Development of detecting methods and predicting the impact of disasters and accidents

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[Abstract]

Key Words: Water quality incidents, anomaly detection, prediction of impact, disasters/accidents, rapid monitoring methods, diffusion prediction, integrated platform

Water pollution has an extremely high impact on the lives of citizens. In Japan, many water supply systems use surface water or dams as their source of water and are exposed to the risk of water quality fluctuations on a daily basis.

In more than half of the water quality accidents, the cause is unknown, and in many cases, while the source or substance of the discharge is unknown, we are forced to deal with the situation due to floating oil, floating fish, or strange odors. It is necessary to detect abnormalities as soon as possible and identify the causative substance.

We analyzed the monitoring data and developed an abnormality detection method. An abnormality detection method based on accurate mass spectrometry was applied to actual raw tap water, and an abnormality detection method combining pretreatment and substance identification was developed.

We analyzed the results of validation tests of the screening analysis method by gas chromatography-mass spectrometry (GC/MS) at multiple institutions, and clarified the qualitative and quantitative errors when the same method was applied by multiple institutions. We also conducted basic studies on screening analysis conditions by liquid chromatography-mass spectrometry (LC/MS) and purge trap (PT)-GC/MS, and constructed a database for pesticides and volatile organic compounds (VOCs).

In order to develop a method for predicting atmospheric and riverine dispersion in the event of a disaster or accident, emission scenarios for chemical substances in the atmosphere and water were developed. Advection-diffusion simulations were conducted for toluene and other chemicals in the atmosphere, and a table was created to show the range of exceedance of toxicity values. For water bodies, the model for torrential rainfall was used to improve the accuracy of suspended solids concentration estimation, and the same table was developed for LAS as for the atmosphere.

We provided a program for an integrated platform for rapid prediction methods, and studied the implementation of a basic geographic information system, a tool for estimating the concentration of chemical substances, a tool for retrieving health effects information, and a tool for estimating the amount of exposure. Especially focusing on atmospheric dispersion and river discharge, we improved and expanded the tools and data, and integrated them into the information infrastructure based on the study of integration with surrounding information.

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