

## Preliminary study on the groundwater flow system in Sanjiang Plain, Northeast China

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Sanjiang plain was a vast extent of wetland surrounded by Heilongjiang (Amur), Songhuajiang, and Ussuri rivers. To be a granary of China, the wetlands are drained to be cropland. Hydrological cycle has been changed during the agricultural development. One of the important consequences is the change in iron flux to Okhotsk Sea through river system. Decline of iron flux may lead to reduction of marine products. Another one is pollution of environmental water mainly caused by fertilizer in cropland. We conducted field survey to reveal the distribution of iron and nitrate nitrogen concentrations in surface and groundwater during 20 to 27, Sep., 2007. Twenty five samples are obtained and analyzed for Fe<sup>2+</sup>, Total-Fe, NO<sub>2</sub>-N, NO<sub>3</sub>-N.

In surface water, Fe<sup>2+</sup> is under the lower limit in all the samples. Total Fe are 0.08, 0.11 mg/l at the confluence of Songhuajiang and Heilongjiang. Waters in wetland and upper stream show the value around 0.1 mg/l. NO<sub>3</sub>-N shows lower than analytical limit in all the points except Songhuajiang and Naoli rivers.

Groundwater shows various values in iron and nitrate. Based on the well depths, groundwater can be classified to six different types:

- [A]: shallow groundwater (less than 20m) with low iron and nitrate nitrogen content
- [B]: shallow groundwater with much iron and less nitrate nitrogen
- [C]: shallow groundwater with less iron and much nitrate nitrogen
- [D]: deep groundwater (20 to 40 m) with much iron and less nitrate nitrogen
- [E]: deep groundwater with less iron and much nitrate nitrogen
- [F]: deep groundwater with less iron and nitrate nitrogen

The origin of nitrate nitrogen can be found in the fertilizer or sewage. This means that high nitrate nitrogen groundwater suffers the influence of ground surface, and the area should be the recharge area in the groundwater flow system. At the discharge area, groundwater comes out from deep aquifer, and nitrate nitrogen content should be low. Iron is existed in the zone of 20m to 40m depth, so the region with high iron content in shallow groundwater can be considered discharge area. Then type B should be the discharge area, and types C and E have the characteristics in recharge area.

Sanjiang plain consists of several uplands or terraces. The groundwater recharged on the upland includes nitrate nitrogen, and flows to deeper aquifer. The groundwater with high nitrate nitrogen is in the recharge area. The iron exists in the depth of 20 to 40m, and the iron flow out to surface at the discharge area. The high iron content in shallow aquifer denotes the discharge area. The idea of groundwater flow system can explain the distribution of iron and nitrate nitrogen contents in groundwater.

This is the simple hypothesis to explain the groundwater flow system in Sanjiang Plain. We are planning further field works to verify the result by correcting more samples and inspecting geomorphology, land use, crop calendar.