

Centrifuge modelling of basement heave in over-consolidated clay

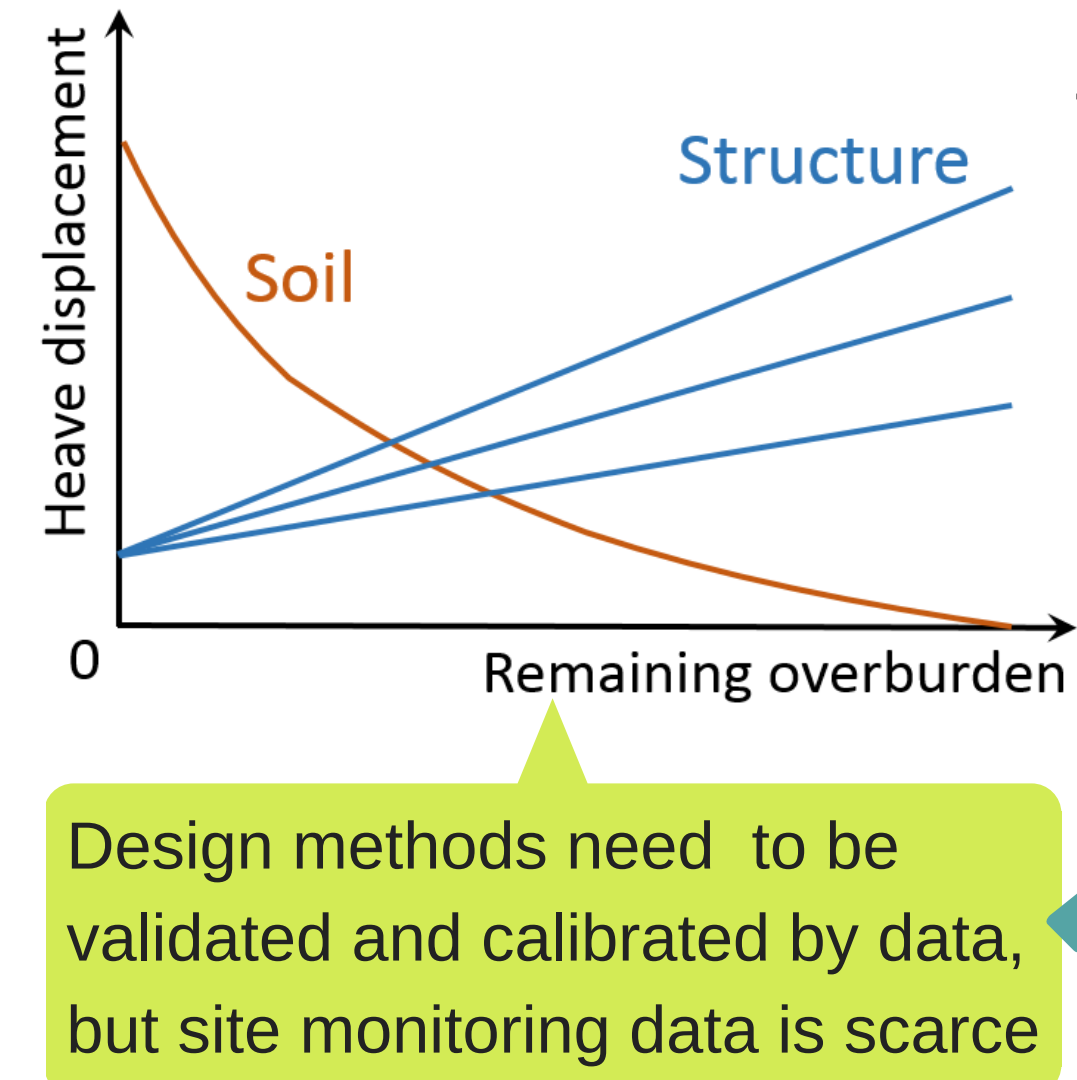
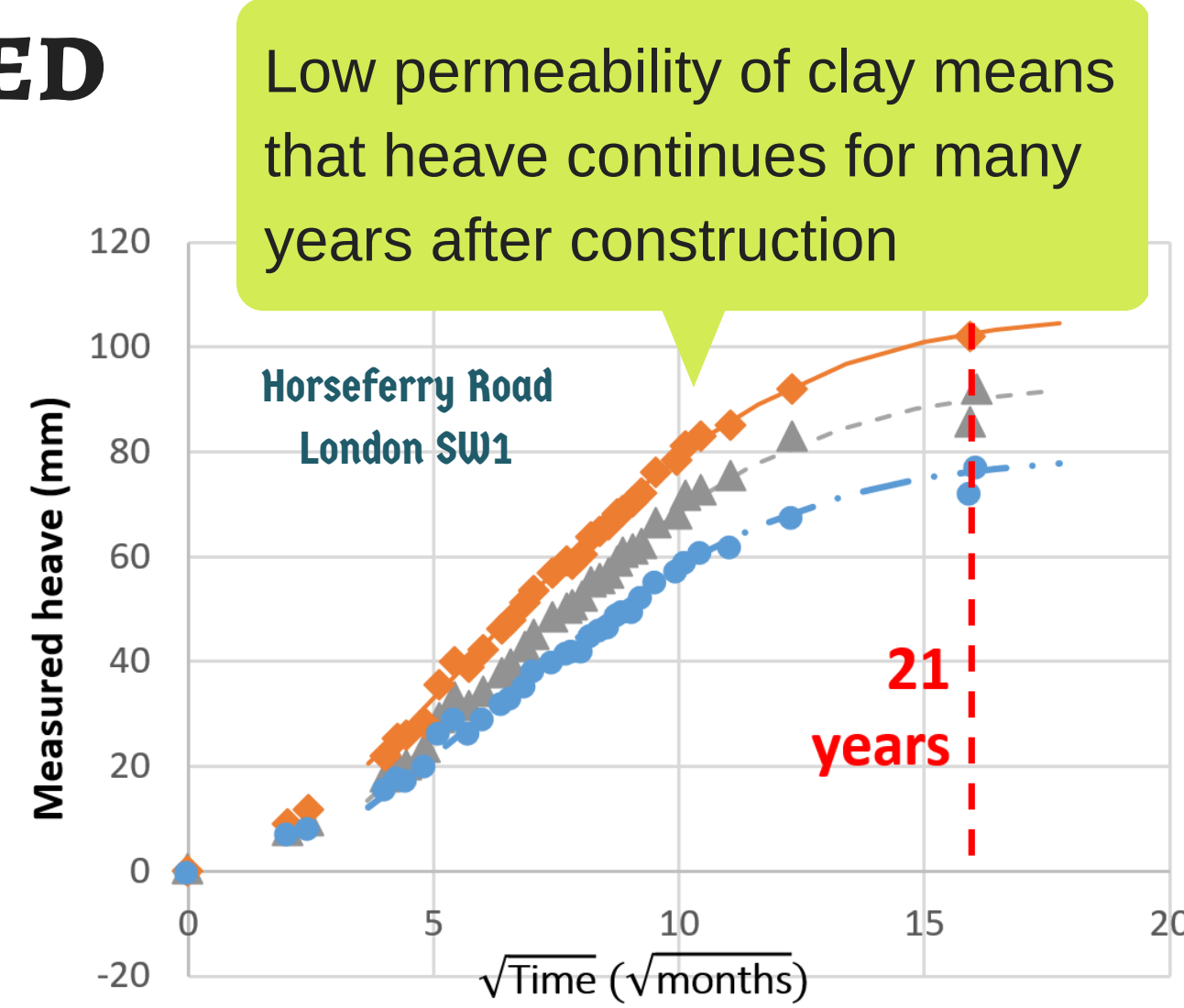
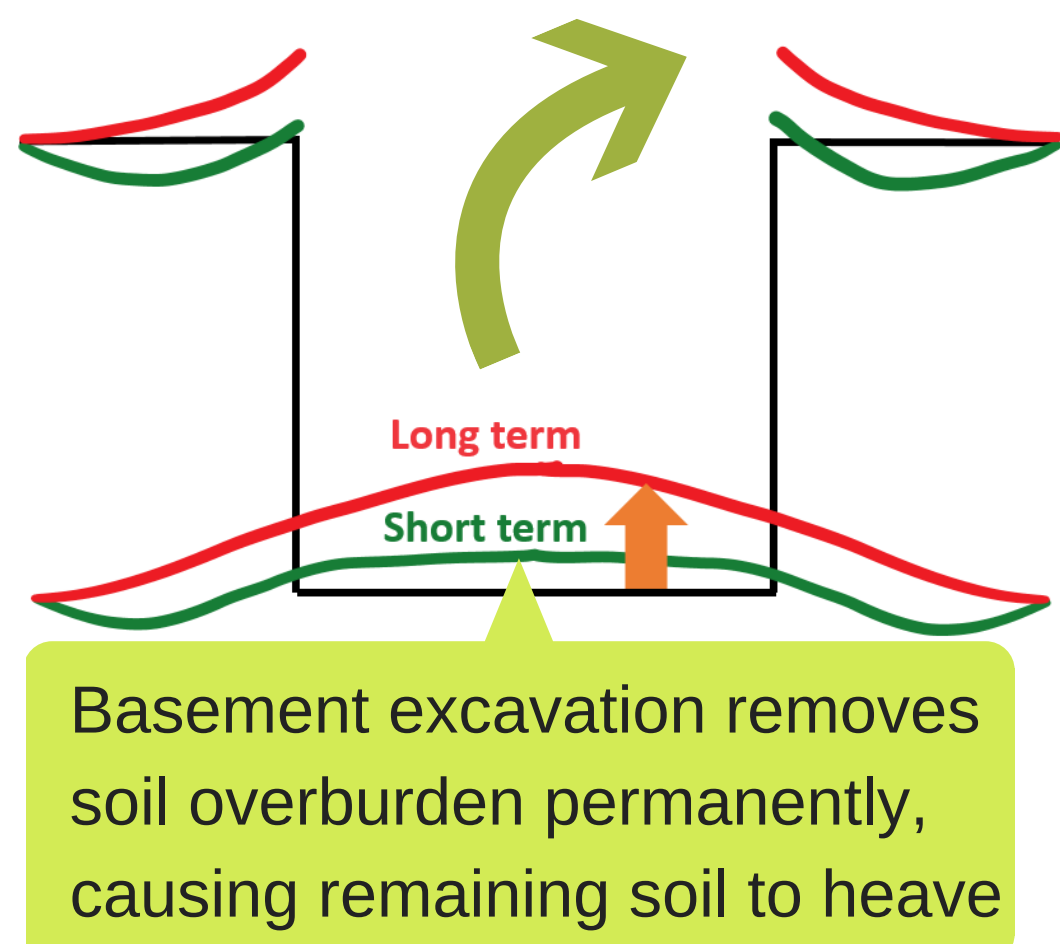
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Long-term heave of base slabs is a pertinent problem in underground construction in stiff clay, for example in London.

This project aims to enhance our understanding of soil-structure interaction in basement heave by experimental simulation.

EXPERIMENTAL NEED

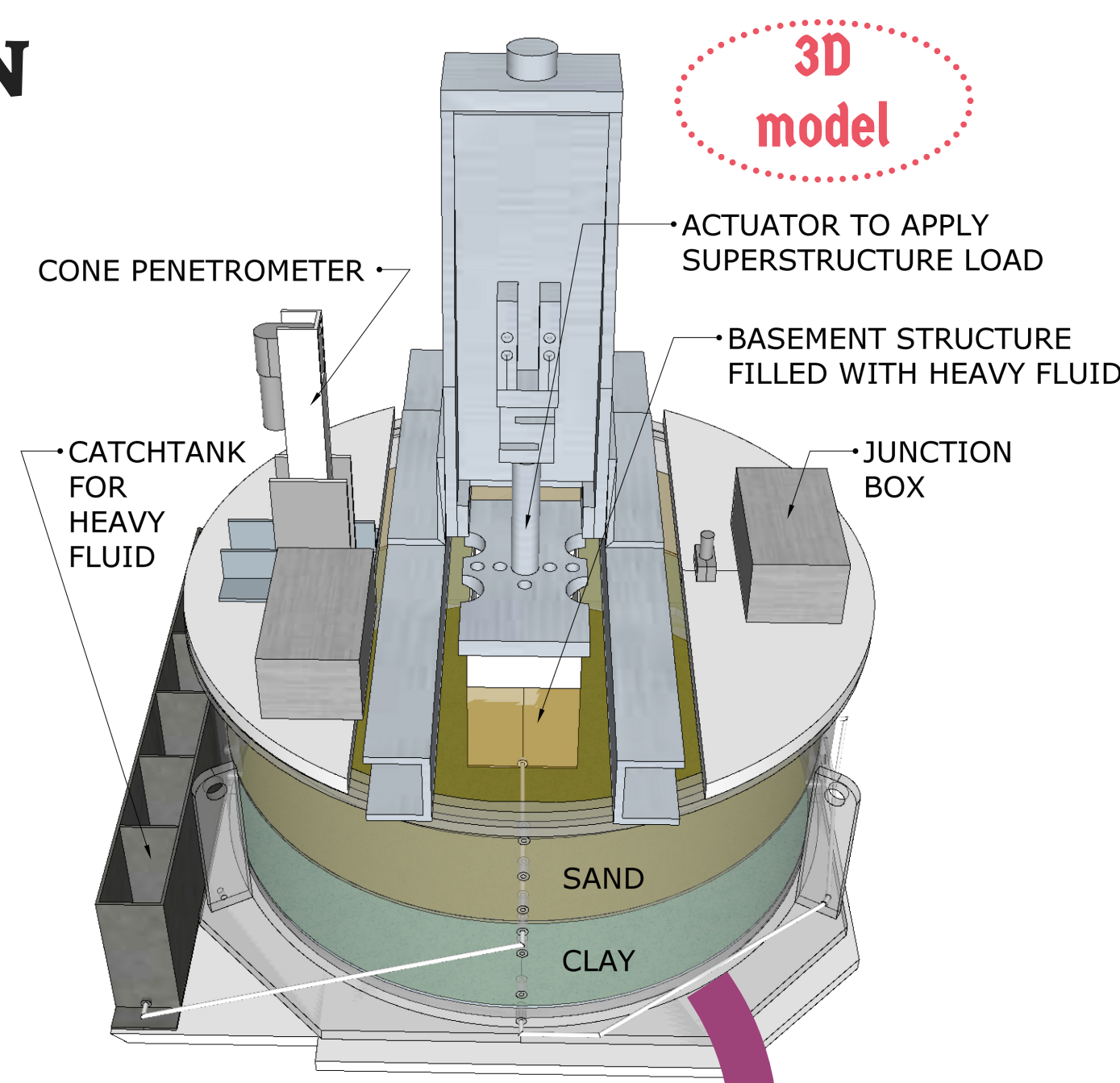


Research gap

Use **experimental simulations** to quantify the effect of basement **structural stiffness** on long-term heave **pressure** and **displacement**

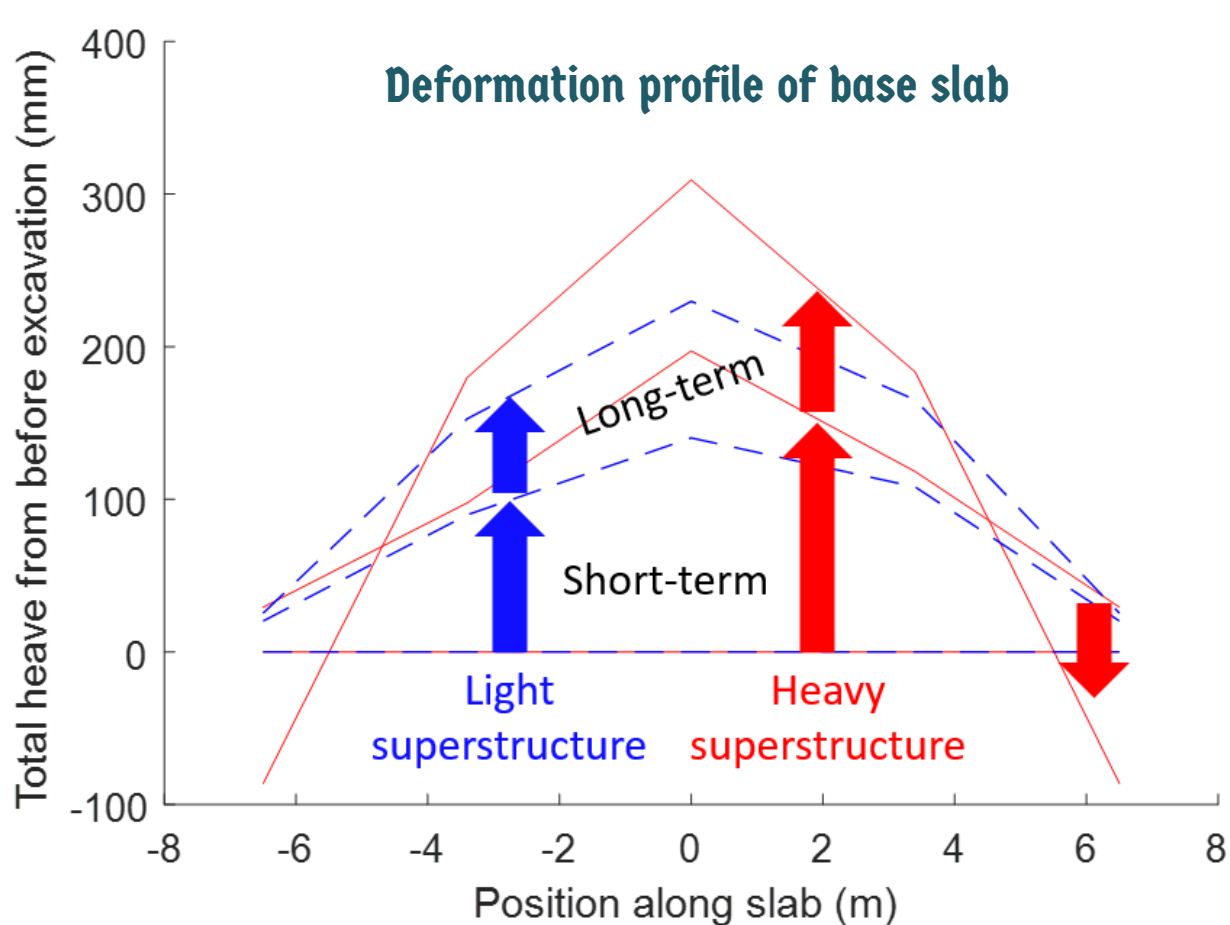
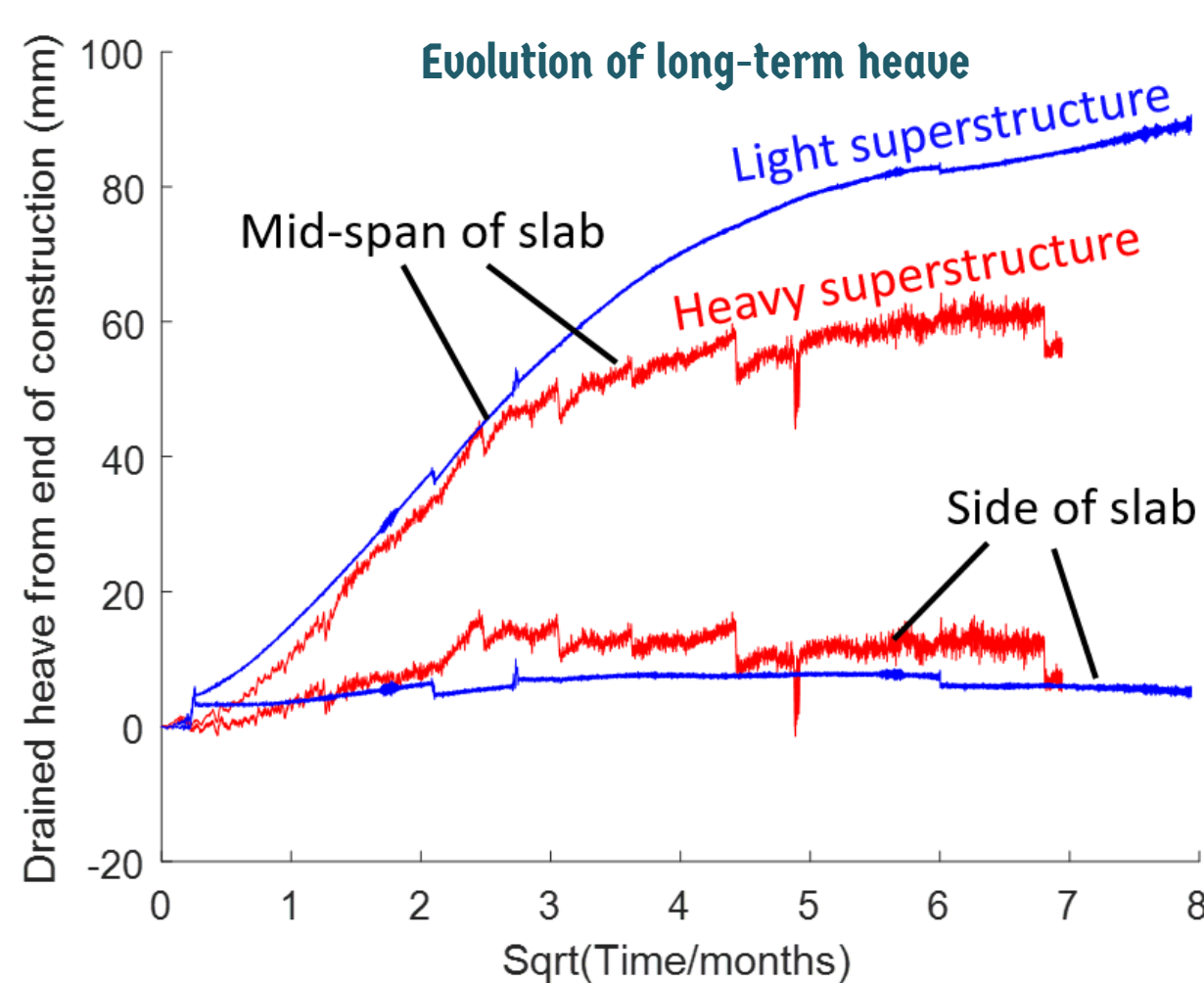
CENTRIFUGE PACKAGE DESIGN

- Over-consolidated, saturated **Speswhite kaolin** overlain by dry **Hostun sand**
- Structural stiffness to match typical basement
- Sodium polytungstate** solution drainage to simulate excavation
- Actuator** to apply structural load
- LVDTs** and **strain gauges** to monitor structural behaviour; **tactile sensing mat** to measure heave pressures

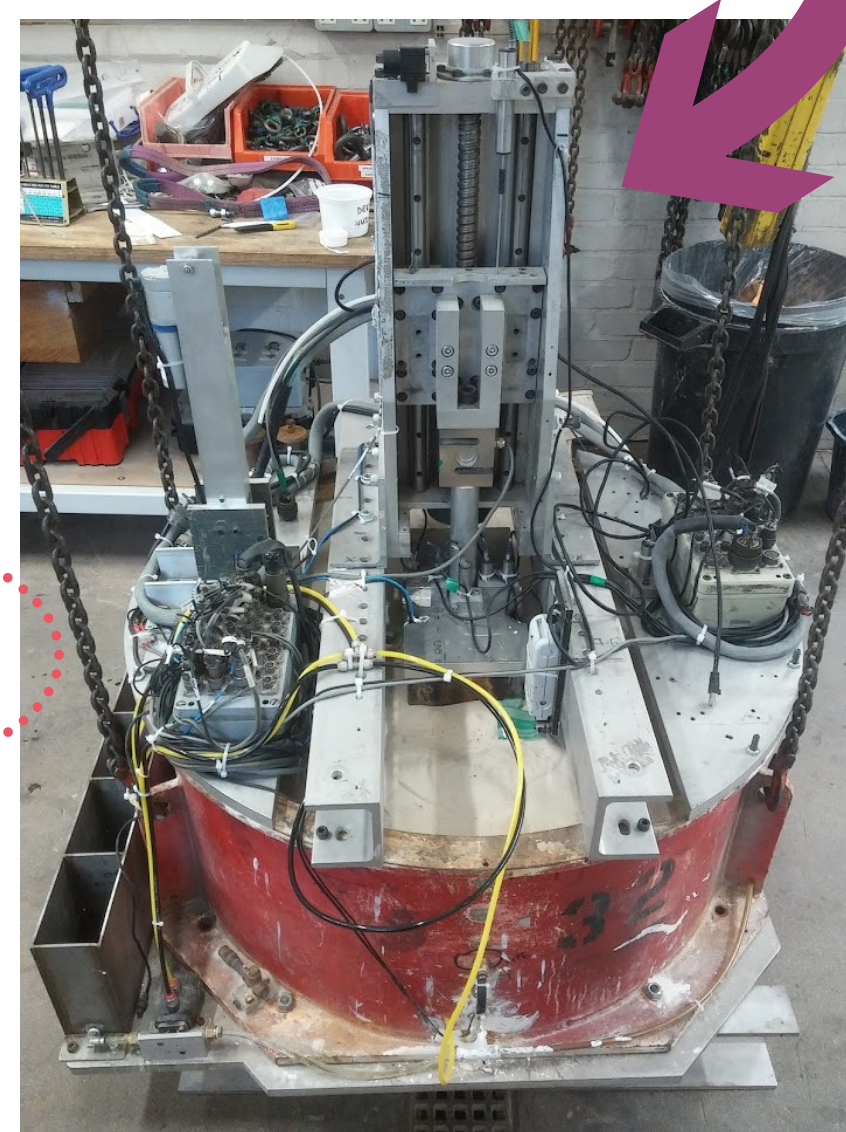


- x100** **N g** centrifuge acceleration
- x100** Length scales down as **N**: 30m basement becomes 300mm model
- x10000** Time scales down as **N²**: 1 year on site becomes 1 hour in lab

PRELIMINARY RESULTS



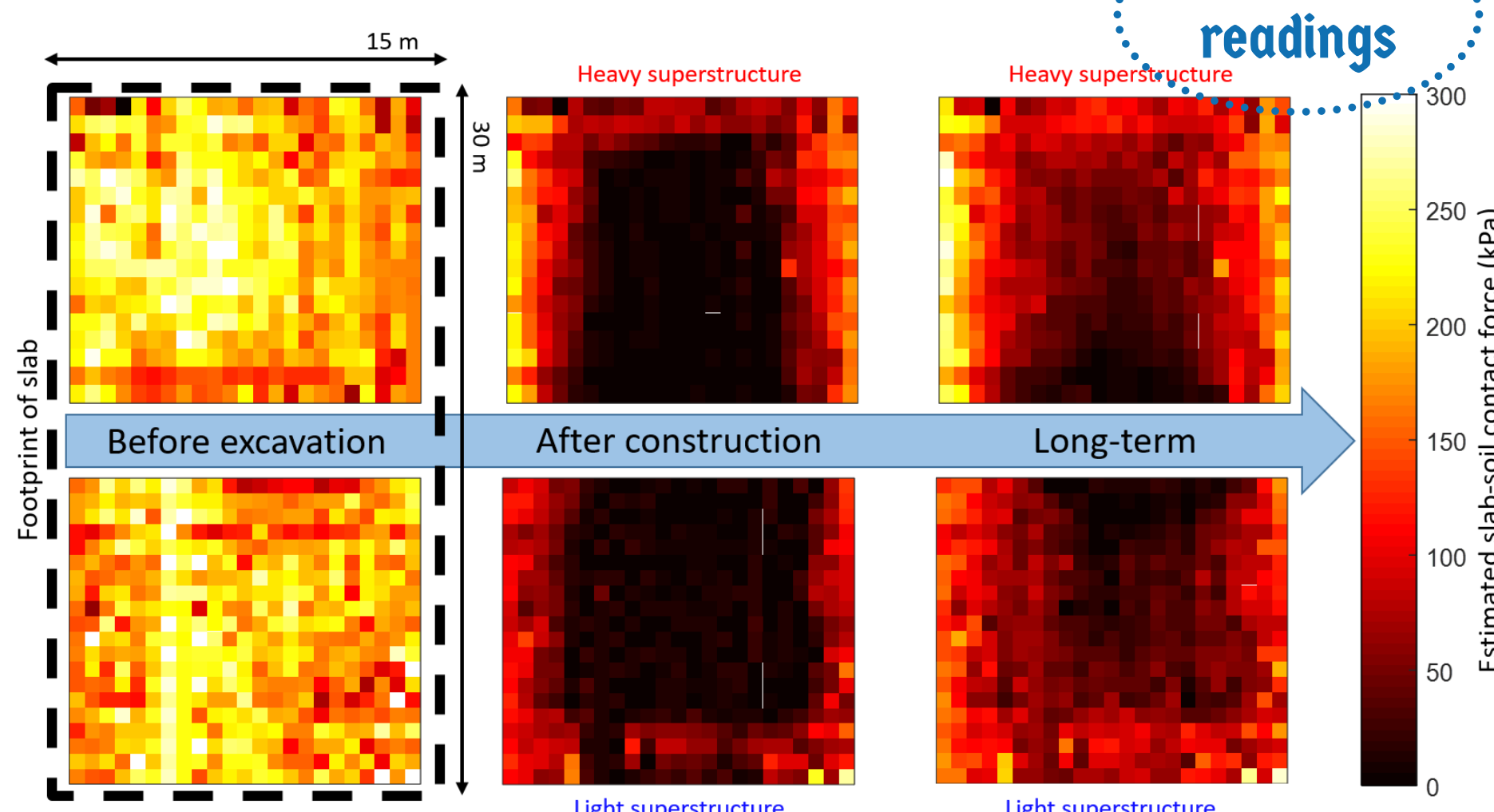
Centrifuge package



- Repeat with different **structural stiffness**
- Build **finite element models** to compare with experimental results
- Postulate **mechanisms** of soil-structure interaction in heave using data obtained in this research project

Future work

Tactile mat readings



- ### Acknowledgements
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 - Laing O'Rourke** | Adam Locke, Corin Walford, Wilson Kesse
 - Mott MacDonald** | Ethel Cortegana, Michael Williamson, Sergio Solera, Yu Sheng Hsu
- ### References
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 - Chan & Madabhushi (2018): *Centrifuge simulation of heave behaviour of deep basement slabs in over-consolidated clay*, ICPMG, London
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