

A Change of Hydrological Cycle and its effects on water chemistry in the North China Plain (NPC) in past 50 years

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The North China Plain (NCP) lying along the eastern coastal area with geographical coordinates 100° to 120° E and 30° to 40° N. Located in the semi-humid and semi-arid regions of eastern China, the North China Plain (NCP) is one of the largest alluvial plains in China with an area of about 380 thousand square kilometers and one of the most important agricultural regions in China. It has a continental monsoon climate with an annual precipitation of 800 mm in the southern part and reducing to about 500 mm in the northern.

After the 1970's, the increase of pumping groundwater began to result in the fall of the groundwater level in the rate of 1 to 1.5m/year. As a result, hydrological system has changed greatly. From the view point of hydrochemistry, groundwater tends to evolve chemically toward the composition of seawater. This evolution is normally accompanied by the following regional changes in dominant anion species:

Travel along flow path (Increasing age) -----
HCO₃⁻ → HCO₃⁻ + SO₄²⁻ → SO₄²⁻ + HCO₃⁻ → SO₄²⁻ + Cl⁻ → Cl⁻ + SO₄²⁻ → Cl⁻

In the NPC, annual average of rainfall is less than 600 mm and the distance from Taihan mountain region to Bohai Sea reaches more than 300 km. For that reason, the activity of groundwater circulation is assumed to be low. Based on the result of our samples and historical literatures, chemical compositions of shallow groundwater in some regions of NCP have changed not only by its natural condition, but also by the pumping for irrigation, city and industrial water use.