New evaluation theory for initial rock stress by borehole jack test

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It is necessary to evaluate the deformability and initial stresses of rock masses in order to study the stability of cavities and tunnels excavated in deep underground. For initial stress measurement rock masses, in Japan, hydraulic fracturing method and stress release method have been used. However, these measurement methods are costly and time consuming.

On the other hand, borehole jack test is an effective method to measure rock deformability. The stiffness of rock masses is calculated from the slope of the linear part of the pressure-displacement curve obtained by the test. In this study, it is theoretically revealed that the initial stresses in rock masses are analyzed from pressure-displacement curves obtained from a set of tests where three or more loading orientations are assigned.

In this paper, the theory to find initial stress from borehole jack test is derived using exact elastic solution, and the result that its validity is verified by laboratory experiments using large concrete specimens is shown.

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