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Using a Large Centrifuge for Academic Research

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Abstract

Engineering centrifuges are unusual pieces of capital equipment, and mainly used for geotechnical modelling purposes. The centrifuge is used to spin an experiment, increasing the gravity experienced by the experiment's contents, such that the stress state in the model is equivalent to the stress state of the representative prototype. The enhanced gravity level allows large prototype problems to be simulated at a small model scale, whilst achieving stress state similitude between the model and prototype scale. This is especially important for geotechnical engineering problems, where the stiffness of the ground is very dependent on its stress state. The geotechnical engineering group at the Civil and Structural Engineering department at the University of Sheffield has recently commissioned two centrifuges as part of a new research centre, more details of which can be found in recent publications (Black, 2014; Black et al., 2014). The centerpiece of the newly established Centre for Energy and Infrastructure Ground Research is the 4 m diameter 50 g-ton centrifuge currently undergoing commissioning.

The presentation will focus on the fundamentals of centrifuge modelling, and the importance of the technique in modelling geotechnical problems. However, it will also highlight how the technique is available to other disciplines who may want to take advantage of the unique experimental platform. After all, there are only around 50 similar machines in the world.

References

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