Study on utilization of groundwater under emergency situations caused by natural disasters: A modeling approach in the Kanto Plain, Japan.

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Serious water shortage could occur after natural disasters, such as great earthquakes centered directly under big cities, extensive flooding induced by extreme rainfalls, and long-term droughts. In the aftermath of disasters, significant water demand would rapidly rise for the service at evacuation shelters and hospitals. In disaster preparedness plans of many local governments in Japan, groundwater is regarded as a good alternative water supply source under emergency situations. However, the potential of using groundwater under emergency situations cannot be verified without information from hydrogeological analysis. Also, it is necessary to carefully evaluate the risks of land subsidence caused by groundwater abstraction activities. This study aims to provide local governments with site specific guidance of safe groundwater usage under emergency situations by integrating information both from geosphere and human activity into up-to-date numerical models. In this presentation, we will introduce a case study of the Kanto Plain, Japan. The Kanto Plain covers a land area of around 40,000 km2, where multiple metropolitan areas and watersheds are surrounded by mountainous areas. Relevant information on climate, geology, land use, groundwater and river runoff observations, and records of groundwater pumping data, were collected. To evaluate surface/groundwater resources, we developed a 3D numerical model by using the simulator GETFLOWS that solves fully coupled surface/subsurface hydrological flows. The model was discretized into 39 million elements, including a 250 m ×250 m regular grid system based on 5 m DEM in the horizontal direction and around 50 layers based on the geological structure/facies distributions in the vertical direction. Information on vegetation and other land uses was assigned to the model surface. Calibrations were carried out against observed groundwater levels and river runoff data with a trial and error basis. Detailed simulations results and discussion will be introduced in this presentation.

Keywords: Groundwater utilization in emergency situations, 3D hydrogeological model of the Kanto Plain, surface/subsurface coupled simulation

