Dissolved iron transport model of the Amur River toward the coupling with ocean iron transport model

Takeo Onishi[1*], Muneoki Yoh[2], Hideaki Shibata[3], Seiya Nagao[4]

[1]RBRC, Gifu Univ., [2]Tokyo Univ.of Agr.and Tech., [3]Field Sci.Cent.North.Bio.Hokkaido Univ., [4]LLRL, Kanazawa Univ.

Primary production of the Sea of Okhotsk and the Oyashio region are limited by iron and important part of it has its origin in the Amur River basin. Iron transported by the Amur River is in the form of dissolved iron, most of which consists of the complex of organic compounds such as fulvic acid and iron. Terrestrial biogeochemical observation verified that wetlands play an important role in producing this dissolved iron. Since wetlands soil is rich in undegraded organic matter and tends to be reductive condition, abundant dissolved iron is produced from wetlands. However, the Amur River basin has been affected by increasing human activity such as conversion of wetland to agricultural land through out the last century. Thus, human activity in the basin might have a great impact on primary productivity of the Sea of Okhotsk by changing dissolved iron productivity of the basin. To simulate iron transport beyond land and ocean boundary and to evaluate how human activity will affect dissolved iron productivity of the basin, hydrological model which incorporate dissolved iron production mechanism is constructed.
The model consists of two modules, one for dealing with the physical processes involved with runoff (TOP-RUNOFF), and the other for processes involved with the production of dissolved iron (TOP-FE). While spatial resolution of river routing is 0.5 degree, runoff calculation is done with 1 km spatial resolution. Time resolution is 1day. Number of tuning parameters is designed to be minimum as possible as we can. Calibration period and validation period is from 1981 to 1983, and 1984 to 1990 respectively. As a result, both monthly discharge and monthly averaged dissolved iron concentration can be calculated with acceptable accuracy. On the other hand, drastic increase of dissolved iron flux was observed during the period from 1996 to 1998. And mechanism which can completely explain this increase is not clarified yet. Thus, to unveil this unknown mechanism is the next step for the complete modeling of dissolved iron transport in terrestrial area. In addition, from the viewpoint of coupling of terrestrial and ocean modeling, one of the most important things to be tackled is to model coagulation process in brackish water.

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