Calculation of air-borne soluble ions in Juam lake orienting from the Yellow Sand

Jae Lyoeng Kim[*1] · Dea Yeun Shin[1] · Young Nam Chun[1] · Nam-Ik Chang[2] · Hyung Jae Yang[2] · Jong Cheon Lee[2] · Gong Unn Kong[3]

1 Department of Environmental Engineering, Chosun University, Gwangju, 501-759 Korea
2 Yeongsan-River Water Quality Research Laboratory National Institute of Environmental Research, Sunchoen Jeollanam-do, 540-932 Korea
3 Department Environmental Science, Wonkwang Health Science College, Iksan Jeollabuk-do, 570-750 Korea

Introduction

Various pollutants are introduced into the Juam lake, due to the industrial development and increase of economic activities. It is transform necessary to calculate the amount of pollutants discharge from factories into the lake for the use the basic data for the management of the lake. Nevertheless EPA (Environmental Protection Agency) reached a conclusion that they could not meet the water quality. It is because other sources such as atmospheric deposition pollutants might affect the water guilty. It is not negligible amount compared to the entering through river water or rainwater. According to US EPA's announcement Albemarle-Pamlico Sound in North Carolina receives 38% of its nitrogen from the atmosphere. This study, therefore, aims to calculate the amount of soluble ions entering into the Juam lake during the Yellow sand period (February ~ May. 2002).

Materials and Method

DDP (Dry Deposition Plate) was used for sampling of atmosphere deposition pollutant particles. This apparatus is 150㎝ in height, with 3 posts attached to a deposition plate. Each deposition plate is placed 50㎝ for apart in order to prevent from interactions. Dry deposition plate is made of transparent acryl, 21.6㎝ in length, 9.0㎝ in width, 0.65㎝ in thickness. It has wings to orient in the direction of wind and a shape blade ($<10^{o}$) in front. Grease(about 5㎎) was applied thinly on the strip (7.36×2.5㎝) the deposition plate.

Sampling of soluble ions in Dry Particles was conducted on fine days from February to May. Treatment for this is that this is the period the Yellow Sand frequents. This is because Yellow Sand, that because the particles, frequents during this period.

The collected dry particles were treated for measurement at bellow.

1) Strip caught dry particles on Dry Deposition Plate were put into a clean bottle of 30㎖ volume. It is then filled with distilled water to 20㎖.
2) Constant temperature was maintained in a mixer and mixed at 250rpm for 2 hour at 60℃.
3) The sample was placed where ultrasonic generator for 2 hour at 60℃.
4) Cooled at the room temperature(20℃)
5) Inserted into the 30㎖ ion chromatography acrodics of 0.2㎛ pore size, and the filtered in to a clean polypropylene bottle.
6) Anions and cations were analyzed using DX-500IC (Ion Chromatography) of Dionex company (Anion SO_4^{2-}, Cl^-, NO_3^- and Cation Ca^{2+}, Mg^{2+}, K^+, Na^+, NH_4^+)

Results and Discussion

1) Volume of deposited soluble ions

Fig. 1 shows deposition volume of anions (SO_4^{2-}, Cl^-, NO_3^-). It shows the maximum concentration levels of SO_4^{2-}, NO_3^- in violent Yellow Sand period on the 21st March.

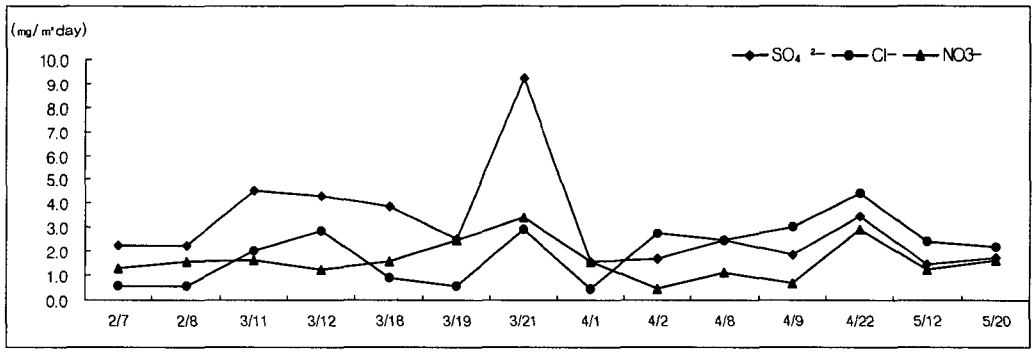

Fig. 1. Volume of deposited soluble anions.

Fig. 2 is showing deposition volumes of cation (K^+, Ca^{2+}, NH_4^+, Mg^{2+}, Na^+). The cation depositions were rather constant. Except Ca^{2+} that is 13 times higher then the other samples. This is probably due to the characteristics at origin. Na^+ and Cl^- show tend to increase approaching summer.

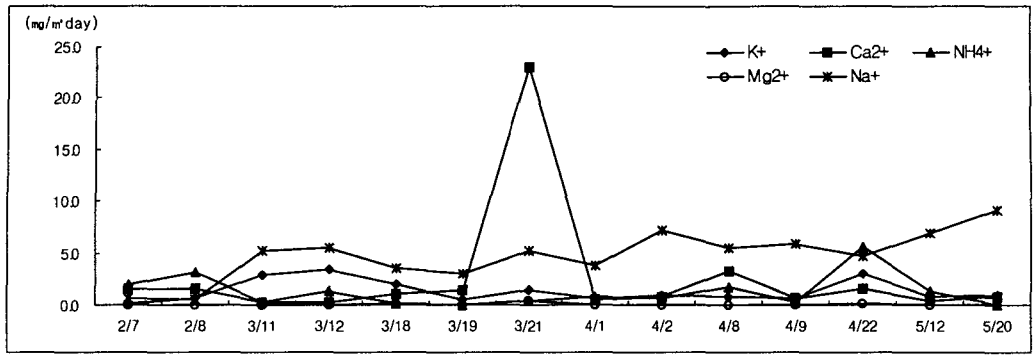

Fig. 2. Volume of deposited soluble cation.

2) Volume of deposited soluble ions in Juam lake

Table 1 shows the volume of the deposited ions measured directly or indirectly in Juam lake (except the change basins of Boseong dam and Dongbok lake).

The average deposition amount of SO_4^{2-} is 1.212 ton/day in the drainage and 0.073 ton/day on water surface on a fine day in February, but deposition amount in Yellow Sand period measures to 3.588 ton/day that is 1.5~3 times as high as in other months. NO_2 and NH_4 are important factors of eutrophication of lake, which close not increase even in the Yellow Sand period.

Table 1. Deposition amount of ion in Juam Lake — Unit : ton/day

Month	Section	SO_4^{2-}	Cl^-	NO_3^-	K^+	Ca^{2+}	NH_4^+	Mg^{2+}	Na^+
Feb (2)	A	1.212	0.308	0.769	0.218	0.832	1.396	0.012	0.327
	B	0.073	0.019	0.046	0.013	0.050	0.084	0.001	0.020
Mar (5)	A	2.677	1.015	1.124	1.117	2.858	0.237	0.062	2.445
	B	0.161	0.061	0.068	0.067	0.172	0.014	0.004	0.147
Mar. Yellow Sand (2)	A	3.588	1.045	1.366	0.933	6.618	0.149	0.124	2.382
	B	0.216	0.063	0.082	0.056	0.399	0.009	0.007	0.143
Apr (5)	A	1.210	1.431	0.743	0.652	0.746	0.991	0.021	2.945
	B	0.073	0.086	0.045	0.039	0.045	0.060	0.001	0.177
Apr. Yellow Sand (2)	A	1.181	1.501	0.504	0.386	1.076	0.529	0.011	3.114
	B	0.071	0.090	0.030	0.023	0.065	0.032	0.001	0.188
May (2)	A	0.872	1.249	0.788	0.453	0.322	0.368	0.013	4.379
	B	0.053	0.075	0.047	0.027	0.019	0.022	0.001	0.264
Month Average (14)	A	1.790	1.091	0.882	0.626	2.076	0.612	0.041	2.599
	B	0.108	0.066	0.053	0.038	0.125	0.037	0.002	0.156

A : The area covered by drainage basin of the Juam lake

B : The surface area of filled with water

( ) : Sample count

Conclusion

1) NO_2 and NH_4 are important factors of eutrophication of lake, which close not increase even in the Yellow Sand period. NO_3^- is the highest during the Yellow Sand period in March.

2) Nitrogen compounds as well as the sulphuric compounds are the cause of acid lake. Sulphuric compounds are deposited to increase twice on average in the Yellow Sand period. Comported to the samples in February & March when there was no Yellow Sand, increase was about 3~3.5 times.

3) Trend of the deposited ions (Ca^{2+} and SO_4^{2-}) in Yellow sand in March comparable were because $CaSO_4$ is the source material.

References

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