

Investigation of submarine groundwater discharge in the coastal zone near the mouth of Yellow River

Tomotoshi Ishitobi[1]; Makoto Taniguchi[2]; Shinichi Onodera[3]; Kunihide Miyaoka[4]; Tomochika Tokunaga[5]; Jianyao Chen[6]; Yoshihiro Fukushima[2]

[1] Science Edu, Nara-edu Univ; [2] RIHN; [3] Integrated Sci., Hiroshima Univ; [4] Faculty of Education, Mie Univ.; [5] Dept. Geosystem Eng., Univ. Tokyo; [6] Earth Sci., Chiba Univ.

Submarine groundwater discharge (SGD) is recently recognized as a potentially significant water and material pathway from the land to the ocean. However, quantitative evaluations have not been done because the measurement is difficult. Therefore, a lot of uncertain points exist about SGD.

The Yellow River does not reach often to the Bo-Hai Sea since 1990's because of huge amount of water uses for irrigation at midstream. Shortage of river water induces water pollution and decrease of nutrient transports to the Bo-Hai Sea. The large-scale delta is formed with the sediments from Yellow River in the region of mouth of this river, where the erosions and the depositions occurs depending on the areas. Therefore, this change of sedimentations and erosions affects the interactions between land and ocean. The purposes of this study are to evaluate the changes of groundwater and depositional environments in the delta, and to evaluate groundwater discharges and their dissolved material transports into the sea.

Measurements of SGD have been done at seven locations of 500 to 2000m from the coast in September, 2004. Automated seepage meters and CT sensors were used to measure SGD rates, temperature and electric conductivity of SGD. As a result, SGD rates were evaluated to be from 0.00000034 to 0.00001731 m/s. The separation of SGD into the fresh terrestrial groundwater discharge and recirculated seawater discharge were also done by using the electric conductivities of the SGD water and two end members, groundwater in the coast and seawater. As a result, ratios of the fresh terrestrial groundwater of SGD were from several percent to several ten percent in most locations. However, this ratio was half of that at 1000m offshore. Therefore, SGD transports nutrients from land to the sea even at the location about 1000m offshore, because terrestrial groundwater discharge is active in this location.