04
	Ws	2.24	0.43	0.19	0.05	1.01	3.58	0.13
	E_P	3.65	1.94	0.53	0.84	0.74	11.33	1
HK	***Rg***	13.86	4.33	0.31	-0.05	4.06	24.34	0.90

Ta	24.08	4.07	0.17	-0.55	13.21	29.83	0.81
Hs	5.83	1.96	0.34	-0.26	0.47	9.94	0.89
RH	84.14	3.61	0.04	-0.52	71.39	94.46	-0.41
Ws	2.65	0.66	0.25	0.61	1.33	4.98	0.04
$\boldsymbol{E_P}$	5.00	1.59	0.32	0.08	1.37	9.97	1

The unit of *Rg*, *Ta*, *Pa*, *Ws* and E_P are MJ m^{-2}, ℃,hPa,ms^{-1} and mm/day, respectively; x_{mean}, S_x, C_v, C_x, x_{min} and x_{max} denote the mean, standard deviation, variation coefficient, skewness, minimum and maximum values, respectively.

Table 3.The input combinations for different artificial intelligence techniques.

Models						Input combinations
ANFIS-GP	FG	GRNN	LSSVM	MARS	MLP	
ANFIS-GP1	FG1	GRNN1	LSSVM1	MARS1	MLP1	***Rg***
ANFIS-GP2	FG2	GRNN2	LSSVM2	MARS2	MLP2	***Ta***
ANFIS-GP3	FG3	GRNN3	LSSVM3	MARS3	MLP3	***Hs***
ANFIS-GP4	FG4	GRNN4	LSSVM4	MARS4	MLP4	***RH***
ANFIS-GP5	FG5	GRNN5	LSSVM5	MARS5	MLP5	***Ws***
ANFIS-GP6	FG6	GRNN6	LSSVM6	MARS6	MLP6	***Rg, Ta***
ANFIS-GP7	FG7	GRNN7	LSSVM7	MARS7	MLP7	***Rg, Ta, Hs***
ANFIS-GP8	FG8	GRNN8	LSSVM8	MARS8	MLP8	***Rg, Ta, Hs, RH***
ANFIS-GP9	FG9	GRNN9	LSSVM9	MARS9	MLP9	***Rg, Ta, Hs, RH, Ws***

Table 4. Comparisons of different models for predicting *Ep* at HEB station.

	Training				Testing			
HEB	MAE	RMSE	R^2	*E*	MAE	RMSE	R^2	*E*
ANFIS-GP1	1.062	1.411	0.815	0.815	1.044	1.431	0.819	0.805
ANFIS-GP2	1.226	1.68	0.737	0.737	1.082	1.471	0.797	0.794
ANFIS-GP3	1.589	2.05	0.609	0.609	1.496	1.834	0.726	0.68
ANFIS-GP4	2.681	2.972	0.178	0.178	2.862	3.171	0.071	0.044
ANFIS-GP5	2.754	3.137	0.085	0.085	2.809	3.340	0.089	-0.061
ANFIS-GP6	0.865	1.225	0.86	0.86	0.781	1.089	0.894	0.887
ANFIS-GP7	0.785	1.167	0.873	0.873	0.645	0.907	0.923	0.922
ANFIS-GP8	0.429	0.601	0.966	0.966	0.517	0.751	0.956	0.946
ANFIS-GP9	**0.378**	**0.521**	**0.975**	**0.975**	**0.431**	**0.600**	**0.967**	**0.966**
FG1	1.031	1.371	0.825	0.825	1.031	1.507	0.816	0.765
FG2	1.151	1.632	0.752	0.752	1.077	1.502	0.786	0.786
FG3	1.528	2.008	0.625	0.625	1.354	1.798	0.74	0.696
FG4	2.487	2.877	0.23	0.23	2.677	3.083	0.118	0.096
FG5	2.708	3.103	0.104	0.104	2.806	3.304	0.091	-0.039
FG6	0.719	1.071	0.893	0.893	0.688	1.178	0.891	0.870
FG7	0.67	1.002	0.907	0.907	0.673	1.059	0.897	0.824
FG8	0.39	0.563	0.971	0.97	0.45	0.638	0.969	0.961
FG9	**0.325**	**0.451**	**0.981**	**0.981**	**0.421**	**0.554**	**0.971**	**0.971**
GRNN1	1.026	1.364	0.827	0.827	1.031	1.479	0.814	0.792
GRNN2	1.138	1.617	0.757	0.757	1.054	1.472	0.796	0.794
GRNN3	1.519	2	0.628	0.627	1.379	1.816	0.738	0.686
GRNN4	2.451	2.835	0.253	0252	2.685	3.087	0.113	0.094
GRNN5	2.72	3.097	0.122	0.108	2.795	3.272	0.085	-0.018
GRNN6	0.549	0.897	0.926	0.925	0.734	1.218	0.878	0.859
GRNN7	0.453	0.71	0.954	0.953	0.696	1.124	0.887	0.88
GRNN8	0.155	0.246	0.994	0.994	0.543	0.962	0.922	0.912
GRNN9	**0.047**	**0.09**	**0.999**	**0.999**	**0.529**	**0.856**	**0.932**	**0.930**
LSSVM1	1.027	1.371	0.825	0.825	1.02	1.461	0.819	0.797
LSSVM2	1.131	1.619	0.756	0.756	1.059	1.487	0.791	0.79
LSSVM3	1.684	2.133	0.604	0.577	1.556	1.949	0.712	0.639
LSSVM4	2.493	2.876	0.231	0.231	2.685	3.094	0.113	0.09
LSSVM5	2.736	3.117	0.097	0.096	2.806	3.320	0.091	-0.048
LSSVM6	0.838	1.205	0.866	0.865	0.79	1.169	0.879	0.87
LSSVM7	0.901	1.267	0.853	0.851	0.761	1.031	0.9	0.899
LSSVM8	0.813	1.128	0.893	0.882	0.826	1.090	0.893	0.887
LSSVM9	**0.483**	**0.667**	**0.960**	**0.959**	**0.589**	**0.766**	**0.959**	**0.944**
MARS1	1.038	1.371	0.825	0.825	1.064	1.581	0.805	0.762
MARS2	1.088	1.543	0.779	0.779	1.093	1.563	0.771	0.768
MARS3	1.537	2.01	0.624	0.624	1.369	1.795	0.744	0.694
MARS4	2.457	2.852	0.243	0.243	2.731	3.133	0.103	0.066
MARS5	2.695	3.079	0.118	0.118	2.795	3.303	0.097	-0.037
MARS6	0.659	0.972	0.912	0.912	0.806	1.390	0.861	0.816
MARS7	0.659	0.972	0.912	0.912	0.806	1.390	0.861	0.816
MARS8	0.543	0.708	0.953	0.953	0.597	0.933	0.935	0.917

MARS9	**0.50**	**0.635**	**0.962**	**0.962**	**0.570**	**0.749**	**0.950**	**0.947**
MLP1	1.044	1.374	0.824	0.824	1.03	1.483	0.818	0.794
MLP2	1.082	1.567	0.771	0.771	1.03	1.490	0.792	0.791
MLP3	1.135	1.618	0.757	0.757	1.04	1.460	0.798	0.797
MLP4	2.539	2.893	0.221	0.221	2.729	3.107	0.108	0.082
MLP5	2.711	3.107	0.102	0.102	2.807	3.304	0.090	-0.038
MLP6	0.655	0.963	0.914	0.914	0.716	1.148	0.892	0.891
MLP7	0.608	0.908	0.923	0.923	0.584	0.879	0.928	0.923
MLP8	0.314	0.458	0.98	0.98	0.409	0.607	0.970	0.966
MLP9	**0.279**	**0.398**	**0.985**	**0.985**	**0.314**	**0.405**	**0.988**	**0.984**
SS	0.954	1.327	0.838	0.838	0.822	1.152	0.886	0.885
MLR	0.825	1.05	0.897	0.897	0.874	1.160	0.875	0.875

Table 5. Comparisons of different models for predicting *Ep* at ALT station.

ALT	Training				Testing			
	MAE	RMSE	R^2	E	MAE	RMSE	R^2	E
ANFIS-GP1	1.19	1.597	0.841	0.841	1.003	1.268	0.896	0.848
ANFIS-GP2	1.19	1.506	0.859	0.859	1.110	1.435	0.884	0.806
ANFIS-GP3	1.345	1.763	0.807	0.807	1.214	1.601	0.844	0.758
ANFIS-GP4	1.364	1.732	0.813	0.813	1.269	1.632	0.769	0.749
ANFIS-GP5	2.354	2.848	0.495	0.495	2.161	2.578	0.379	0.373
ANFIS-GP6	0.535	0.786	0.962	0.962	0.707	1.013	0.973	0.903
ANFIS-GP7	0.494	0.737	0.966	0.966	0.691	1.012	0.977	0.903
ANFIS-GP8	0.286	0.411	0.99	0.99	0.398	0.586	0.984	0.968
ANFIS-GP9	**0.241**	**0.351**	**0.992**	**0.992**	**0.371**	**0.545**	**0.987**	**0.972**
FG1	1.079	1.398	0.878	0.878	0.994	1.300	0.891	0.838
FG2	0.78	1.065	0.929	0.929	0.953	1.29	0.928	0.846
FG3	1.052	1.375	0.882	0.882	1.002	1.328	0.92	0.835
FG4	1.251	1.682	0.824	0.824	1.183	1.714	0.745	0.724
FG5	2.237	2.79	0.515	0.515	2.099	2.554	0.404	0.386
FG6	0.45	0.703	0.969	0.969	0.670	1.027	0.971	0.899
FG7	0.49	0.717	0.968	0.968	0.697	1.043	0.971	0.898
FG8	0.266	0.38	0.991	0.991	0.391	0.575	0.987	0.967
FG9	**0.253**	**0.343**	**0.993**	**0.993**	**0.394**	**0.570**	**0.988**	**0.969**
GRNN1	1.052	1.38	0.882	0.881	0.951	1.229	0.90	0.858
GRNN2	0.784	1.08	0.928	0.927	0.931	1.249	0.931	0.853
GRNN3	1.041	1.368	0.884	0.883	0.977	1.290	0.92	0.843
GRNN4	1.279	1.688	0.823	0.823	1.152	1.631	0.763	0.749
GRNN5	2.439	2.859	0.512	0.491	2.239	2.560	0.397	0.382
GRNN6	0.431	0.683	0.971	0.971	0.657	0.987	0.975	0.908
GRNN7	0.384	0.629	0.975	0.975	0.705	1.015	0.978	0.903
GRNN8	**0.173**	**0.278**	**0.995**	**0.995**	**0.468**	**0.658**	**0.988**	**0.959**
GRNN9	0.095	0.165	0.998	0.998	0.48	0.683	0.984	0.956
LSSVM1	1.075	1.392	0.879	0.879	0.993	1.285	0.894	0.844
LSSVM2	0.765	1.047	0.932	0.932	0.96	1.299	0.926	0.84

LSSVM3	1.447	1.839	0.827	0.789	1.034	1.391	0.863	0.817
LSSVM4	1.278	1.692	0.822	0.822	1.192	1.668	0.753	0.738
LSSVM5	2.335	2.814	0.508	0.507	2.189	2.565	0.391	0.379
LSSVM6	0.520	0.769	0.964	0.963	0.673	0.954	0.973	0.914
LSSVM7	0.617	0.868	0.955	0.953	0.749	0.945	0.973	0.916
LSSVM8	0.709	0.927	0.953	0.946	0.63	0.770	0.968	0.944
LSSVM9	**0.356**	**0.53**	**0.983**	**0.982**	**0.48**	**0.650**	**0.986**	**0.960**
MARS1	1.032	1.371	0.883	0.883	0.956	1.269	0.899	0.848
MARS2	0.748	1.029	0.934	0.934	0.927	1.280	0.929	0.832
MARS3	1.043	1.356	0.886	0.886	1.043	1.367	0.916	0.824
MARS4	1.216	1.645	0.832	0.832	1.159	1.715	0.743	0.723
MARS5	2.161	2.714	0.542	0.542	2.328	2.858	0.292	0.229
MARS6	0.437	0.657	0.973	0.973	0.641	0.996	0.975	0.906
MARS7	0.438	0.658	0.973	0.973	0.644	1.000	0.975	0.906
MARS8	0.29	0.411	0.989	0.989	0.428	0.655	0.985	0.96
MARS9	**0.276**	**0.382**	**0.991**	**0.991**	**0.403**	**0.622**	**0.987**	**0.964**
MLP1	1.03	1.363	0.884	0.884	0.951	1.268	0.897	0.849
MLP2	0.787	1.07	0.929	0.929	0.951	1.282	0.93	0.845
MLP3	0.752	1.039	0.933	0.933	0.93	1.280	0.929	0.846
MLP4	1.25	1.683	0.824	0.824	1.183	1.699	0.751	0.727
MLP5	2.266	2.805	0.51	0.51	2.089	2.542	0.405	0.391
MLP6	0.445	0.689	0.97	0.97	0.667	1.033	0.971	0.900
MLP7	0.521	0.769	0.963	0.963	0.659	1.017	0.974	0.902
MLP8	0.234	0.34	0.993	0.993	0.348	0.523	0.989	0.974
MLP9	**0.161**	**0.211**	**0.989**	**0.989**	**0.190**	**0.265**	**0.989**	**0.978**
SS	0.539	0.761	0.964	0.964	0.681	1.053	0.963	0.963
MLR	0.712	0.89	0.951	0.951	0.740	0.861	0.969	0.968

Table 6. Comparisons of different models for predicting *Ep* at MQ station.

MQ	Training				Testing			
	MAE	RMSE	R^2	E	MAE	RMSE	R^2	E
ANFIS-GP1	1.337	1.76	0.85	0.85	1.133	1.396	0.941	0.889
ANFIS-GP2	1.33	1.698	0.86	0.86	1.203	1.587	0.863	0.856
ANFIS-GP3	2.467	3.11	0.53	0.53	2.453	3.045	0.55	0.47
ANFIS-GP4	3.895	4.324	0.092	0.092	3.758	4.146	0.035	0.018
ANFIS-GP5	3.256	3.807	0.296	0.296	2.879	3.385	0.353	0.345
ANFIS-GP6	0.83	1.178	0.933	0.933	0.868	1.220	0.952	0.915
ANFIS-GP7	0.828	1.165	0.934	0.934	0.882	1.229	0.951	0.914
ANFIS-GP8	0.648	0.886	0.962	0.962	0.608	0.810	0.981	0.963
ANFIS-GP9	**0.474**	**0.66**	**0.979**	**0.979**	**0.512**	**0.646**	**0.987**	**0.976**
FG1	1.297	1.735	0.854	0.854	1.112	1.412	0.926	0.886
FG2	1.263	1.638	0.87	0.87	1.198	1.555	0.87	0.862
FG3	2.447	3.057	0.546	0.546	2.373	2.953	0.58	0.504
FG4	3.871	4.307	0.10	0.1	3.746	4.130	0.04	0.026
FG5	3.215	3.782	0.306	0.306	2.83	3.344	0.366	0.361

FG6	0.828	1.178	0.933	0.933	0.854	1.196	0.952	0.917
FG7	0.795	1.13	0.938	0.938	0.923	1.335	0.942	0.914
FG8	0.608	0.81	0.968	0.968	0.636	0.805	0.978	0.968
FG9	**0.456**	**0.614**	**0.983**	**0.973**	**0.435**	**0.574**	**0.99**	**0.974**
GRNN1	1.289	1.725	0.856	0.856	1.076	1.386	0.927	0.890
GRNN2	1.225	1.593	0.877	0.877	1.148	1.504	0.876	0.871
GRNN3	2.441	3.04	0.552	0.551	2.35	2.909	0.585	0.516
GRNN4	3.845	4.281	0.112	0.111	3.701	4.091	0.051	0.044
GRNN5	3.379	3.85	0.304	0.281	3.026	3.429	0.363	0.328
GRNN6	0.688	1.002	0.951	0.951	0.777	1.099	0.954	0.931
GRNN7	0.508	0.761	0.972	0.972	0.849	1.210	0.948	0.916
GRNN8	0.178	0.291	0.996	0.996	0.66	0.947	0.966	0.949
GRNN9	**0.055**	**0.126**	**0.999**	**0.999**	**0.599**	**0.832**	**0.973**	**0.960**
LSSVM1	1.295	1.732	0.854	0.854	1.107	1.411	0.927	0.886
LSSVM2	1.259	1.634	0.87	0.87	1.202	1.561	0.869	0.861
LSSVM3	2.713	3.216	0.522	0.498	2.523	2.983	0.558	0.492
LSSVM4	3.861	4.296	0.105	0.104	3.711	4.094	0.052	0.043
LSSVM5	3.242	3.789	0.304	0.303	2.872	3.369	0.358	0.352
LSSVM6	0.841	1.182	0.933	0.932	0.858	1.166	0.951	0.922
LSSVM7	0.911	1.225	0.929	0.927	0.933	1.200	0.95	0.918
LSSVM8	0.982	1.243	0.937	0.925	0.919	1.118	0.960	0.929
LSSVM9	**0.549**	**0.747**	**0.974**	**0.973**	**0.544**	**0.711**	**0.982**	**0.971**
MARS1	1.352	1.76	0.85	0.85	1.133	1.403	0.936	0.888
MARS2	1.076	1.46	0.897	0.897	1.08	1.472	0.888	0.876
MARS3	2.419	3.039	0.552	0.552	2.436	2.996	0.564	0.487
MARS4	3.829	4.282	0.11	0.11	3.751	4.125	0.046	0.028
MARS5	3.225	3.813	0.294	0.294	2.878	3.391	0.35	0.343
MARS6	0.804	1.127	0.938	0.938	0.921	1.247	0.948	0.911
MARS7	0.807	1.126	0.938	0.938	0.97	1.290	0.95	0.905
MARS8	0.668	0.87	0.963	0.963	0.735	0.929	0.973	0.951
MARS9	**0.546**	**0.72**	**0.975**	**0.975**	**0.627**	**0.826**	**0.977**	**0.961**
MLP1	1.297	1.735	0.854	0.854	1.107	1.408	0.928	0.887
MLP2	1.057	1.458	0.897	0.897	1.113	1.492	0.888	0.873
MLP3	1.139	1.524	0.887	0.887	1.108	1.488	0.884	0.872
MLP4	3.833	4.289	0.107	0.107	3.676	4.069	0.063	0.054
MLP5	3.179	3.761	0.313	0.313	2.81	3.329	0.371	0.367
MLP6	0.724	1.026	0.949	0.949	0.797	1.074	0.96	0.935
MLP7	0.742	1.064	0.945	0.945	0.821	1.113	0.959	0.929
MLP8	0.538	0.738	0.974	0.974	0.538	0.716	0.981	0.97
MLP9	**0.384**	**0.532**	**0.986**	**0.986**	**0.358**	**0.489**	**0.99**	**0.986**
SS	0.922	1.281	0.92	0.92	1.039	1.389	0.944	0.942
MLR	0.77	0.967	0.955	0.955	0.784	0.921	0.972	0.971

Table 7. Comparisons of different models for predicting *Ep* at BJ station.

BJ	Training				Testing			
	MAE	RMSE	R^2	E	MAE	RMSE	R^2	E
ANFIS-GP1	0.872	1.205	0.826	0.826	0.749	0.956	0.922	0.868
ANFIS-GP2	1.439	1.907	0.564	0.564	1.294	1.554	0.662	0.650
ANFIS-GP3	1.431	1.818	0.603	0.603	1.482	1.880	0.561	0.488
ANFIS-GP4	2.306	2.881	0.005	0.005	2.223	2.608	0.019	0.014
ANFIS-GP5	2.345	2.865	0.015	0.015	2.22	2.577	0.07	0.038
ANFIS-GP6	0.846	1.189	0.831	0.831	0.717	0.923	0.921	0.877
ANFIS-GP7	0.742	1.071	0.862	0.862	0.688	0.972	0.909	0.863
ANFIS-GP8	0.464	0.735	0.935	0.935	0.384	0.510	0.965	0.962
ANFIS-GP9	**0.424**	**0.657**	**0.948**	**0.948**	**0.361**	**0.48**	**0.971**	**0.967**
FG1	0.835	1.127	0.848	0.848	0.823	1.075	0.914	0.828
FG2	1.416	1.891	0.571	0.571	1.256	1.544	0.665	0.653
FG3	1.387	1.733	0.64	0.64	1.483	1.846	0.561	0.504
FG4	2.244	2.839	0.033	0.033	2.23	2.653	0.001	-0.051
FG5	2.288	2.822	0.045	0.045	2.234	2.608	0.02	0.015
FG6	0.742	1.063	0.864	0.864	0.688	0.997	0.922	0.855
FG7	0.721	1.052	0.867	0.867	0.679	0.959	0.926	0.869
FG8	0.451	0.721	0.938	0.938	0.394	0.484	0.971	0.965
FG9	**0.438**	**0.662**	**0.947**	**0.947**	**0.355**	**0.443**	**0.977**	**0.972**
GRNN1	0.819	1.114	0.852	0.851	0.811	1.062	0.916	0.837
GRNN2	1.379	1.852	0.589	0.588	1.23	1.520	0.678	0.665
GRNN3	1.347	1.702	0.654	0.653	1.487	1.850	0.559	0.504
GRNN4	2.262	2.827	0.044	0.041	2.253	2.667	0.001	-0.03
GRNN5	2.32	2.856	0.023	0.021	2.224	2.591	0.101	0.027
GRNN6	0.626	0.924	0.898	0.898	0.657	0.939	0.904	0.872
GRNN7	0.473	0.754	0.932	0.932	0.68	0.967	0.885	0.865
GRNN8	0.185	0.348	0.986	0.985	0.403	0.541	0.958	0.958
GRNN9	**0.166**	**0.301**	**0.989**	**0.989**	**0.356**	**0.473**	**0.968**	**0.967**
LSSVM1	0.831	1.121	0.849	0.849	0.823	1.068	0.916	0.835
LSSVM2	1.409	1.883	0.575	0.575	1.238	1.525	0.677	0.663
LSSVM3	1.502	1.877	0.606	0.577	1.522	1.865	0.547	0.496
LSSVM4	2.281	2.851	0.025	0.025	2.236	2.630	0.008	-0.18
LSSVM5	2.332	2.858	0.02	0.02	2.216	2.579	0.093	0.036
LSSVM6	0.775	1.117	0.852	0.85	0.647	0.927	0.926	0.875
LSSVM7	0.785	1.129	0.849	0.847	0.66	0.932	0.92	0.874
LSSVM8	0.733	1.074	0.876	0.862	0.619	0.823	0.926	0.902
LSSVM9	**0.481**	**0.753**	**0.934**	**0.932**	**0.335**	**0.437**	**0.974**	**0.972**
MARS1	0.835	1.129	0.847	0.847	0.857	1.080	0.914	0.831
MARS2	1.364	1.832	0.597	0.597	1.282	1.607	0.659	0.626
MARS3	1.359	1.717	0.646	0.646	1.48	1.844	0.558	0.507
MARS4	2.183	2.728	0.107	0.107	2.392	2.962	0.001	-0.271
MARS5	2.323	2.86	0.019	0.019	2.245	2.616	0.01	0.008
MARS6	0.694	0.974	0.886	0.886	0.685	0.986	0.904	0.859
MARS7	0.691	0.977	0.886	0.886	0.671	0.967	0.911	0.865
MARS8	0.52	0.767	0.929	0.929	0.5	0.603	0.963	0.947

MARS9	**0.478**	**0.717**	**0.938**	**0.938**	**0.427**	**0.527**	**0.971**	**0.960**
MLP1	0.784	1.075	0.861	0.861	0.813	1.045	0.914	0.842
MLP2	1.325	1.803	0.61	0.61	1.249	1.595	0.677	0.631
MLP3	1.401	1.875	0.578	0.578	1.236	1.523	0.678	0.664
MLP4	2.268	2.857	0.021	0.021	2.214	2.620	0.013	0.005
MLP5	2.298	2.823	0.045	0.044	2.204	2.581	0.042	0.035
MLP6	0.675	0.968	0.888	0.888	0.66	0.974	0.911	0.867
MLP7	0.653	0.962	0.889	0.889	0.62	0.907	0.904	0.88
MLP8	**0.417**	**0.692**	**0.943**	**0.943**	**0.312**	**0.394**	**0.982**	**0.977**
MLP9	0.337	0.506	0.969	0.969	0.314	0.428	0.979	0.972
SS	0.89	1.263	0.816	0.816	0.647	0.921	0.897	0.895
MLR	0.614	0.879	0.907	0.907	0.514	0.648	0.946	0.945

Table 8. Comparisons of different models for predicting *Ep* at LSA station.

	Training				Testing			
LSA	MAE	RMSE	R^2	E	MAE	RMSE	R^2	E
ANFIS-GP1	1.327	1.718	0.411	0.411	1.072	1.424	0.594	0.581
ANFIS-GP2	1.245	1.523	0.536	0.536	1.192	1.417	0.601	0.585
ANFIS-GP3	1.821	2.218	0.017	0.017	1.796	2.148	0.055	0.046
ANFIS-GP4	1.772	2.196	0.037	0.037	1.794	2.127	0.072	0.065
ANFIS-GP5	1.721	2.11	0.111	0.111	1.695	2.033	0.178	0.146
ANFIS-GP6	1.149	1.471	0.568	0.568	1.046	1.304	0.651	0.648
ANFIS-GP7	0.966	1.223	0.701	0.701	0.875	1.082	0.761	0.758
ANFIS-GP8	**0.529**	**0.675**	**0.909**	**0.909**	**0.73**	**0.907**	**0.896**	**0.830**
ANFIS-GP9	0.478	0.61	0.926	0.926	0.816	1.038	0.875	0.777
FG1	1.324	1.715	0.413	0.413	1.073	1.415	0.600	0.584
FG2	1.151	1.465	0.571	0.571	1.159	1.392	0.621	0.600
FG3	1.803	2.169	0.06	0.06	1.771	2.093	0.118	0.115
FG4	1.627	2.072	0.143	0.143	1.64	2.036	0.145	0.141
FG5	1.683	2.092	0.125	0.125	1.704	2.022	0.163	0.152
FG6	1.044	1.381	0.619	0.619	0.987	1.201	0.725	0.705
FG7	0.968	1.215	0.705	0.705	0.896	1.099	0.757	0.737
FG8	0.499	0.631	0.921	0.921	0.767	0.925	0.903	0.823
FG9	**0.491**	**0.61**	**0.926**	**0.926**	**0.729**	**0.886**	**0.914**	**0.86**
GRNN1	1.296	1.692	0.429	0.428	1.094	1.436	0.587	0.574
GRNN2	1.025	1.336	0.647	0.643	1.072	1.288	0.679	0.657
GRNN3	1.783	2.152	0.077	0.075	1.762	2.080	0.134	0.105
GRNN4	1.618	2.079	0.138	0.136	1.586	1.971	0.209	0.196
GRNN5	1.712	2.108	0.119	0.112	1.705	2.052	0.176	0.13
GRNN6	0.791	1.067	0.778	0.773	0.83	1.044	0.786	0.775
GRNN7	0.425	0.598	0.93	0.928	0.789	1.025	0.789	0.783
GRNN8	0.137	0.202	0.992	0.992	0.566	0.711	0.914	0.895
GRNN9	**0.056**	**0.103**	**0.998**	**0.998**	**0.459**	**0.592**	**0.933**	**0.932**
LSSVM1	1.307	1.706	0.419	0.419	1.083	1.420	0.594	0.583
LSSVM2	1.008	1.32	0.652	0.652	1.109	1.317	0.67	0.641

LSSVM3	1.811	2.209	0.027	0.025	1.791	2.144	0.07	0.05
LSSVM4	1.663	2.113	0.109	0.107	1.638	2.010	0.187	0.165
LSSVM5	1.721	2.109	0.112	0.111	1.692	2.030	0.182	0.148
LSSVM6	1.107	1.431	0.592	0.591	1.033	1.268	0.681	0.668
LSSVM7	1.073	1.336	0.65	0.644	0.915	1.119	0.759	0.741
LSSVM8	0.957	1.199	0.766	0.713	0.869	1.043	0.833	0.775
LSSVM9	**0.57**	**0.753**	**0.894**	**0.887**	**0.582**	**0.702**	**0.926**	**0.898**
MARS1	1.311	1.72	0.409	0.409	1.091	1.440	0.585	0.571
MARS2	1.012	1.318	0.653	0.653	1.098	1.299	0.683	0.651
MARS3	1.82	2.182	0.049	0.049	1.766	2.089	0.12	0.097
MARS4	1.663	2.098	0.121	0.121	1.639	2.020	0.159	0.157
MARS5	1.694	2.096	0.122	0.122	1.705	2.037	0.161	0.143
MARS6	0.917	1.23	0.698	0.698	0.947	1.176	0.735	0.714
MARS7	0.94	1.227	0.699	0.699	0.913	1.135	0.746	0.734
MARS8	0.501	0.641	0.918	0.918	0.762	0.929	0.91	0.822
MARS9	**0.516**	**0.662**	**0.912**	**0.912**	**0.668**	**0.818**	**0.924**	**0.862**
MLP1	1.308	1.707	0.418	0.418	1.073	1.413	0.596	0.586
MLP2	0.992	1.307	0.659	0.658	1.111	1.313	0.675	0.647
MLP3	0.994	1.316	0.654	0.654	1.108	1.312	0.675	0.647
MLP4	1.601	2.075	0.14	0.14	1.561	1.956	0.216	0.207
MLP5	1.686	2.095	0.124	0.124	1.703	2.022	0.162	0.155
MLP6	0.883	1.187	0.719	0.719	0.918	1.123	0.754	0.746
MLP7	0.686	0.91	0.835	0.835	0.728	0.958	0.825	0.803
MLP8	0.397	0.503	0.949	0.949	0.629	0.771	0.928	0.877
MLP9	**0.522**	**0.681**	**0.907**	**0.907**	**0.53**	**0.638**	**0.936**	**0.916**
SS	1.198	1.577	0.515	0.515	0.969	1.307	0.652	0.652
MLR	0.628	0.795	0.874	0.874	0.656	0.789	0.906	0.905

Table 9. Comparisons of different models for predicting *Ep* at CQ station.

	Training				Testing			
CQ	MAE	RMSE	R^2	E	MAE	RMSE	R^2	E
ANFIS-GP1	0.466	0.859	0.815	0.815	0.280	0.397	0.958	0.953
ANFIS-GP2	0.82	1.189	0.645	0.645	0.693	0.959	0.748	0.726
ANFIS-GP3	0.539	0.722	0.869	0.869	0.537	0.679	0.876	0.863
ANFIS-GP4	1.631	1.958	0.036	0.036	1.486	1.743	0.553	0.096
ANFIS-GP5	1.298	1.619	0.341	0.341	1.234	1.557	0.406	0.279
ANFIS-GP6	0.416	0.786	0.845	0.845	0.316	0.398	0.959	0.953
ANFIS-GP7	0.369	0.492	0.939	0.939	0.242	0.329	0.968	0.968
ANFIS-GP8	0.225	0.29	0.979	0.979	0.224	0.312	0.976	0.971
ANFIS-GP9	**0.187**	**0.244**	**0.985**	**0.985**	**0.203**	**0.300**	**0.978**	**0.973**
FG1	0.467	0.805	0.837	0.837	0.294	0.375	0.963	0.959
FG2	0.616	0.877	0.807	0.807	0.568	0.685	0.876	0.860
FG3	0.474	0.672	0.887	0.887	0.479	0.607	0.905	0.890
FG4	1.066	1.343	0.547	0.547	1.015	1.241	0.542	0.539
FG5	1.291	1.601	0.356	0.356	1.308	1.659	0.324	0.183

FG6	0.385	0.704	0.876	0.876	0.303	0.384	0.96	0.957
FG7	0.396	0.572	0.918	0.918	0.294	0.385	0.958	0.956
FG8	0.287	0.38	0.964	0.964	0.229	0.299	0.974	0.973
FG9	**0.195**	**0.25**	**0.984**	**0.984**	**0.182**	**0.280**	**0.981**	**0.979**
GRNN1	0.437	0.746	0.861	0.86	0.284	0.374	0.963	0.958
GRNN2	0.574	0.845	0.823	0.821	0.507	0.651	0.883	0.874
GRNN3	0.453	0.652	0.893	0.893	0.473	0.610	0.902	0.889
GRNN4	1.212	1.475	0.562	0.453	1.158	1.330	0.557	0.474
GRNN5	1.318	1.617	0.354	0.342	1.253	1.548	0.395	0.287
GRNN6	0.306	0.598	0.911	0.91	0.279	0.384	0.959	0.956
GRNN7	0.197	0.278	0.981	0.981	0.243	0.328	0.968	0.968
GRNN8	**0.145**	**0.203**	**0.99**	**0.99**	**0.177**	**0.240**	**0.983**	**0.983**
GRNN9	0.227	0.308	0.977	0.977	0.234	0.297	0.975	0.974
LSSVM1	0.449	0.758	0.856	0.856	0.282	0.377	0.961	0.958
LSSVM2	0.552	0.825	0.829	0.829	0.503	0.650	0.888	0.874
LSSVM3	0.687	0.862	0.887	0.813	0.625	0.765	0.906	0.826
LSSVM4	1.07	1.345	0.548	0.545	1.003	1.222	0.556	0.555
LSSVM5	1.305	1.626	0.336	0.335	1.233	1.543	0.406	0.292
LSSVM6	0.399	0.741	0.864	0.862	0.322	0.399	0.960	0.953
LSSVM7	0.391	0.586	0.918	0.914	0.266	0.355	0.966	0.962
LSSVM8	0.407	0.634	0.916	0.899	0.284	0.392	0.968	0.954
LSSVM9	**0.313**	**0.482**	**0.944**	**0.941**	**0.219**	**0.290**	**0.976**	**0.975**
MARS1	0.5	0.753	0.858	0.858	0.274	0.357	0.964	0.962
MARS2	0.559	0.806	0.837	0.837	0.509	0.653	0.888	0.873
MARS3	0.453	0.664	0.889	0.889	0.466	0.599	0.904	0.904
MARS4	0.974	1.234	0.617	0.617	1.09	1.38	0.466	0.433
MARS5	1.236	1.51	0.427	0.427	1.321	1.741	0.277	0.10
MARS6	0.354	0.617	0.904	0.904	0.333	0.444	0.949	0.941
MARS7	0.336	0.48	0.942	0.942	0.292	0.372	0.959	0.959
MARS8	**0.273**	**0.426**	**0.954**	**0.954**	**0.221**	**0.300**	**0.973**	**0.973**
MARS9	0.267	0.417	0.956	0.956	0.25	0.323	0.970	0.969
MLP1	0.419	0.733	0.865	0.865	0.27	0.371	0.96	0.959
MLP2	0.55	0.81	0.835	0.835	0.509	0.658	0.887	0.872
MLP3	0.568	0.845	0.82	0.82	0.502	0.637	0.893	0.877
MLP4	1.052	1.338	0.55	0.55	0.999	1.231	0.55	0.549
MLP5	1.299	1.61	0.348	0.348	1.263	1.591	0.381	0.247
MLP6	0.334	0.65	0.894	0.894	0.266	0.355	0.966	0.947
MLP7	0.252	0.348	0.97	0.969	0.218	0.296	0.975	0.971
MLP8	**0.185**	**0.239**	**0.986**	**0.986**	**0.167**	**0.230**	**0.985**	**0.984**
MLP9	0.161	0.211	0.989	0.989	0.189	0.265	0.985	0.979
SS	0.379	0.786	0.847	0.847	0.226	0.307	0.973	0.971
MLR	0.389	0.534	0.928	0.928	0.317	0.398	0.955	0.955

Table 10. Comparisons of different models for predicting *Ep* at HZ station.

	Training				Testing			
HZ	MAE	RMSE	R^2	E	MAE	RMSE	R^2	E
ANFIS-GP1	0.532	0.698	0.87	0.87	0.451	0.605	0.903	0.902
ANFIS-GP2	0.72	1.001	0.734	0.734	0.728	0.965	0.754	0.728
ANFIS-GP3	0.937	1.164	0.64	0.64	0.991	1.178	0.694	0.631
ANFIS-GP4	1.567	1.94	0.001	0.001	1.59	1.943	0.017	-0.004
ANFIS-GP5	1.569	1.931	0.009	0.009	1.557	1.910	0.084	0.029
ANFIS-GP6	0.377	0.521	0.928	0.928	0.333	0.448	0.948	0.947
ANFIS-GP7	0.357	0.482	0.938	0.938	0.311	0.397	0.961	0.958
ANFIS-GP8	**0.272**	**0.356**	**0.966**	**0.966**	**0.329**	**0.427**	**0.965**	**0.951**
ANFIS-GP9	0.242	0.312	0.974	0.974	0.347	0.453	0.949	0.945
FG1	0.519	0.686	0.875	0.875	0.438	0.590	0.908	0.907
FG2	0.612	0.79	0.834	0.834	0.613	0.764	0.846	0.845
FG3	0.943	1.151	0.648	0.648	1.012	1.188	0.701	0.624
FG4	1.572	1.925	0.015	0.015	1.576	1.922	0.024	0.018
FG5	1.519	1.862	0.08	0.08	1.67	2.014	0.02	-0.081
FG6	0.358	0.485	0.938	0.938	0.299	0.397	0.959	0.958
FG7	0.344	0.462	0.943	0.943	0.29	0.373	0.965	0.963
FG8	0.269	0.347	0.968	0.968	0.295	0.375	0.974	0.952
FG9	**0.26**	**0.36**	**0.966**	**0.966**	**0.278**	**0.369**	**0.964**	**0.963**
GRNN1	0.519	0.68	0.878	0.877	0.457	0.607	0.904	0.902
GRNN2	0.556	0.733	0.859	0.857	0.581	0.736	0.86	0.856
GRNN3	0.926	1.127	0.664	0.662	1.02	1.197	0.705	0.619
GRNN4	1.564	1.926	0.023	0.022	1.578	1.930	0.006	0.005
GRNN5	1.526	1.882	0.09	0.059	1.621	1.971	0.011	-0.033
GRNN6	0.322	0.438	0.949	0.949	0.314	0.409	0.957	0.955
GRNN7	0.238	0.327	0.972	0.972	0.295	0.404	0.961	0.957
GRNN8	**0.119**	**0.17**	**0.992**	**0.992**	**0.308**	**0.400**	**0.960**	**0.956**
GRNN9	0.047	0.084	0.998	0.998	0.367	0.524	0.929	0.927
LSSVM1	0.517	0.679	0.878	0.878	0.442	0.596	0.906	0.905
LSSVM2	0.55	0.713	0.865	0.865	0.546	0.695	0.873	0.872
LSSVM3	0.996	1.214	0.638	0.608	1.074	1.267	0.678	0.573
LSSVM4	1.554	1.918	0.022	0.022	1.568	1.937	0.005	0.002
LSSVM5	1.527	1.865	0.078	0.075	1.654	1.996	0.016	-0.06
LSSVM6	0.367	0.504	0.933	0.932	0.325	0.437	0.951	0.949
LSSVM7	0.364	0.496	0.937	0.935	0.328	0.427	0.961	0.951
LSSVM8	**0.385**	**0.538**	**0.935**	**0.923**	**0.379**	**0.493**	**0.953**	**0.935**
LSSVM9	0.278	0.382	0.963	0.961	0.296	0.397	0.961	0.958
MARS1	0.52	0.69	0.874	0.874	0.443	0.601	0.904	0.904
MARS2	0.534	0.686	0.875	0.875	0.524	0.673	0.881	0.879
MARS3	0.915	1.132	0.660	0.66	1.032	1.226	0.675	0.60
MARS4	1.571	1.94	0.0	0	1.591	1.939	0.00	0
MARS5	1.486	1.833	0.107	0.107	1.712	2.069	0.024	-0.139
MARS6	0.339	0.449	0.946	0.946	0.273	0.362	0.966	0.965
MARS7	0.335	0.437	0.949	0.949	0.282	0.358	0.966	0.966
MARS8	0.287	0.374	0.963	0.963	0.314	0.386	0.976	0.96

MARS9	**0.27**	**0.358**	**0.966**	**0.966**	**0.276**	**0.361**	**0.967**	**0.965**
MLP1	0.529	0.691	0.873	0.873	0.449	0.598	0.906	0.905
MLP2	0.523	0.68	0.877	0.877	0.523	0.674	0.881	0.879
MLP3	0.908	1.124	0.664	0.664	0.992	1.181	0.698	0.626
MLP4	1.554	1.919	0.022	0.022	1.564	1.931	0.01	0.008
MLP5	1.541	1.883	0.058	0.058	1.578	1.929	0.056	0.01
MLP6	0.334	0.65	0.894	0.894	0.266	0.355	0.966	0.962
MLP7	0.333	0.446	0.947	0.947	0.279	0.348	0.968	0.966
MLP8	0.247	0.326	0.972	0.972	0.318	0.405	0.978	0.952
MLP9	**0.244**	**0.319**	**0.973**	**0.973**	**0.263**	**0.340**	**0.977**	**0.969**
SS	0.35	0.487	0.938	0.938	0.291	0.388	0.96	0.96
MLR	0.32	0.427	0.952	0.952	0.395	0.486	0.942	0.94

Table 11. Comparisons of different models for predicting *Ep* at HK station.

	Training				Testing			
HK	MAE	RMSE	R^2	E	MAE	RMSE	R^2	E
ANFIS-GP1	0.528	0.688	0.814	0.814	0.669	0.800	0.854	0.727
ANFIS-GP2	0.741	0.964	0.634	0.634	0.802	0.970	0.742	0.599
ANFIS-GP3	0.619	0.798	0.749	0.749	0.482	0.610	0.851	0.841
ANFIS-GP4	1.23	1.451	0.171	0.171	1.200	1.490	0.268	0.054
ANFIS-GP5	1.305	1.594	0.01	0.01	1.333	1.585	0.030	-0.072
ANFIS-GP6	0.488	0.646	0.836	0.836	0.660	0.796	0.861	0.73
ANFIS-GP7	0.46	0.597	0.86	0.86	0.494	0.609	0.891	0.842
ANFIS-GP8	0.388	0.501	0.901	0.901	0.809	0.930	0.919	0.631
ANFIS-GP9	**0.286**	**0.379**	**0.943**	**0.943**	**0.428**	**0.555**	**0.925**	**0.869**
FG1	0.506	0.661	0.828	0.828	0.662	0.792	0.858	0.732
FG2	0.716	0.914	0.671	0.671	0.793	0.940	0.784	0.623
FG3	0.612	0.768	0.768	0.768	0.503	0.630	0.850	0.831
FG4	1.103	1.333	0.30	0.300	1.169	1.480	0.306	0.077
FG5	1.234	1.531	0.08	0.080	1.430	1.739	0.030	-0.251
FG6	0.471	0.626	0.846	0.846	0.659	0.786	0.875	0.738
FG7	0.451	0.591	0.863	0.863	0.485	0.596	0.895	0.843
FG8	0.39	0.496	0.903	0.903	0.718	0.849	0.920	0.688
FG9	**0.311**	**0.397**	**0.938**	**0.938**	**0.414**	**0.552**	**0.932**	**0.870**
GRNN1	0.505	0.666	0.829	0.829	0.673	0.810	0.854	0.719
GRNN2	0.699	0.902	0.681	0.680	0.786	0.929	0.776	0.63
GRNN3	0.6	0.759	0.775	0.773	0.511	0.642	0.845	0.825
GRNN4	1.11	1.335	0.311	0.299	1.178	1.472	0.316	0.077
GRNN5	1.295	1.581	0.025	0.016	1.342	1.600	0.008	-0.09
GRNN6	0.452	0.605	0.859	0.859	0.65	0.771	0.879	0.734
GRNN7	0.405	0.535	0.889	0.889	0.484	0.589	0.892	0.842
GRNN8	0.408	0.538	0.894	0.894	0.539	0.651	0.916	0.853
GRNN9	**0.241**	**0.342**	**0.956**	**0.956**	**0.415**	**0.512**	**0.917**	**0.881**
LSSVM1	0.502	0.658	0.829	0.829	0.671	0.802	0.858	0.726
LSSVM2	0.70	0.895	0.685	0.685	0.822	0.971	0.793	0.598

LSSVM3	0.649	0.828	0.766	0.73	0.578	0.714	0.852	0.782
LSSVM4	1.10	1.333	0.301	0.301	1.151	1.469	0.311	0.08
LSSVM5	1.296	1.588	0.009	0.007	1.349	1.611	0.007	-0.107
LSSVM6	0.481	0.64	0.841	0.839	0.658	0.787	0.868	0.736
LSSVM7	0.463	0.609	0.856	0.854	0.491	0.603	0.891	0.845
LSSVM8	0.441	0.571	0.880	0.872	0.552	0.664	0.917	0.812
LSSVM9	**0.326**	**0.425**	**0.930**	**0.929**	**0.398**	**0.501**	**0.925**	**0.893**
MARS1	0.506	0.661	0.828	0.828	0.662	0.791	0.860	0.733
MARS2	0.664	0.862	0.708	0.708	0.858	1.023	0.766	0.554
MARS3	0.603	0.758	0.774	0.774	0.5	0.638	0.842	0.826
MARS4	1.084	1.315	0.319	0.319	1.185	1.500	0.243	0.041
MARS5	1.266	1.56	0.043	0.043	1.364	1.634	0.001	-0.138
MARS6	0.438	0.581	0.867	0.867	0.733	0.899	0.869	0.655
MARS7	0.426	0.547	0.882	0.882	0.536	0.691	0.891	0.797
MARS8	0.407	0.517	0.895	0.895	0.682	0.807	0.917	0.722
MARS9	**0.322**	**0.414**	**0.932**	**0.932**	**0.397**	**0.515**	**0.927**	**0.887**
MLP1	0.512	0.671	0.823	0.823	0.657	0.793	0.855	0.732
MLP2	0.686	0.878	0.697	0.697	0.822	0.979	0.792	0.591
MLP3	0.707	0.903	0.679	0.679	0.821	0.973	0.79	0.626
MLP4	1.073	1.309	0.325	0.325	1.137	1.459	0.293	0.092
MLP5	1.306	1.591	0.005	0.005	1.329	1.576	0.028	-0.058
MLP6	0.47	0.623	0.847	0.847	0.657	0.779	0.878	0.741
MLP7	0.421	0.542	0.884	0.884	0.485	0.594	0.897	0.847
MLP8	0.431	0.554	0.88	0.879	0.671	0.786	0.916	0.736
MLP9	**0.34**	**0.444**	**0.923**	**0.923**	**0.386**	**0.491**	**0.930**	**0.897**
SS	0.523	0.683	0.827	0.827	0.64	0.773	0.823	0.822
MLR	0.328	0.431	0.927	0.927	0.396	0.505	0.927	0.925

Table 12.Accuracy ranks* of the soft computing models in estimating *Ep*.

Stations	ANFIS-GP	FG	GRNN	LSSV	MARS	MLP	MLR
HEB	2	3	4	6	5	1	7
ALT	3	4	6	2	5	1	7
MQ	3	2	4	7	5	1	6
BJ	4	5	3	2	6	1	7
LSA	6	5	1	3	4	2	7
CQ	6	3	2	4	5	1	7
HZ	6	4	2	5	3	1	7
HK	6	7	3	5	4	1	2
ALL	4	5	2	3	6	1	7
Total	**40**	**38**	**27**	**37**	**43**	**10**	**57**

*Accuracy ranks were determined according to the RMSE, MAE, E and R^2 criteria. For the HEB, for example, MLP has the highest accuracy (1^{st} model) while the MLR has the lowest accuracy (7^{th} model).

Table 13. Comparisons of different models for predicting *Ep* at all stations.

	Training				Testing			
	MAE	RMSE	R^2	*E*	MAE	RMSE	R^2	*E*
ANFIS-GP1	1.204	1.681	0.739	0.739	1.022	1.378	0.804	0.803
ANFIS-GP2	1.906	2.522	0.412	0.412	1.768	2.345	0.437	0.431
ANFIS-GP3	1.913	2.377	0.478	0.478	1.877	2.262	0.475	0.471
ANFIS-GP4	1.23	1.451	0.171	0.171	1.20	1.490	0.268	0.054
ANFIS-GP5	1.305	1.594	0.001	0.001	1.333	1.585	0.029	-0.072
ANFIS-GP6	0.994	1.446	0.807	0.807	0.88	1.228	0.847	0.844
ANFIS-GP7	0.917	1.341	0.834	0.834	0.782	1.113	0.872	0.872
ANFIS-GP8	0.606	0.846	0.934	0.934	0.601	0.833	0.933	0.928
ANFIS-GP9	**0.517**	**0.738**	**0.95**	**0.95**	**0.486**	**0.666**	**0.957**	**0.957**
FG1	1.208	1.676	0.74	0.74	1.028	1.377	0.805	0.804
FG2	1.883	2.511	0.417	0.417	1.741	2.332	0.443	0.438
FG3	1.8	2.221	0.544	0.544	1.812	2.148	0.524	0.521
FG4	1.106	1.336	0.298	0.298	1.151	1.469	0.318	0.075
FG5	1.288	1.567	0.034	0.034	1.326	1.565	0.009	-0.044
FG6	0.936	1.378	0.824	0.824	0.821	1.154	0.865	0.862
FG7	0.883	1.294	0.845	0.845	0.753	1.072	0.882	0.880
FG8	0.589	0.834	0.936	0.936	0.607	0.842	0.931	0.929
FG9	**0.518**	**0.744**	**0.949**	**0.949**	**0.495**	**0.678**	**0.956**	**0.954**
GRNN1	1.193	1.669	0.743	0.743	1.013	1.373	0.806	0.805
GRNN2	1.859	2.49	0.427	0.427	1.716	2.311	0.453	0.448
GRNN3	1.772	2.216	0.549	0.546	1.773	2.127	0.532	0.532
GRNN4	1.11	1.335	0.311	0.299	1.178	1.472	0.316	0.077
GRNN5	1.295	1.581	0.025	0.016	1.342	1.600	0.02	-0.091
GRNN6	0.819	1.234	0.86	0.859	0.733	1.075	0.884	0.880
GRNN7	0.724	1.114	0.886	0.885	0.642	0.963	0.905	0.904
GRNN8	0.458	0.674	0.958	0.958	0.489	0.723	0.947	0.946
GRNN9	**0.265**	**0.425**	**0.984**	**0.983**	**0.364**	**0.573**	**0.967**	**0.966**
LSSVM1	1.198	1.667	0.743	0.743	1.017	1.371	0.807	0.806
LSSVM2	1.85	2.495	0.425	0.425	1.703	2.312	0.453	0.447
LSSVM3	1.854	2.314	0.506	0.505	1.858	2.215	0.493	0.492
LSSVM4	1.10	1.333	0.301	0.301	1.151	1.469	0.311	0.08
LSSVM5	1.296	1.588	0.009	0.007	1.349	1.611	0.007	-0.107
LSSVM6	0.935	1.386	0.823	0.822	0.806	1.149	0.866	0.864
LSSVM7	0.933	1.369	0.827	0.827	0.8	1.134	0.867	0.867
LSSVM8	0.824	1.148	0.879	0.878	0.774	1.023	0.893	0.892
LSSVM9	**0.494**	**0.719**	**0.952**	**0.952**	**0.476**	**0.657**	**0.958**	**0.955**
MARS1	1.198	1.666	0.744	0.744	1.021	1.373	0.806	0.805
MARS2	1.793	2.428	0.455	0.455	1.676	2.268	0.476	0.468
MARS3	1.772	2.206	0.55	0.55	1.77	2.125	0.534	0.533
MARS4	1.084	1.315	0.319	0.319	1.185	1.500	0.243	0.040
MARS5	1.268	1.561	0.04	0.04	1.386	1.677	0.012	-0.199

MARS6	1.025	1.439	0.808	0.808	0.924	1.232	0.846	0.843
MARS7	0.925	1.324	0.838	0.838	0.804	1.113	0.873	0.872
MARS8	0.782	1.03	0.902	0.902	0.754	0.956	0.910	0.906
MARS9	**0.692**	**0.933**	**0.920**	**0.920**	**0.654**	**0.829**	**0.932**	**0.929**
MLP1	1.196	1.663	0.744	0.744	1.020	1.373	0.806	0.805
MLP2	1.835	2.485	0.429	0.429	1.689	2.304	0.457	0.451
MLP3	1.842	2.491	0.426	0.426	1.695	2.302	0.458	0.452
MLP4	1.073	1.309	0.325	0.325	1.137	1.459	0.293	0.090
MLP5	1.306	1.591	0.005	0.005	1.329	1.576	0.03	-0.058
MLP6	0.836	1.256	0.854	0.854	0.740	1.086	0.882	0.878
MLP7	0.774	1.181	0.871	0.871	0.649	0.980	0.902	0.901
MLP8	0.529	0.758	0.947	0.947	0.531	0.770	0.943	0.939
MLP9	**0.279**	**0.398**	**0.985**	**0.985**	**0.314**	**0.405**	**0.988**	**0.981**
SS	1.107	1.544	0.785	0.785	1.007	1.336	0.823	0.822
MLR	0.905	1.235	0.859	0.859	0.860	1.091	0.880	0.880

Table 14. Evaluation of the optimal models by training with testing dataset and testing with training dataset

		Training				Testing		
	MAE	RMSE	R^2	*E*	MAE	RMSE	R^2	*E*
ANFIS-GP9	0.447	0.631	0.959	0.959	0.526	0.792	0.945	0.942
FG9	0.476	0.686	0.951	0.951	0.591	0.864	0.934	0.931
GRNN9	0.230	0.331	0.989	0.989	0.493	0.820	0.941	0.927
LSSVM9	0.703	0.962	0.907	0.907	0.784	1.170	0.882	0.826
MARS9	0.600	0.783	0.937	0.937	0.691	0.968	0.916	0.913
MLP9	**0.383**	**0.537**	**0.970**	**0.970**	**0.481**	**0.735**	**0.953**	**0.950**

Table 15. The MLP model performances tested at different stations with full weather inputs

		Training				Testing		
	MAE	RMSE	R^2	*E*	MAE	RMSE	R^2	*E*
HEB	0.150	0.197	0.996	0.996	0.498	0.687	0.970	0.956
ALT	0.193	0.255	0.994	0.994	0.524	0.831	0.980	0.957
MQ	0.446	0.542	0.984	0.983	0.693	0.908	0.974	0.960
BJ	0.187	0.241	0.992	0.992	0.468	0.813	0.930	0.921
LSA	0.270	0.342	0.976	0.976	0.636	0.788	0.880	0.876
CQ	0.114	0.159	0.992	0.992	0.317	0.740	0.865	0.862
HZ	0.208	0.271	0.981	0.981	0.403	0.535	0.937	0.924
HK	0.317	0.393	0.934	0.934	0.414	0.548	0.922	0.882