— GROUP 8 REPORT —

NATURAL VARIABILITY OF THE HYDRO-METROLOGICAL AND HYDRO-CHEMICAL CONDITIONS

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1. PURPOSE

The purpose of the Group 8 was initially set as understanding natural variability of the hydro-meteorological and hydro-chemical conditions. However, as research activity of the Amur Okhotsk project progressed, another important purpose of the group was considered as construction of hydrological model that incorporates dissolved iron producition and transport. Thus, numerical modeling was added as another important target of the group. To achive this purpose, the group attempted to develop a numerical hydro-geochemical model with special emphasis on iron dynamics for the Amur River basin.

2. DATA AND RESEARCH TARGETS

Our group research could not progress without provision of abundant data sets that have been collected by ROSHYDROMET since 1960s. They provide us long-term discharge and dissolved iron data at many observation stations within the basin. Thus, main findings of our group are heavily owed to those data sets. Also, our research activity was intimately connected with progress of Group 3, 4, 6, since mechanisms of biogeochemical processes and land cover change that are correlated to dissolved iron production and transport were intensively studied by those group. Based on those data, and interactng with other research group activity, what we have actually executed researches are as follows.

(1) Identify governing mechanisms of climatological conditions of the basin.
(2) Analysis of long-term trend of dissolved iron concentration in the basin.
(3) Numerical modeling of dissolved iron production and transport in the basin
(4) Evaluation of land cover change impact on dissolved iron flux of the basin

What we have intensively used method to accomplish those research targes are analysis method of large data sets and numerical modeling technique.

3. RESULTS

Main Achievements are as follows.

(1) It is found that the annually integrated Arctic Oscillation (AO) influences both summer discharge and winter ice. Summer discharge is larger and winter ice is reduced during positive AO years. The analysis also suggests that freshwater from the river is not the main control of multiyear ice variability.
(2) It is found that dissolved iron concentration of many different rivers show seasonal variation. In addtion, unprecedented and scientifically stimulating finding is that drastic increase of dissolved iron flux in late 1990s', especially from 1996 to 1998. Mechanisms of this abrupt increase are not clarified yet.
(3) Numerical hydrological model that incorporates dissolved iron production of the Amur River basin is constructed. The model can calculate both monthly discharge and monthly average dissolved iron concentration with acceptable accuracy.
(4) Numerical simulation by constructed model indicates that dissolved iron flux in 1930s' might be about 20% higher than present day land cover condition. Also, complete conversion of wetlands in the basin might result in a decrease in dissolved iron flux of approximately 20% compared with present conditions.

4. FUTURE PERSPECTIVE

Most important and scientifically interesting challenges that are found as a result of our group and interdisciplinary research activities with other groups can be summarized as two points.

(1) Understanding mechanisms that govern unprecedented increase of dissolved iron flux in late 1990s'. At present, there area several leading hypothesis; a) overexploitation of groundwater which contains highly concentrated dissolved iron, b) inundation of extensive area by large flooding, c) change in spring time snow melt and soil thawing.
(2) Scientifically reliable prediction of land cover change of the Amur River basin in the future. Though this is very difficult task, it is also very important for the purpose of making realistic proposal for the conservation of the Amur – Okhotsk ecosystem.