

Supplementary figure

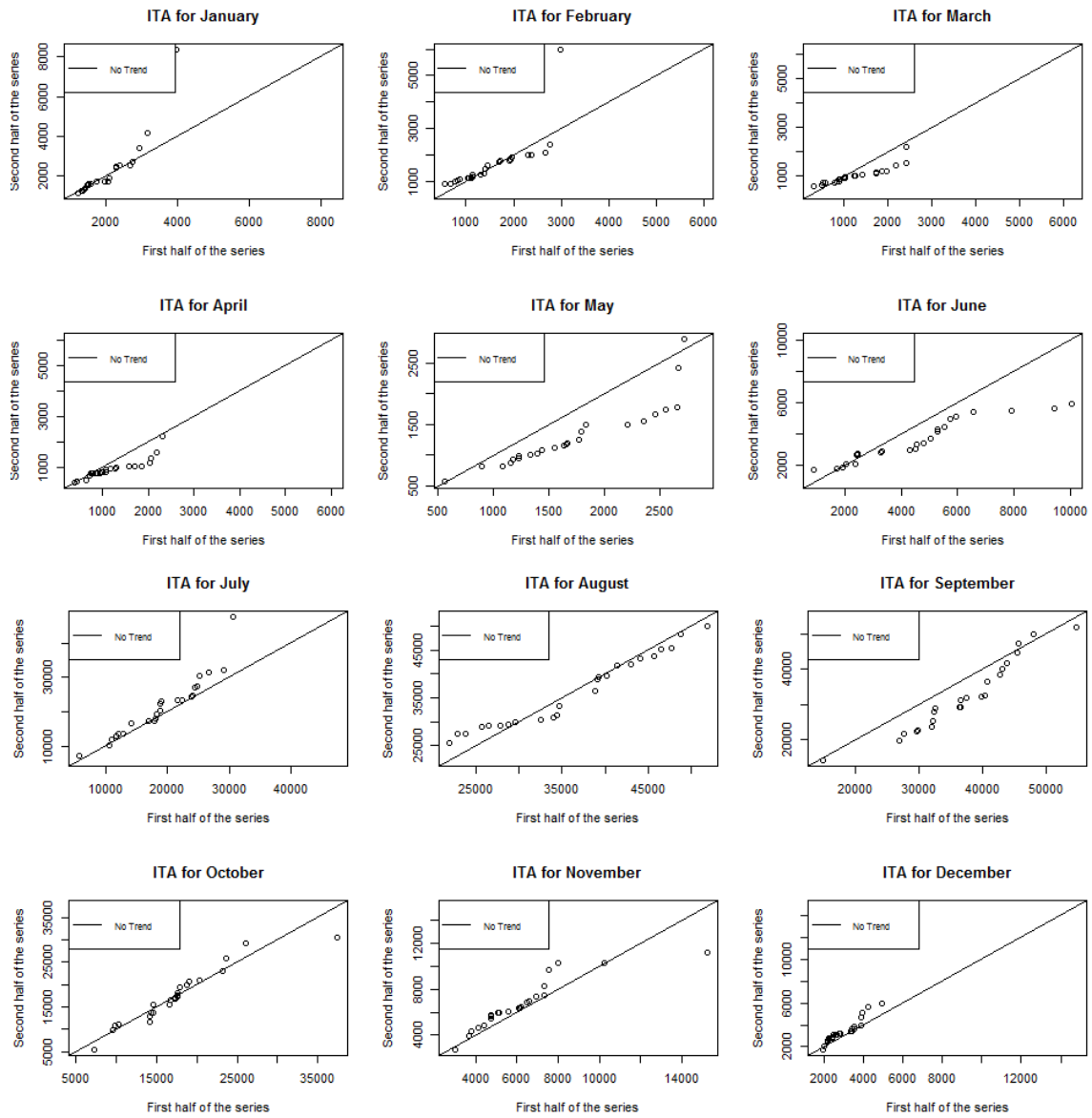


Figure S1 Innovative trend analysis for average discharge (Supplementary section)

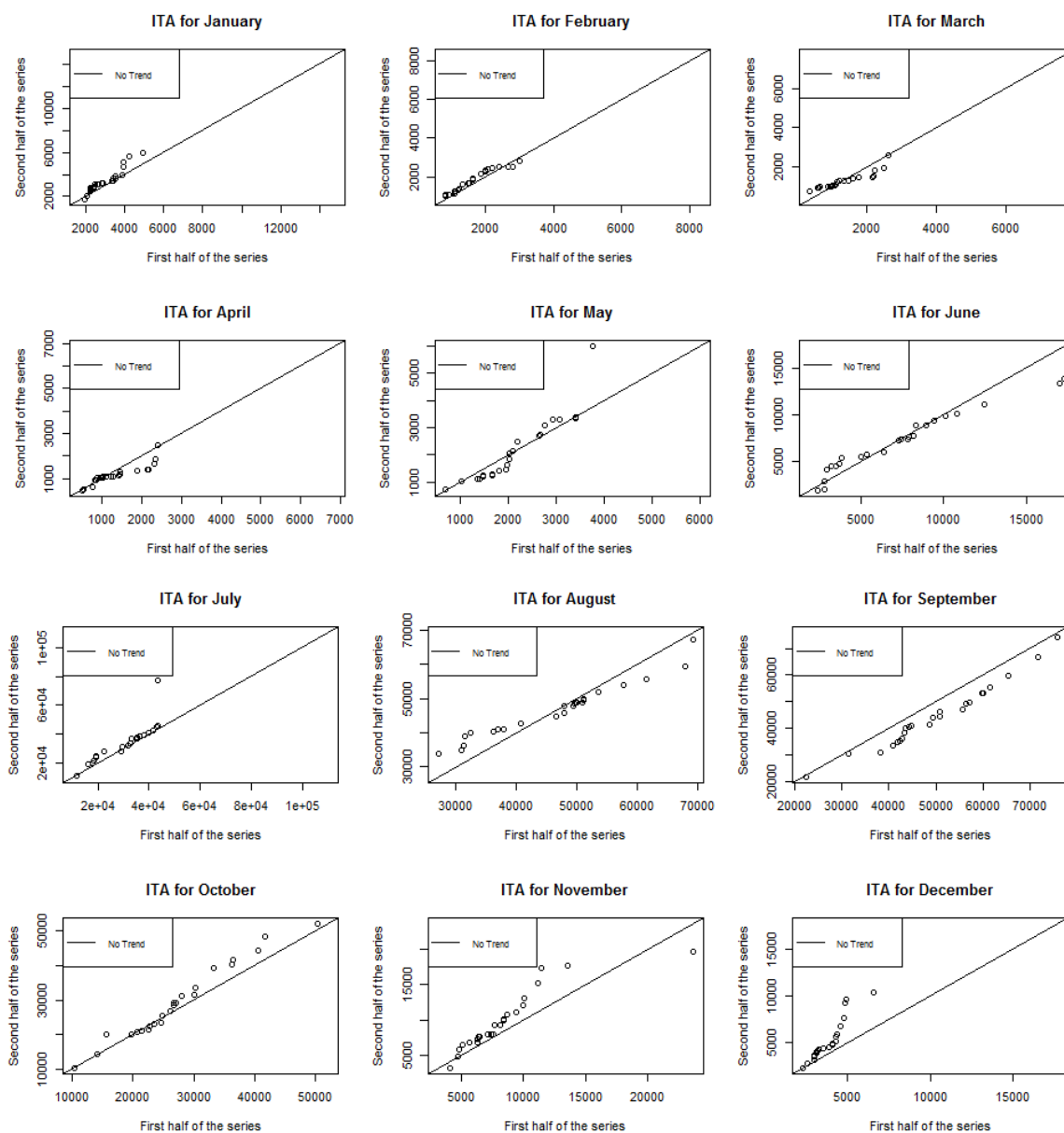


Figure S2 Innovative trend analysis for maximum discharge (supplementary section)

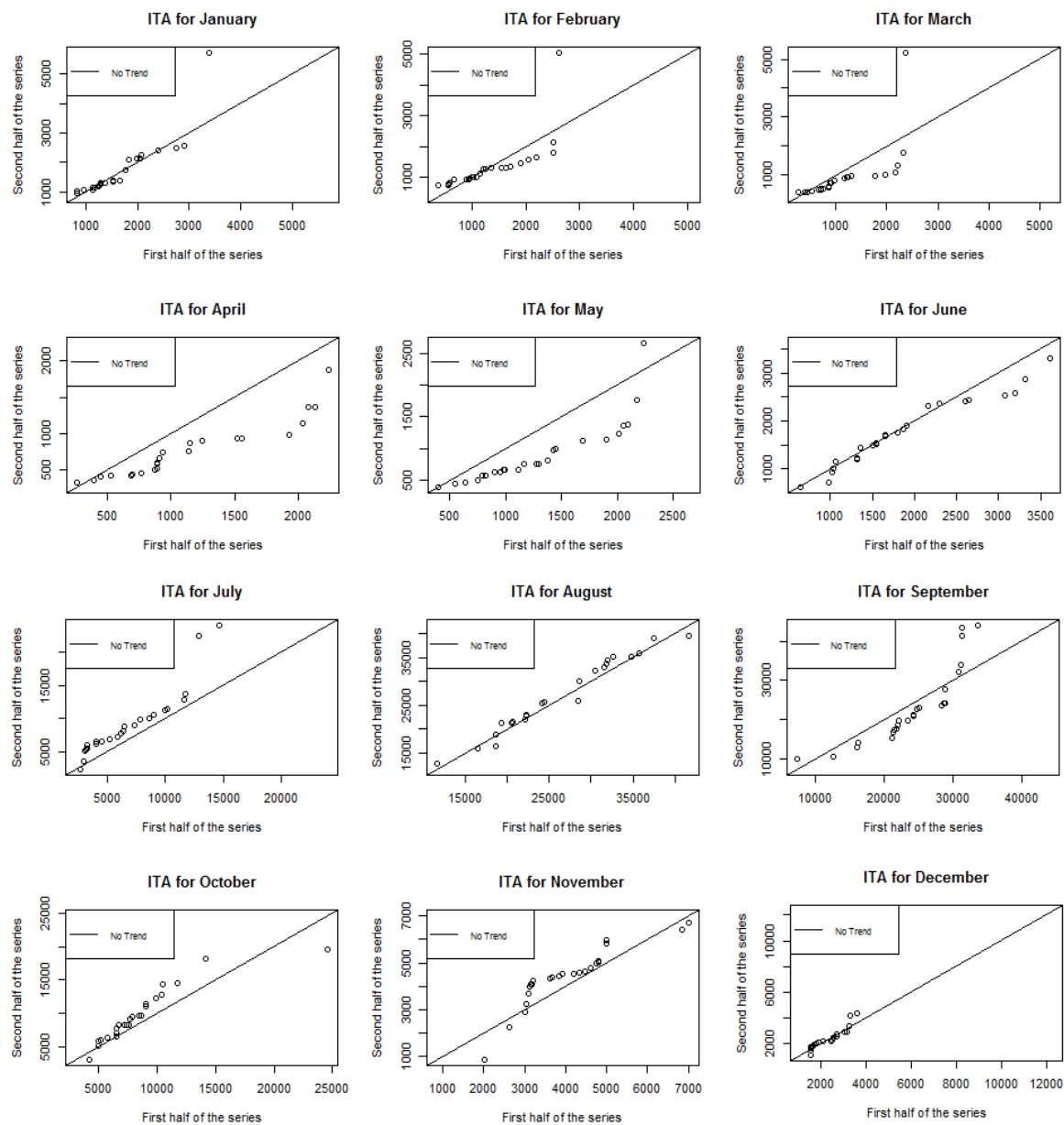


Figure S3 Innovative trend analysis for minimum discharge (supplementary section)

Supplementary table

Table S1 The optimized parameters of machine learning algorithms by PSO for groundwater potentiality modelling

Algorithms	Optimized Parameters
PSO-M5P	Lag-5, Seed-10, Number of iteration-1000, Learning rate-0.2, Activation function in hidden unit-Sigmoid, Swarm size-20, Iteration-500, mutation type-bit-flip, mutation probability-0.01, inertia weight-0.33, social weight-0.33, individual weight-0.34, report frequency-20, seed-5
PSO-REPTree	Lag-5, seed-10, Number of hidden unit-7, activation for hidden unit-Sigmoid, Number of iteration-1000; learning rate-0.2, Swarm size-25, Iteration-100, mutation type-bit-flip, mutation probability-0.01, inertia weight-0.33, social weight-0.33, individual weight-0.34, report frequency-20, seed-1
PSO-RF	Maximum depth of tree-8, calculation of out of bag error-TRUE, Number of hidden unit-7, Number of iteration-1500, Lag-5, Number of thread-4, seed-5, Swarm size-35, Iteration-100, mutation type-bit-flip, mutation probability-0.01, inertia weight-0.33, social weight-0.33, individual weight-0.34, report frequency-

	20, seed-3
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Table S2 Monthly RVA analysis for average, maximum and minimum discharge in this study

Months	High Threshold	Low Threshold	Maximum	Minimum	Average
January	4185.62	2801.04	2913.38	1555.33	2087.87
February	3186.33	2250.34	1782.26	1211.78	1453.98
March	2644.31	1982.36	1378.47	899.39	1123.59
April	2604.05	2136.29	1274.29	786.2	1068.16
May	3261.78	2376.56	2013.93	973.51	1366.59
June	13877.74	6517.92	6676.44	1719.75	3640.83
July	44057.05	21409.61	33413.3	7731.50	19756.47
August	51995.65	31223.02	46857.53	26212.11	36204.1
September	51860.73	41491.27	47119.43	23316.54	34994.59
October	30802.19	20846.14	28138.99	8975.89	17032.81
November	11767.06	7261.27	9013.42	4131.22	6257.93
December	5985.349	3632.98	4821.37	2401.23	3425.34