（学位第３号様式）

学 位 論 文 要 旨

氏　名	Masahiro Takahashi
題　目	Study on Residual Saltwater Behavior in Water Storage Area of Subsurface Dam (地下ダム貯水域における残留塩水の挙動に関する研究)

The effect of climate change necessitated the construction of subsurface dams as one countermeasure for securing freshwater resources in small islands. The behavior of residual saltwater in the storage area of subsurface dam was examined based on the laboratory experiments and numerical analysis. First, laboratory experiments on saltwater intrusion in a confined aquifer were performed and the behavior of residual saltwater trapped between the cutoff wall and the storage area were observed. The results showed that the toe of the saltwater wedge gradually retreated until all saltwater was finally removed, and that the cutoff wall is effective to prevent saltwater intrusion. Numerical analyses using SEAWAT showed that the most effective wall height to washout the residual salt mass was approximately equal to the height of the saltwater wedge at the where the cutoff wall location. A rotational flow in the saltwater wedge occurred and fresh water discharge flowing at the outer part of this circulation transported and finally flushed out the saltwater.

Secondly, laboratory experiments and numerical simulation were performed to investigate the behavior of residual saltwater after installation of a cutoff wall in an unconfined aquifer. The dispersivity values were estimated using image analysis of tracers on pulse and continuous injection experiments, and validated by numerical analysis and analytical solution. The ratio of longitudinal to transverse dispersivity was 20 in the red food dye tracer and 27 in the fluorescent tracer experiment. Saltwater intrusion and removal experiments were then simulated in SEAWAT using the estimated dispersivity ratio of 27. Numerical analysis using a fixed longitudinal dispersivity showed that compared with a dispersivity ratio of 10, the removal time of the residual saltwater was 1.5 and 2 times for the dispersivity ratio of 27 and 100, respectively. This result shows that transverse dispersion significantly affected the removal process.

Finally, a field scale numerical analysis of the behavior of the residual saltwater after installation of cutoff wall at a coastal area was performed. As with the laboratory experiments, the residual saltwater was gradually washed out. However, it took 25 years for more than 70% of the residual saltwater to be removed. Therefore, real field scenario would require forcible removal of the residual saltwater by pumping to enable freshwater use as soon as possible.