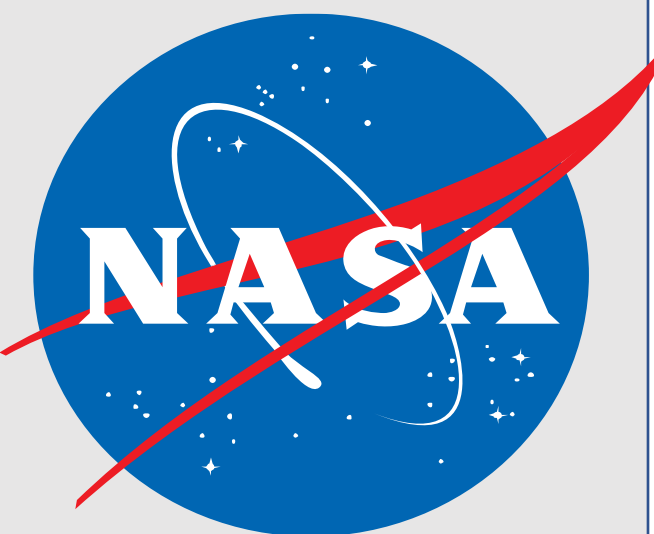


Fundamental Regolith Properties, Handling and Water Capture (FLEET) Update



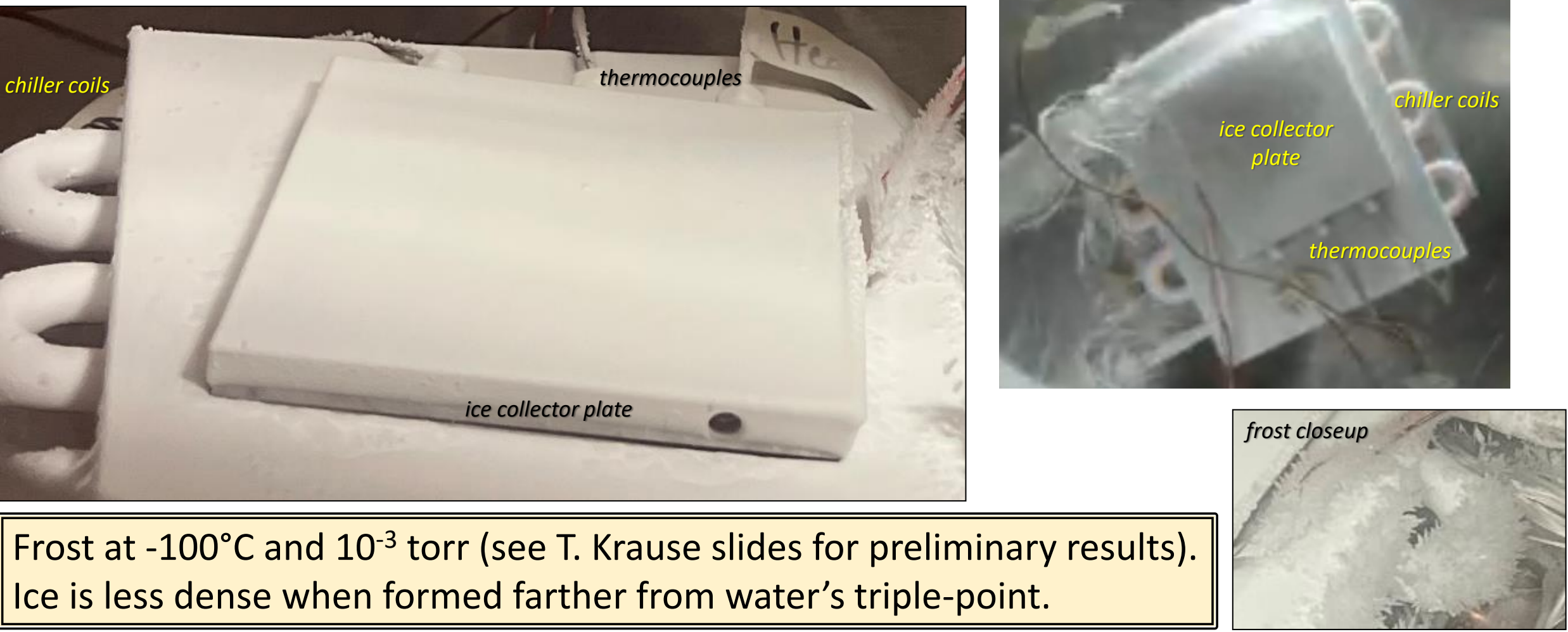
L. Gertsch, J. Pierce, B. Compton, T. Krause, J. Stewart, E. Rezich, M. Proctor, F. Thomas, J. Fothergill / NASA GRC; J. Mantovani / NASA KSC
for Space Resources Roundtable XXIV, 2024, Golden, CO, USA

Goal: Develop concepts applicable to regolith excavation, regolith handling, and water collection for Moon and Mars.

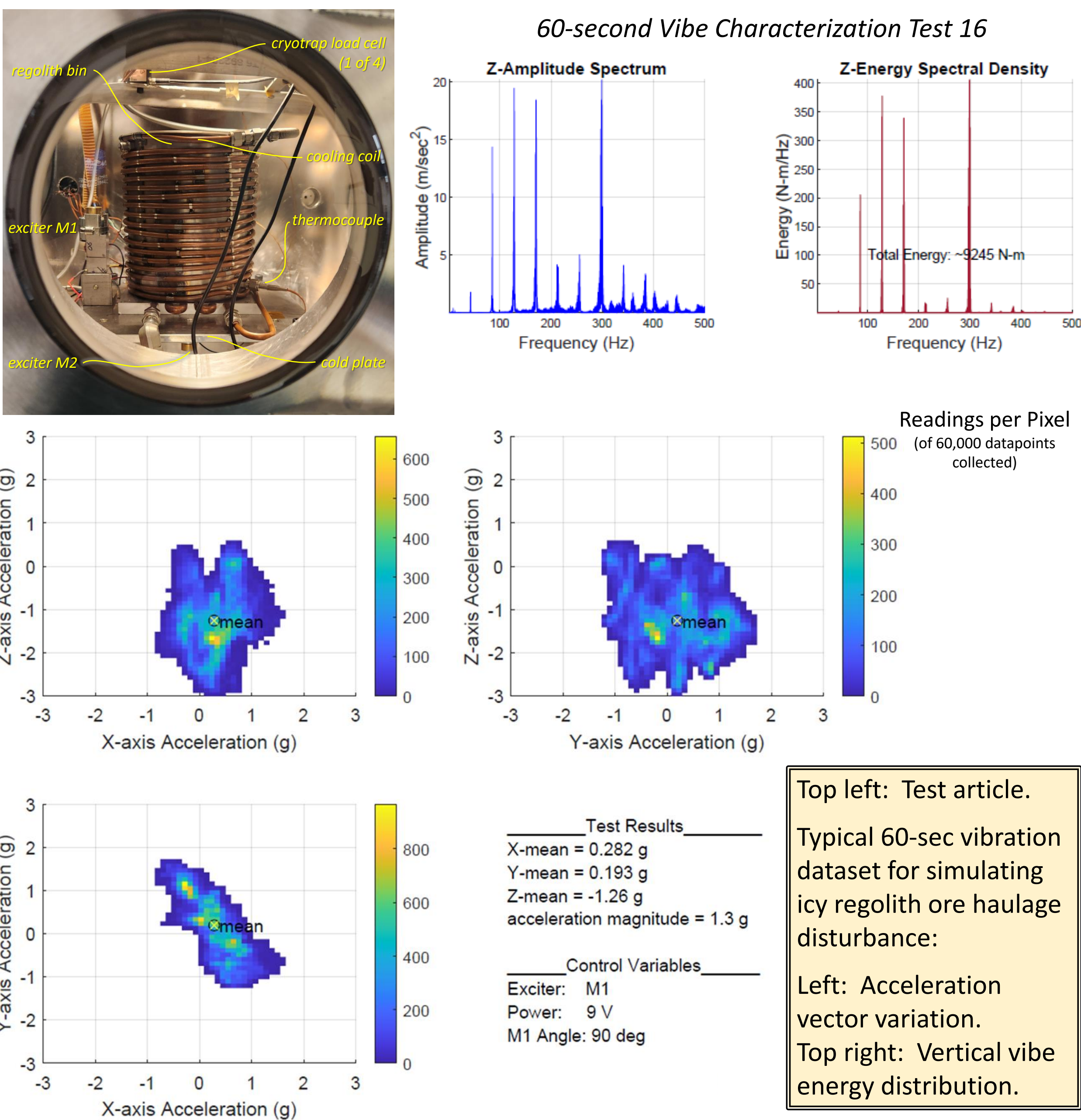
Specific Task Goals

- Ultrasonic Blade (UB) evaluates effects of vibration-assisted excavation.
- Bulk Water Stability (BWS) evaluates water sublimation loss from regolith handling.
- Mobile Water Extractor (MWE) evaluates water vapor loss from heating in an unsealed (open-gap) bin.
- Vertical Regolith Conveyor (VRC) evaluates stick-slip and vibratory spiral motion of regolith.
- Columnated Soil Seal (CSS) evaluates piled regolith to seal pressure chambers.
- Water Capture (WC) evaluates the form of captured ice, needed to design solid-ice hauler volume.

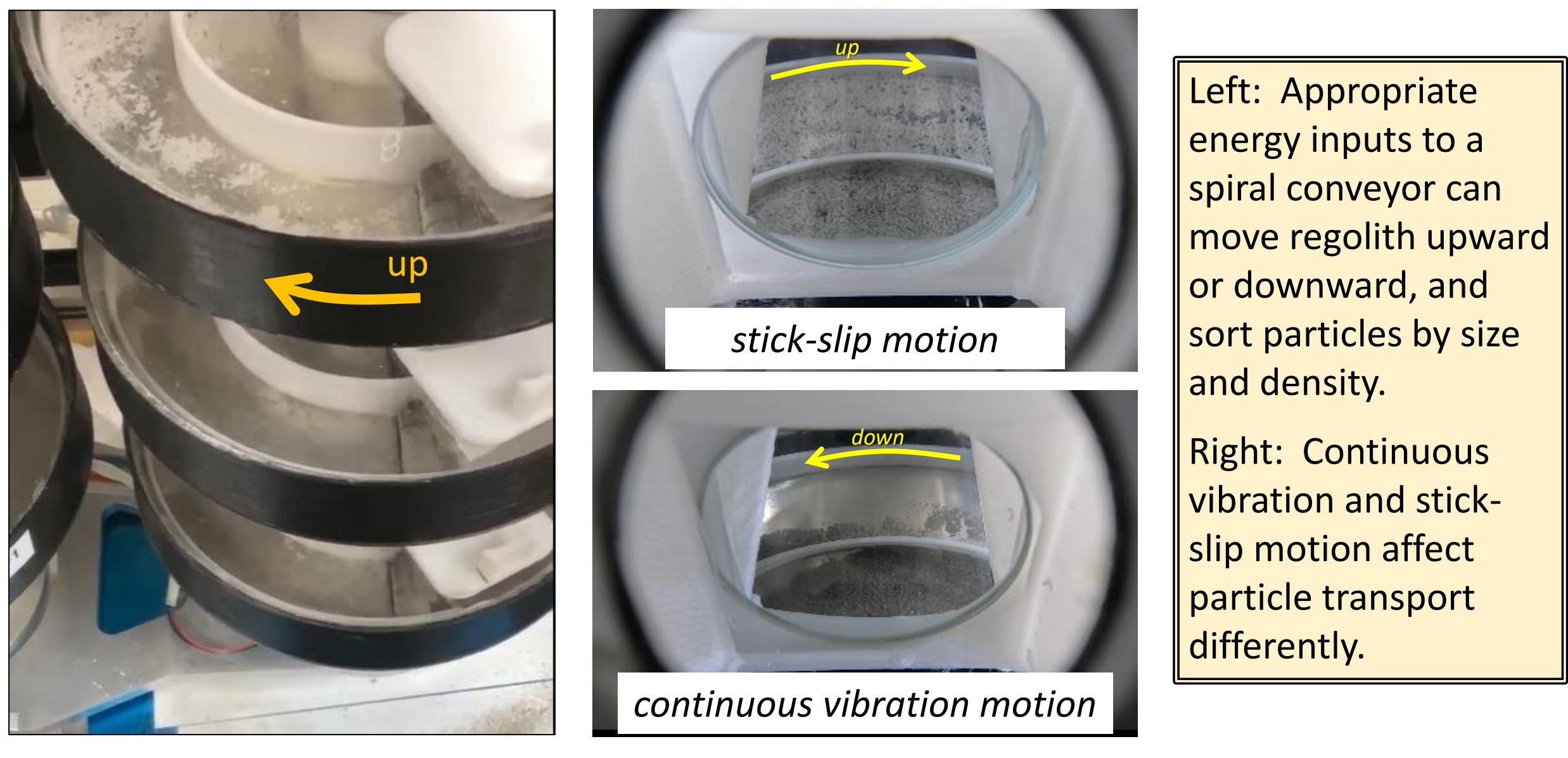
WC: Water Ice Capture Density



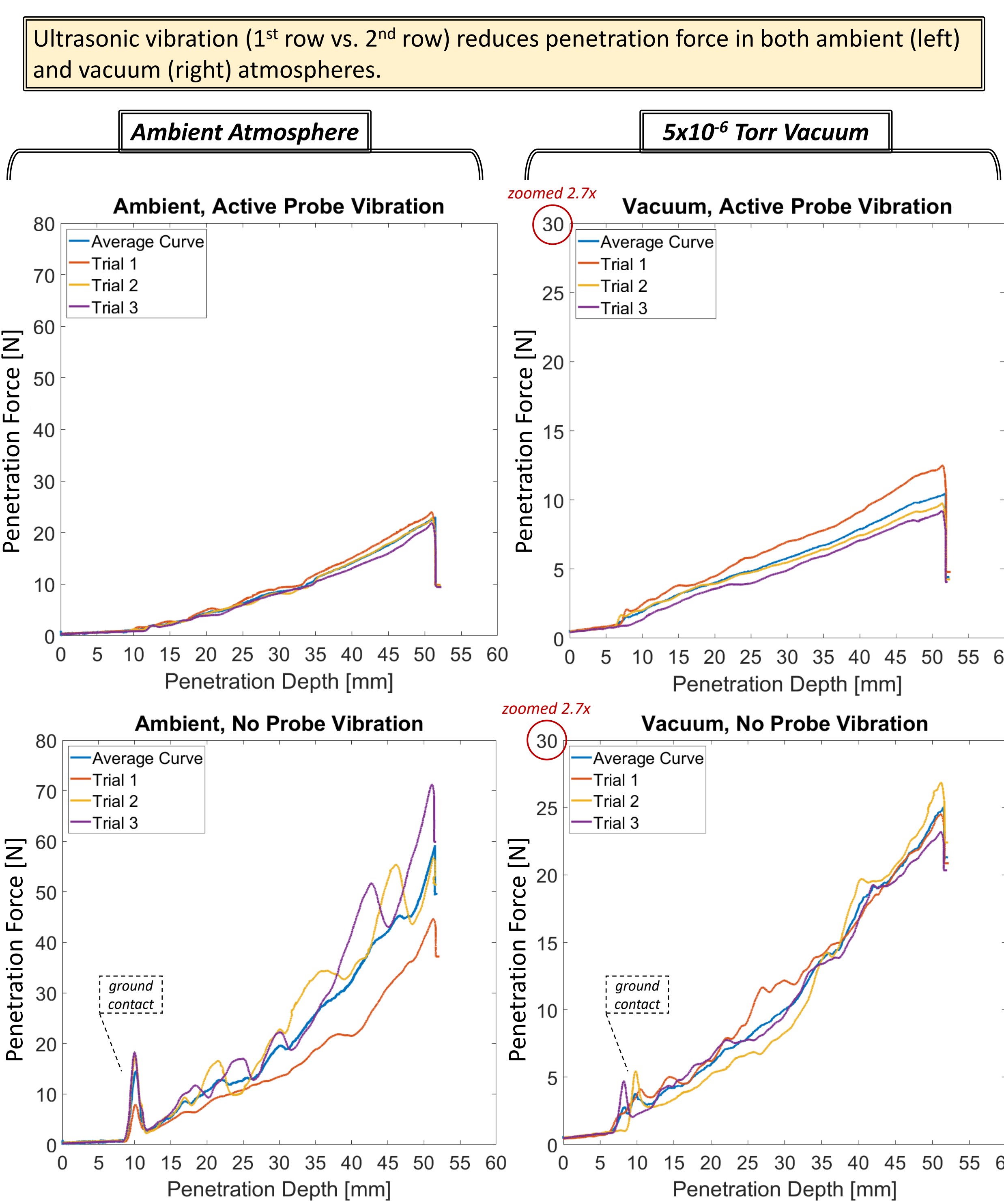
BWS: Vibration Environment



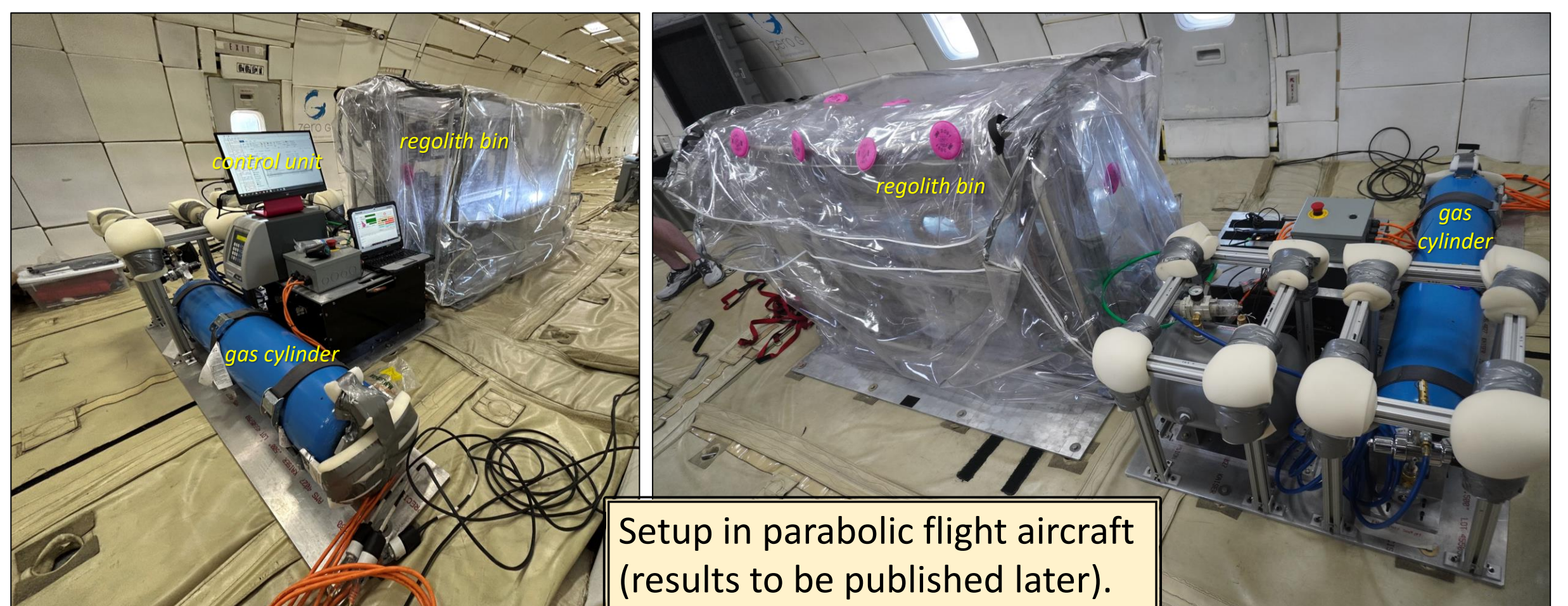
VRC: Vertical Spiral Conveying



UB: 20 kHz-Vibe Excavation Assist in Vacuum



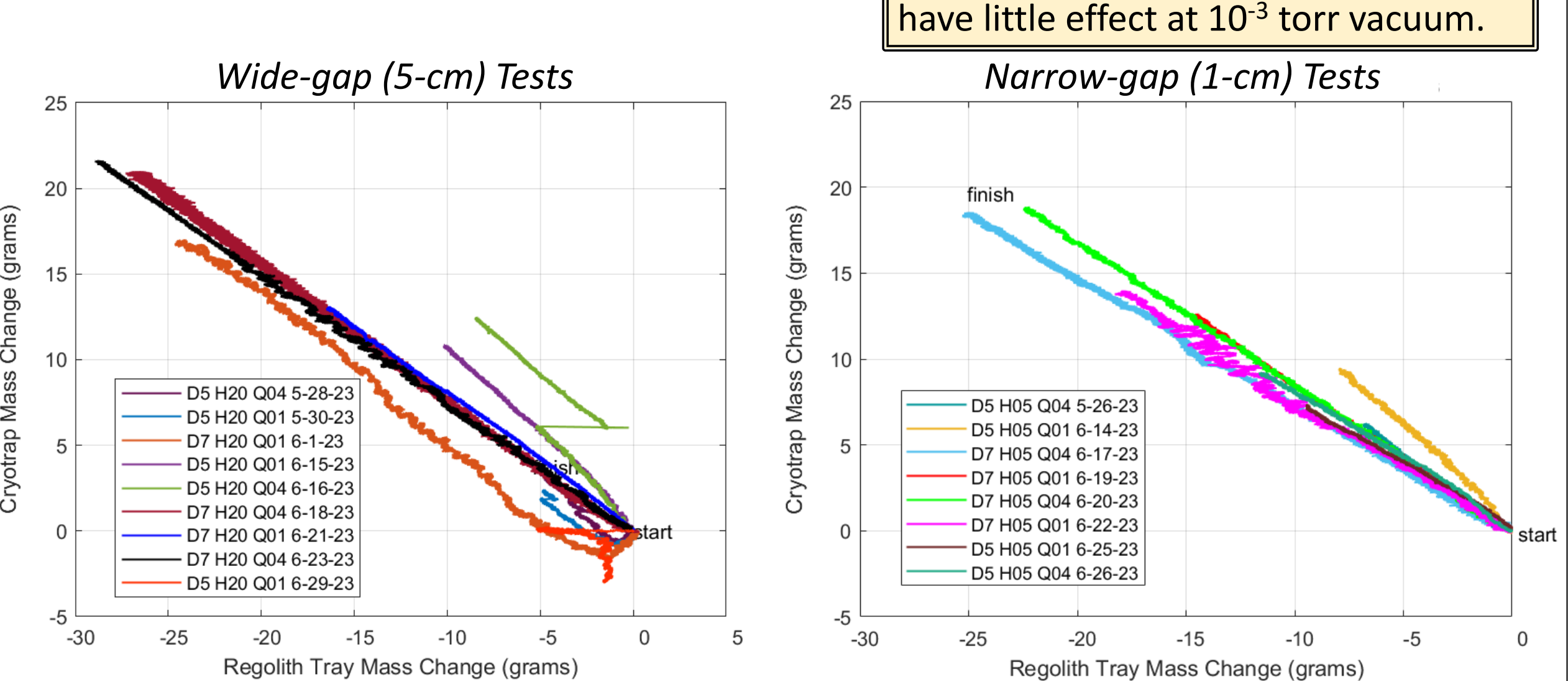
UB: 20 kHz-Vibe Excavation Assist in Other Gravities



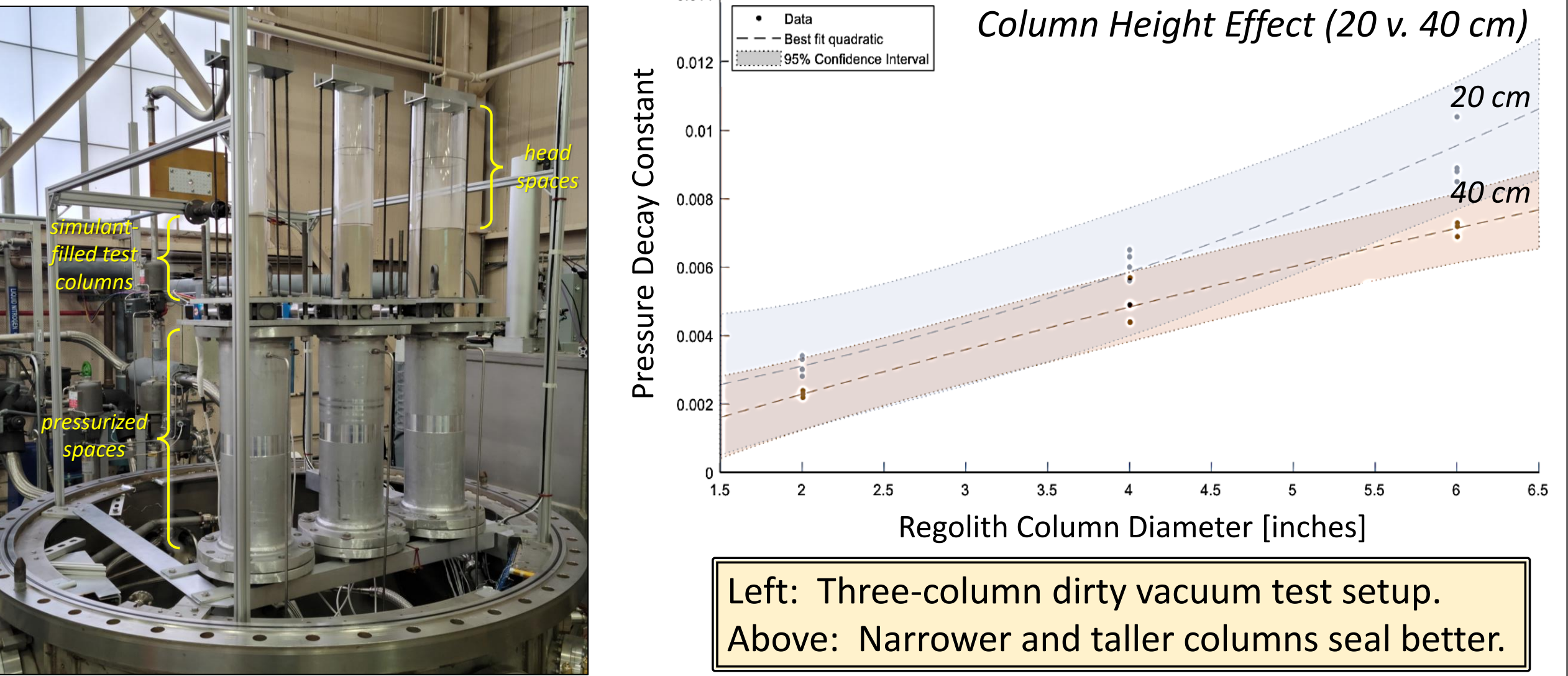
Anticipated Next Steps

- Establish gravity effects on concepts' performance.
- Incorporate ultrasonic assist into ground-engagement tools.
- Refine models of water loss via containment gaps and loose-regolith pressure seals.
- Clarify control-parameter space for vibratory transport and sorting of regolith.

MWE: Open-gap Water Loss



CSS: Loose Regolith as Pressure Seal



Acknowledgments

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