4. Development of a System for Visualizing Geological Components at the Face of a Shield-driven Tunnel

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Longer shield-driven tunnels have recently been constructed in urban areas because of the difficulty in acquiring sites for vertical shafts or because of the congestion of buried structures. In an increasing number of cases, therefore, the soil type varied while shield tunneling progressed. Controlling the progress of the shield tunneling machine is more important than before. In closed-type shield tunneling machines, geological variations are generally evaluated based on such parameters as the muck properties, pressure at the tunnel face and cutter torque. Then, the average components of the ground at the face are grasped. As a result, the shield tunneling machine progresses without identifying the components of the ground. When it encounters hard soils, the shield tunneling machine gets stranded or skids, and securing the vertical and horizontal alignments of the tunnel becomes difficult.
In this study, a geological evaluation method [1] using the measurements of accelerometers attached to the shield surface plates was applied, and a “face geological components visualization system” was developed that is capable of planar evaluation regardless of the diameter or type of the shield by mapping the soil components at the face. The developed system was applied to a 2.36-m-diameter earth pressure balanced shield, and geological variations and geological components at the face were evaluated during the progress of the shield. The results are described in this paper.

Key words: shields, geological variations, accelerometers, face geological components visualization