The Runoff Characteristic of Nutrients from Kako River in Hyogo Pref., Japan

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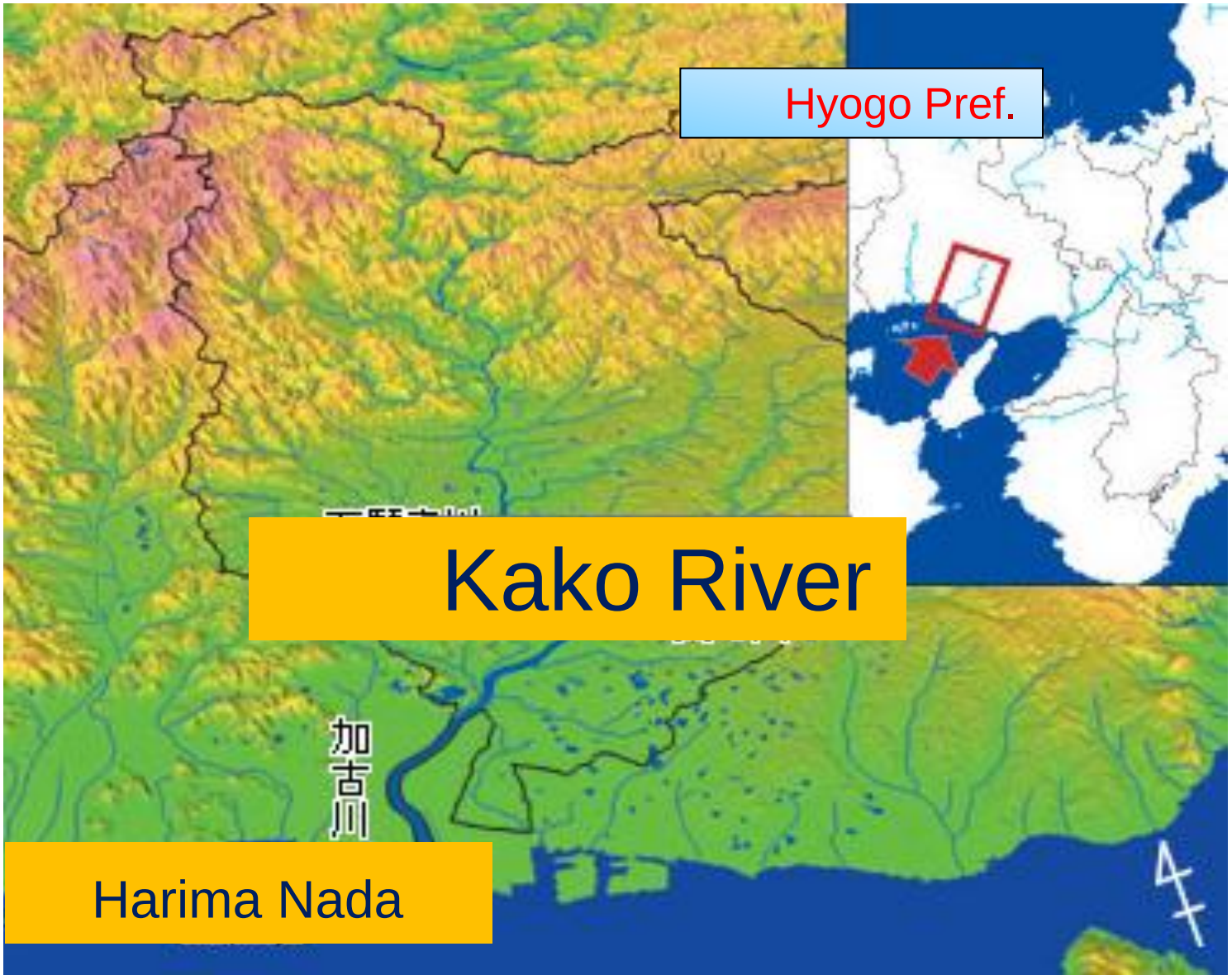
Hyogo Pref. and Kako River



Background of the research

- 30years ago, the red tide had frequently occurred in the Seto Inland Sea.
- The environmental standard of TN and TP has been set in 1993, and a lot of reduction policy of nutrients acts.
- As the result, the water quality in the Seto Inland Sea has been improved.
- However it has occurred the new probrem that seaweed has been low quality.

- The red tide measures and the seaweed quality will be trade-off. To solve the problem ,it is necessary the high quality management of the nutrients .
- The nutrients from Kako River is influence of Harima Nada. Therefore, and it has investigated every day in the Kako River to understand the loading dose of the nutrients.

Purpose of study

The investigation during year in Kako River

Grasp of loading doses such as organic matter and nutrients

The pollution factor is analyzed by the comparison with a social background etc. It ties to the nutrients management.

Investigation procedure

- Investigation period: April to December, 2010
- Investigation site: Ikejiri bridge (downstream of Kako River).

Frequency of sampling: Once a day.
Analysis item: Total nitrogen (T-N) and Total phosphorus (T-P)
Flow rate calculates by using the discharge amount data of the Kakogawa weir that the Ministry of Land, Infrastructure andTransport set up.

Investigation site: Ikejiri bridge

The outline of Kako River water shed

- area : 1,730㎢
- length of river : 96㎞
- population : 600,000
- land use :forest 59% ,
  farmland 26%
  urban area 11%

Results and Discussion

Results of main item(daily investigation)

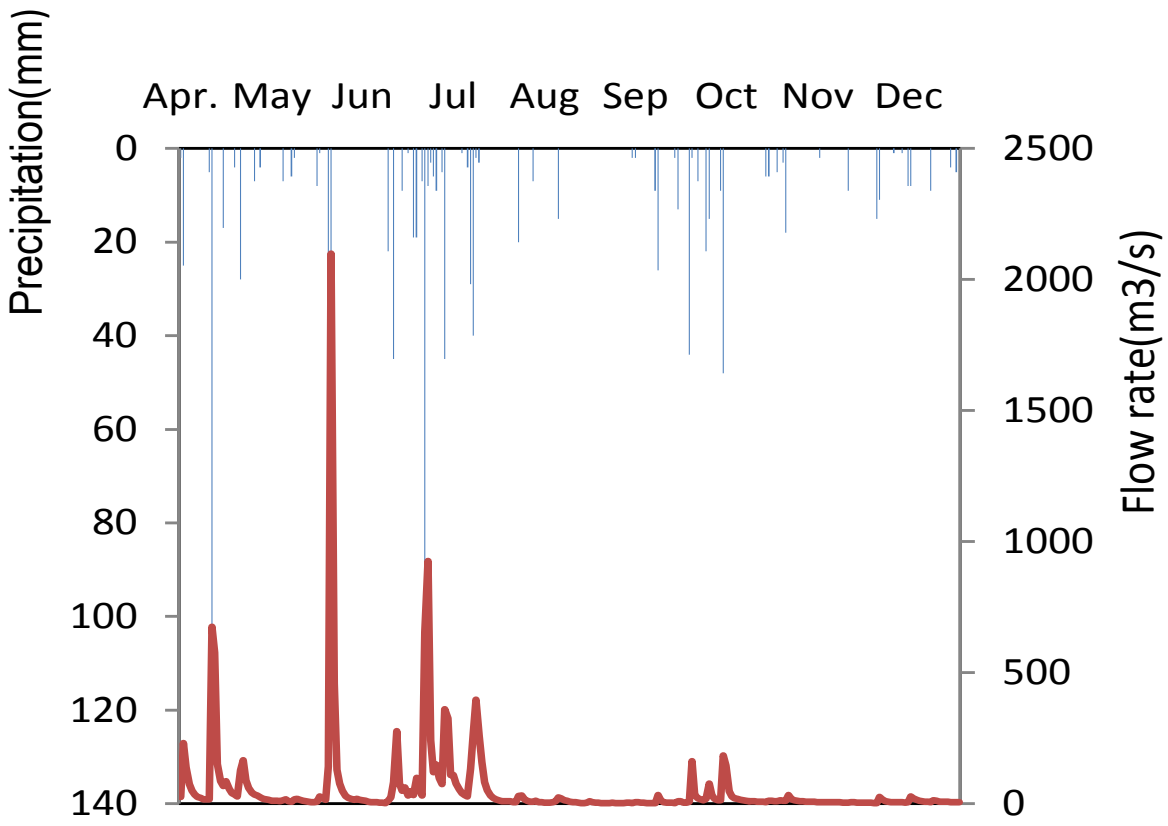
item (unit)	flow rate m^3/s	pH	EC mS/m	SS mg/L	TP mg/L	PO_4-P mg/L	TN mg/L	DOC mg/L
min.	2.6	6.56	6.0	0.1	0.041	0.016	0.67	0.23
max.	2,100	9.32	34.8	615	0.903	0.374	4.77	5.17
ave.	51.6	7.61	20	8.3	0.104	0.060	1.08	1.94

The concentration of TP and TN

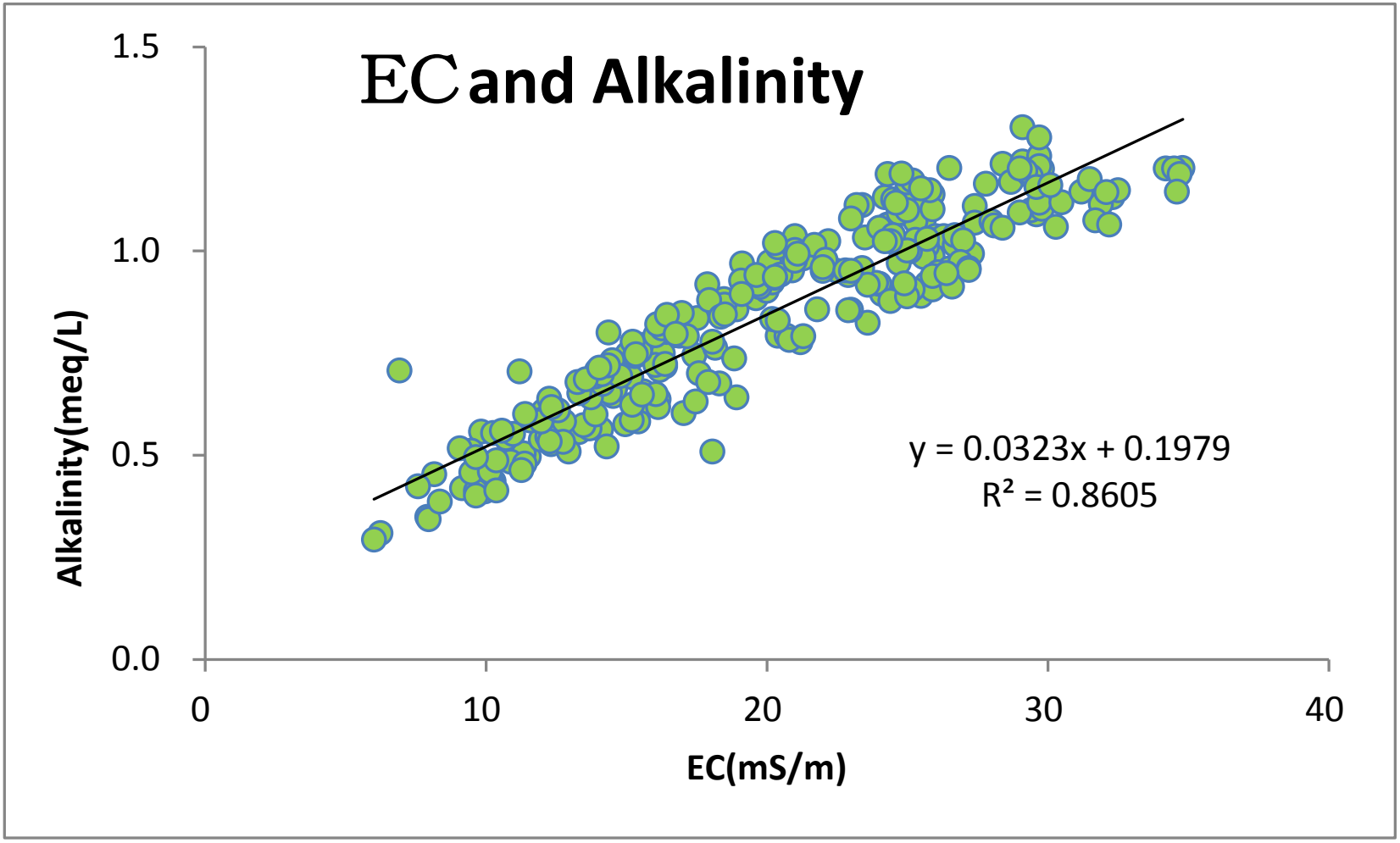
The concentration of TP and TN (monthly)

	TP (mg/L)			TN (mg/L)		
	max.	min.	ave.	max.	min.	ave.
Apr.	0.201	0.057	0.088	1.62	0.84	1.10
May	0.903	0.044	0.120	4.77	0.69	1.08
Jun.	0.265	0.061	0.124	1.92	0.77	1.17
Jul.	0.471	0.071	0.117	1.58	0.67	0.96
Aug.	0.141	0.088	0.111	1.2	0.69	0.91
Sep.	0.409	0.089	0.130	4.1	0.67	0.99
Oct.	0.177	0.055	0.084	1.68	0.77	1.08
Nov.	0.126	0.056	0.079	1.45	0.92	1.07
Dec.	0.143	0.041	0.080	1.82	1.12	1.32
ave.	0.315	0.062	0.104	2.27	0.79	1.08

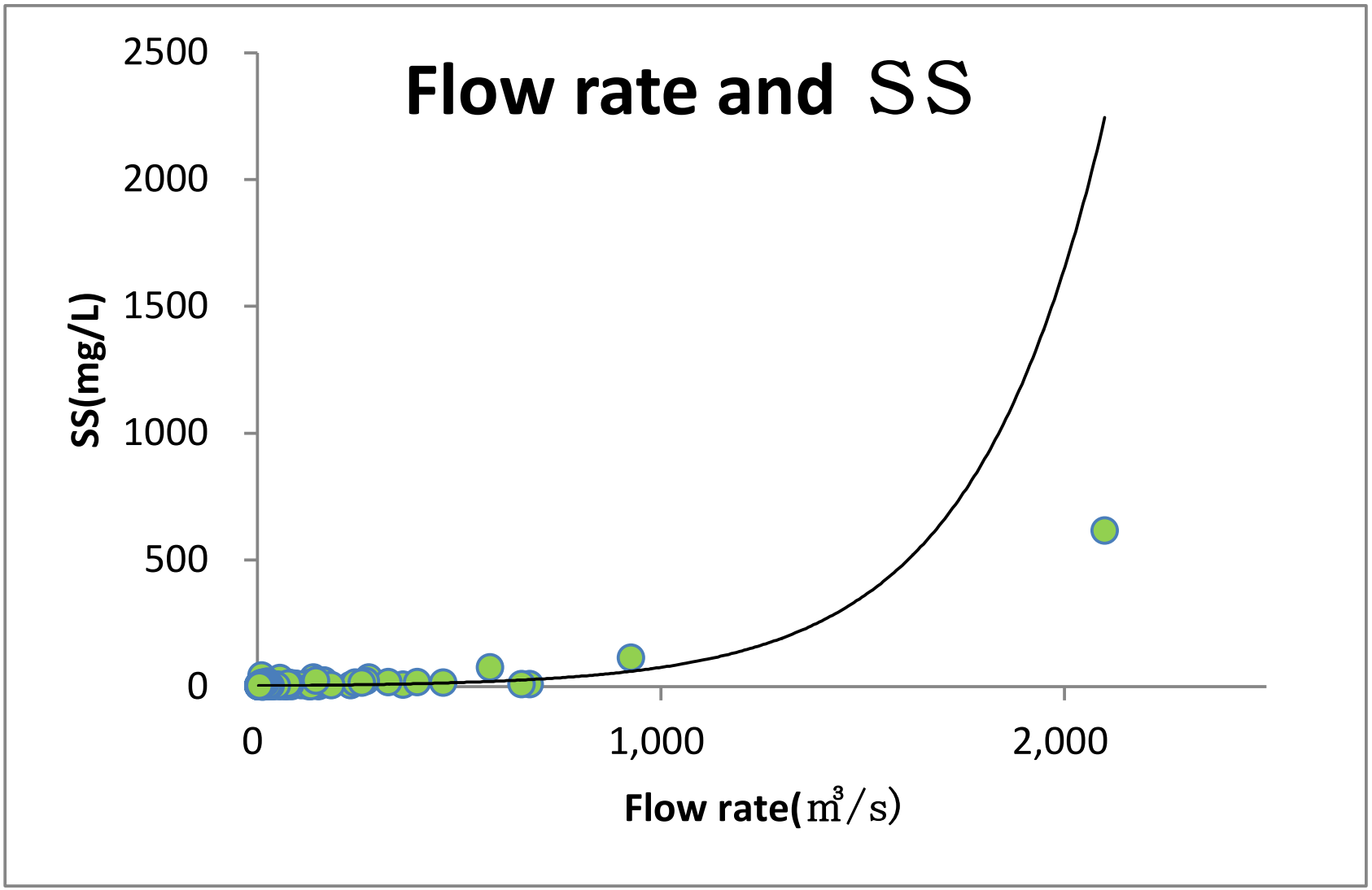
Precipitation and outflow rate



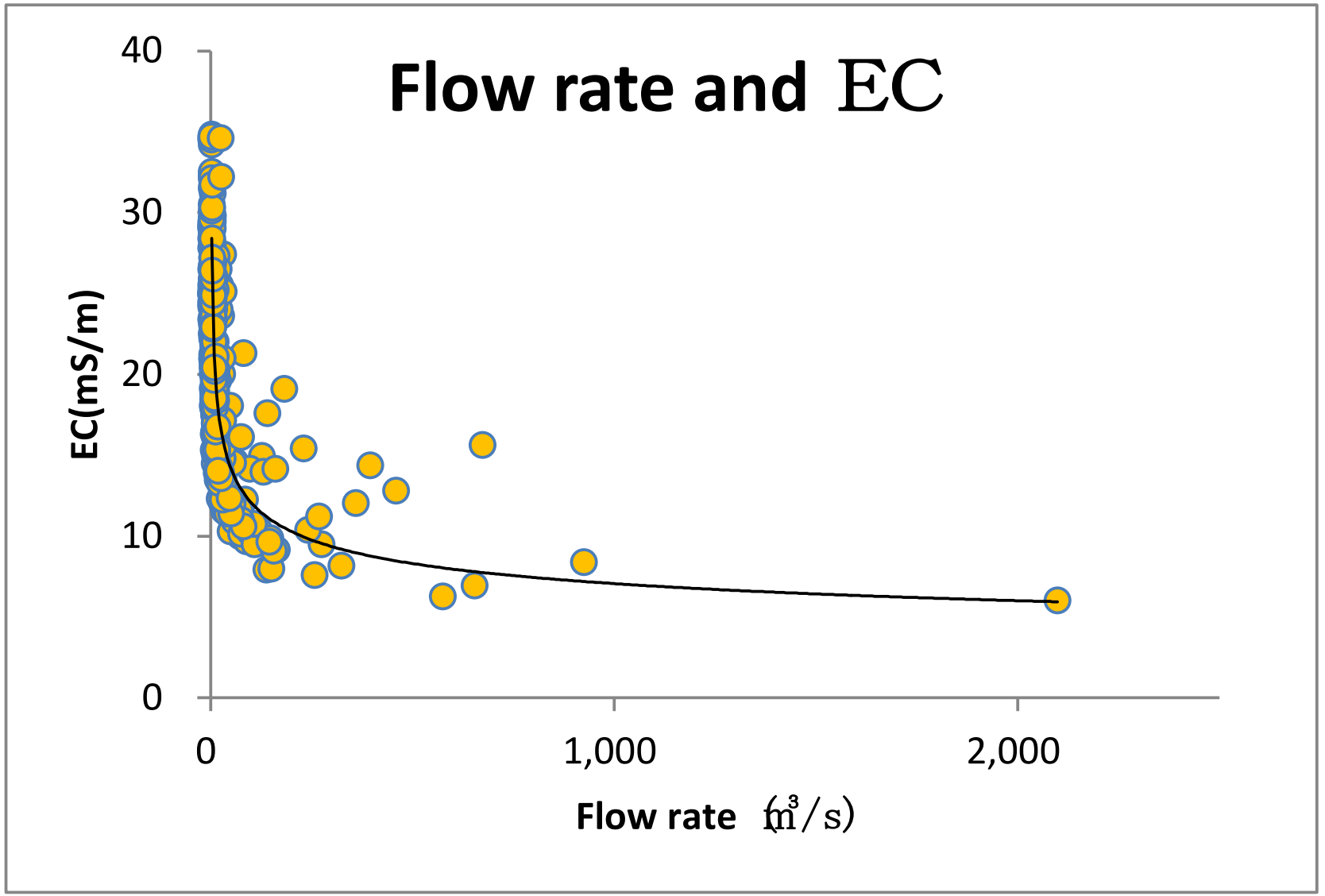
The reration between the EC and Alkalinity



The reration between the Flow rate and SS



The reration between the EC and Flow rate



The montyly loading doses

	TP (t/day)		TN (t/day)	
	Ave.	Sum.	Ave.	Sum.
Apr.	1.00	30.10	10.7	322.2
May	6.36	197.16	32.9	988.4
Jun.	1.54	46.32	11.5	344.6
Jul.	1.34	41.52	8.8	271.7
Aug.	0.07	2.06	0.6	17.4
Sep.	0.23	6.78	1.7	52.1
Oct.	0.26	7.97	2.9	88.7
Nov.	0.05	1.56	0.7	20.7
Dec.	0.07	2.18	1.1	32.7
Ave.	1.22	37.29	7.8	237.6

Results 2

- The Runoff of Loading Doses（in 9 months、275days）are 2,100t(T-N) and 340t(T-P).
- In days of 10% with a lot of flow rate per year,T-P occupied 88%,T- N occupied 81% ,in respect.
- Especially in May 24, the loading doses of T-P occupied 156t a day.

L-Q equation

T-P ： $L=0.065Q^{1.13}$

T-N: $L=0.828Q^{1.08}$

L-Q equation T-P :

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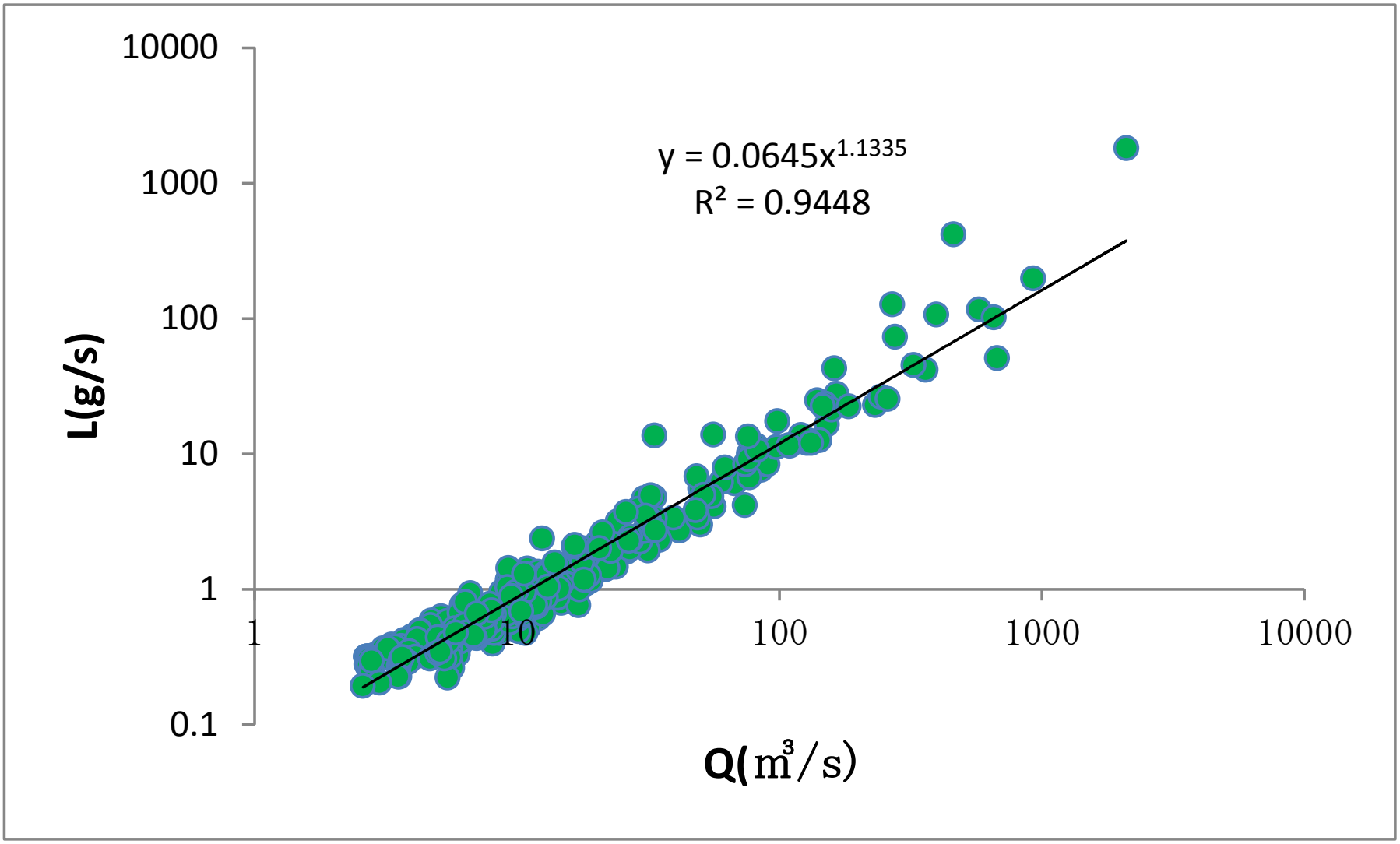

L-Q equation T-N:

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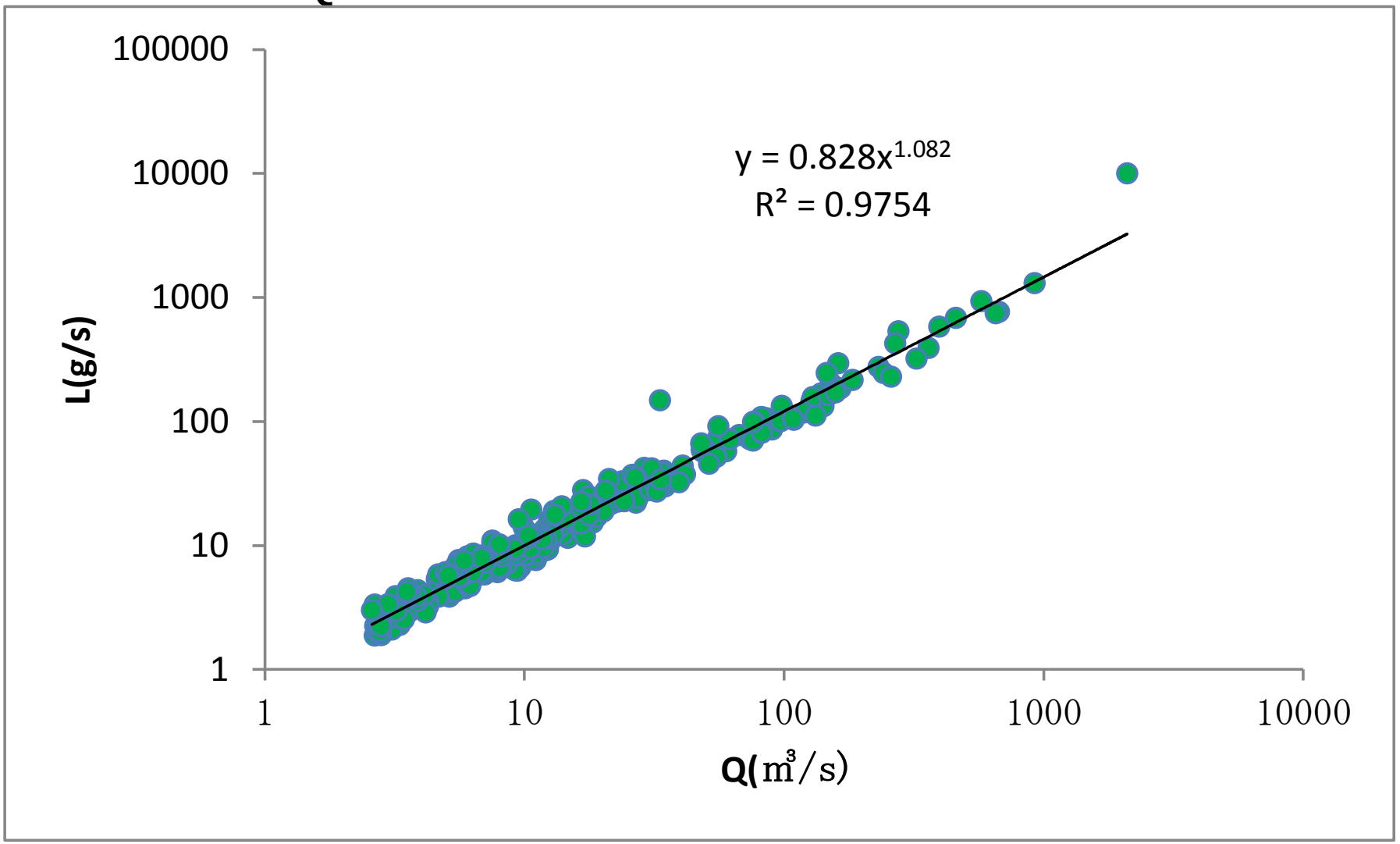

Runoff Characteristics

L-Q equation $L=aQ^b$

When $b>1$: washout type

When $b=1$:constant type

When $b<1$:dilution type

By Dr. Tachibana(1993)

Conclusion

The concentration of nutrients was influenced by the rainfall and flow rate.

In order to measure the loading dose, it is essential to investigate the normal water sampling research when it rains additionally

We found out the management nutrients is difficult when it rains. Therefore it is important to continue to investigate for outflow in raining.

A cknowledgements

This study is supported Hyogo Pref. Water and Air quality control division and Institute of environmental sciences, The Association for the EnvironmentalConservation of the Seto Inland Sea. Thank you very much.

Thank you for listening.