Numerical Simulation of Dissolved Iron Production and Transport in the Amur river and the Sea of Okhotsk

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Wetland in the Amur River basin plays an important role in producing dissolved iron. Though significant part of dissolved iron is removed at the estuary zone, the mouth of the river is located coincidentally over the northwestern shelf where Dense Shelf Water (DSW) is vigorously produced. Thus, dissolved iron from the Amur River should be transported by DSW to the Sea of Okhotsk in which iron is the limiting factor of primary production. During the last century, wetland was drastically converted into cultivated land, which in turn may have great impact on dissolved iron production. To assess the land cover conversion impact on dissolved iron production and primary production of the Sea of Okhotsk, we constructed numerical model to simulate dissolved iron production and transport in the Amur River and the Sea of Okhotsk.

Developed model consists of terrestrial module and marine module. The terrestrial module successfully simulates discharge and dissolved iron flux of the basin. The marine module can also simulates realistic DSW well, which flows along the Sakhalin coast through the intermediate layer of 200-500m deep, and then experiences strong tidal mixing along the Kuril Islands in the southern Okhotsk Sea. Thus, our model can simulate dissolved iron production and transport in the Amur River basin and the Sea of Okhotsk.

By using the terrestrial module, we tried to simulate the land cover change impact on dissolved iron productivity of the Amur River basin under different land cover scenarios. Two typical land cover change scenarios were set up as possible future land cover change in the basin. One is conversion of wetland to agricultural land (paddy fields and dry lands). The other is forest fire. Results indicated that wetland conversion to agricultural lands has significant impact on dissolved iron flux. Further research is needed to know how wetland decrease affects primary production of the Sea of Okhotsk.

Keywords: Amur river, Sea of Okhotsk, wetland, dissolved iron, dense shelf water, land cover change