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Groundwater vulnerability to Pollutions in Asian megacities

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Urbanization causes the convergence, consumption and disposal of material. Consequently, soil and groundwater pollution occurs at many cities. In the Material Group of the RIHN project conducted by Makoto Taniguchi, we have conducted the intensive researches of groundwater pollution in two different seasons at Bangkok, Jakarta and Manila as well as research in one season at Taipei and Seoul. In addition, we have conducted the monitoring of SGD and collection of rainwater, sediment core and porewater at the coastal zone at Osaka, Manila, Bangkok, and Jakarta. In my presentation, I would like to report the review of our researches.

The results are summarized as follows:

1) Our researches indicated huge accumulation amount of trace metal and dissolved nitrogen in groundwater, especially in Jakarta and Manila. Then, various N sources and denitrification were confirmed by using N isotope distribution in groundwater. In addition, As contamination in deep groundwater were detected at some cities. But As and NH₄⁺ contamination originated by natural sources were suggested by some results.

2) Various groundwater salinisations were compared in Osaka, Bangkok and Jakarta. The difference of marine alluvium volume (same as topographic gradient), natural recharge and intensive pumping period controlled salinisation.

3) Soil pollution was confirmed in Bangkok. Trace metal content was higher in the central of the city than in the others. And organic pollution and metal pollution histories were reconstructed, using marine sediments. In addition, the differences of the peak in each trace metal were confirmed.

4) Less terrestrial submarine groundwater discharge but huge material flux by total SGD was confirmed. Spatial variation in SGD was estimated in around each cities, using topographic model and Rn measurements.

5) Some new methods were established. Firstly, analysis system of dissolved N₂/Ar in groundwater was applied for reconstruction of dinitrification in groundwater and nitrate content during the groundwater recharge. Second one is Rn analysis system for the quantification of SGD and seawater intrusion. Third one is the purification method of organic chlorine pollution.

Keywords: megacity, pollution, groundwater, vulnearbility