A systematic approach to developing real-time hybrid simulation capability for wave tank testing

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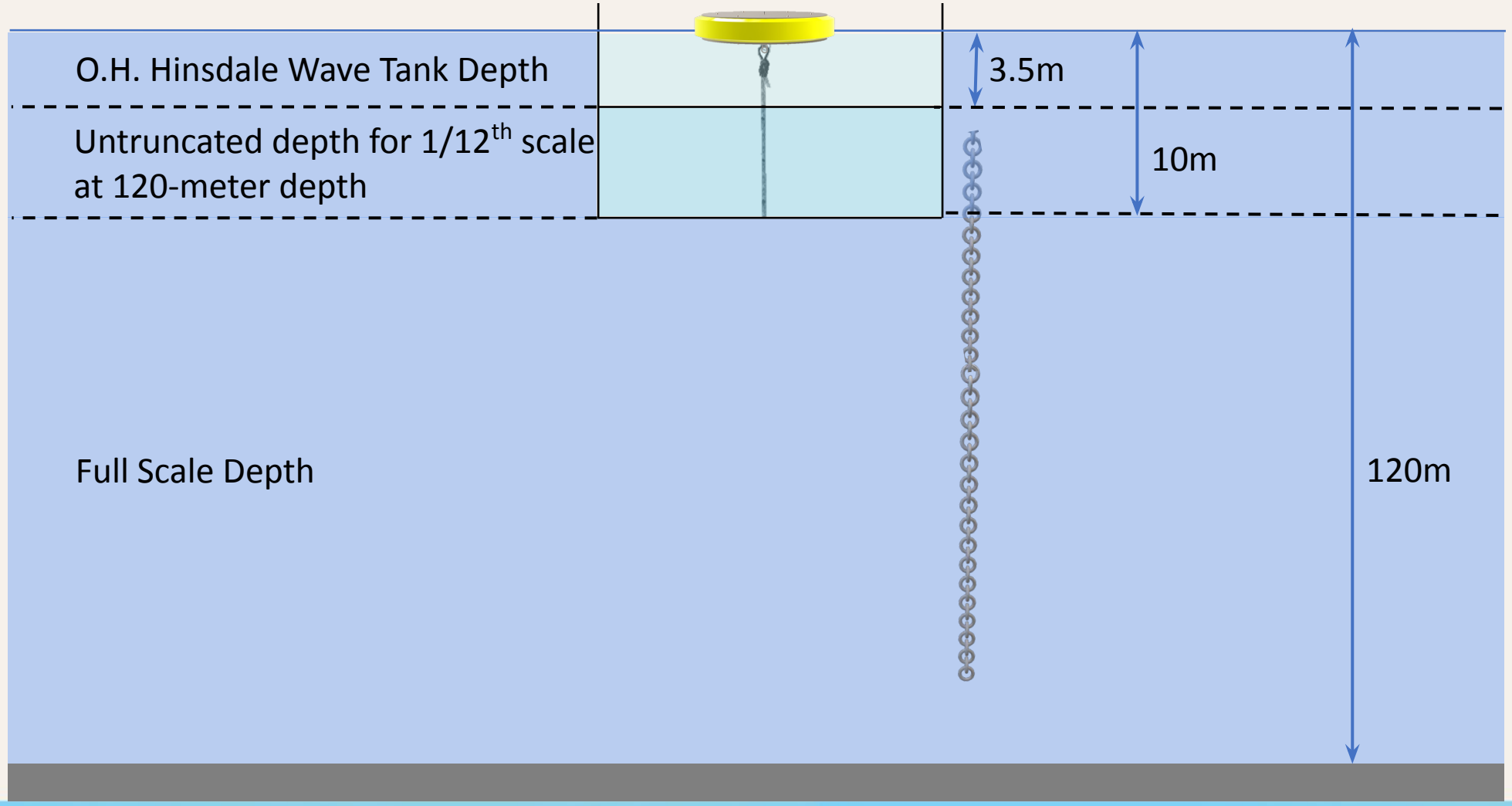
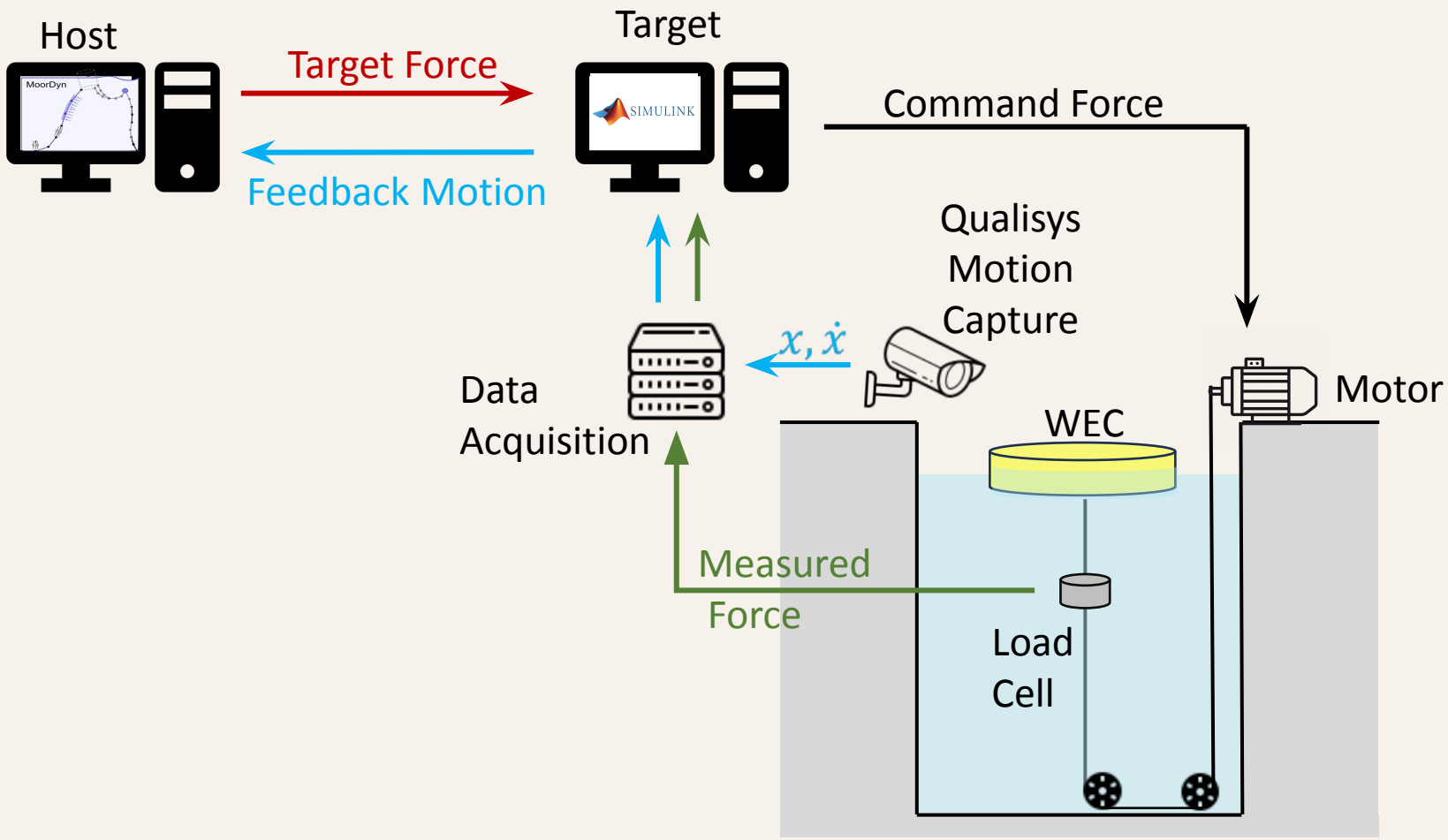
Motivation

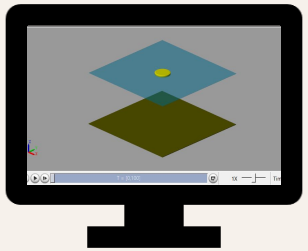

O.H. Hinsdale Wave Tank Depth
Untruncated depth for 1/12th scale
at 120-meter depth
Full Scale Depth
3.5m
10m
120m

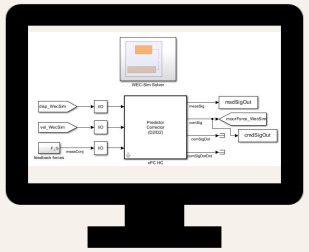
Brief overview of real-time hybrid simulation (RTHS)

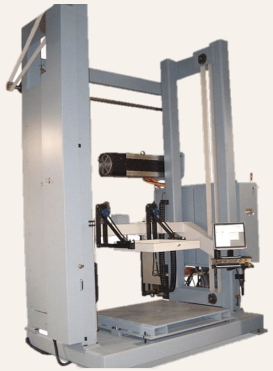


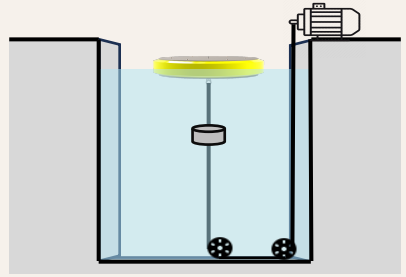
Approach to developing RTHS for WEC mooring

Simulation → Virtual RTHS → Single Loop LTB → Dual Loop LTB → Wave Flume



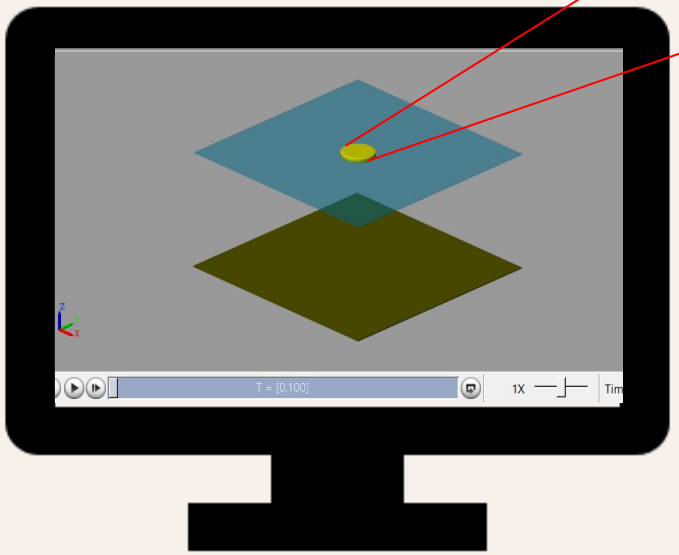


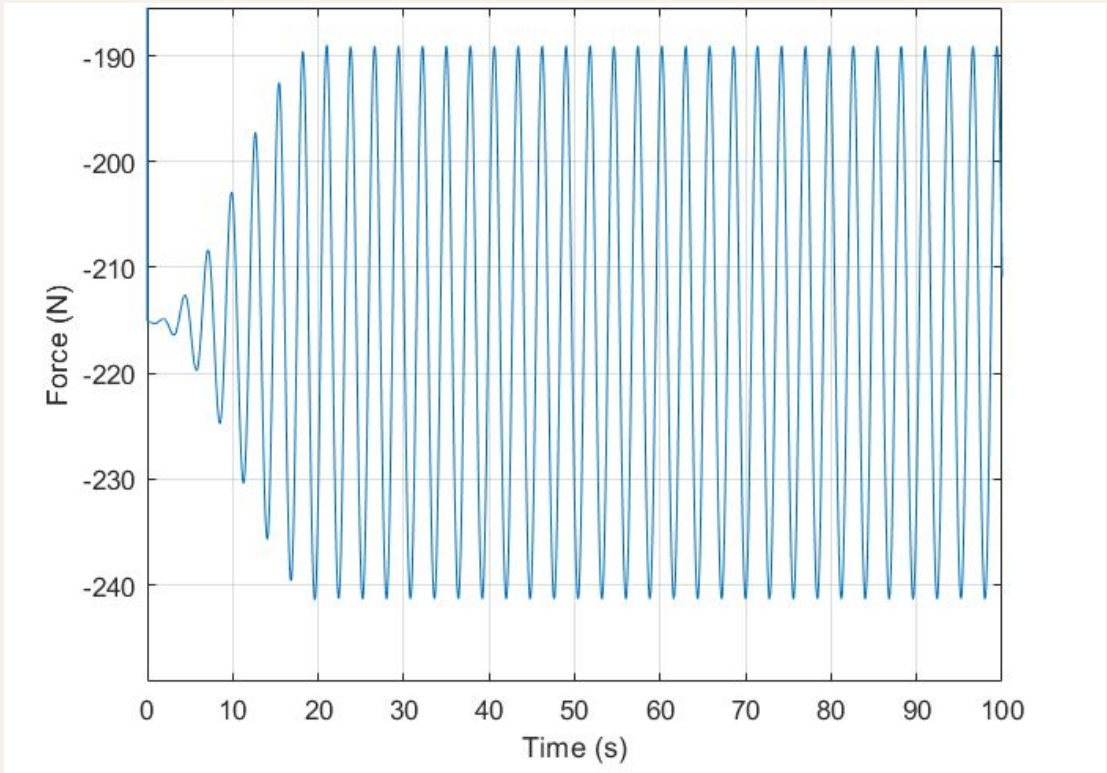




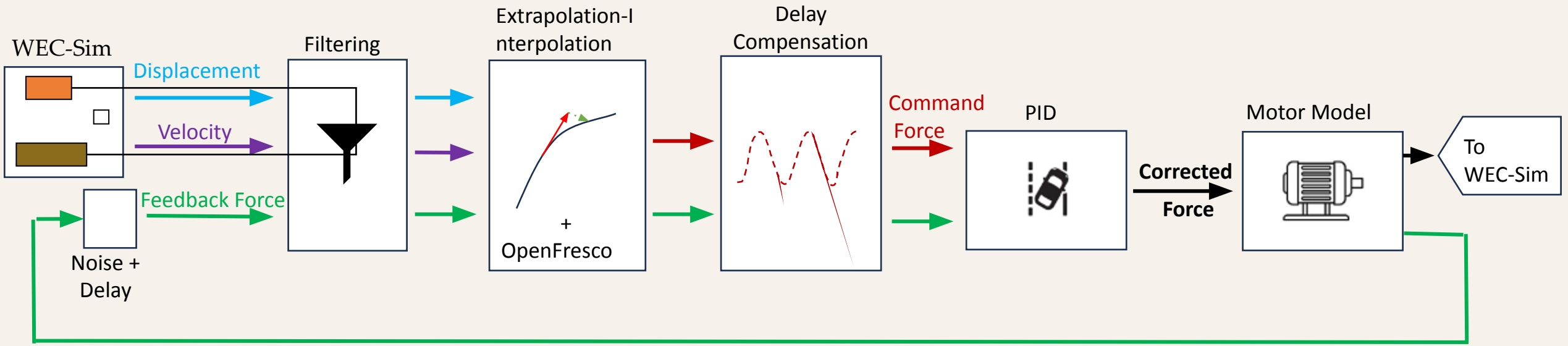
WEC-Sim model

<u>SubWEC</u>
Ø 1 meter
Period 2.8 seconds
Wave height 0.3 meters

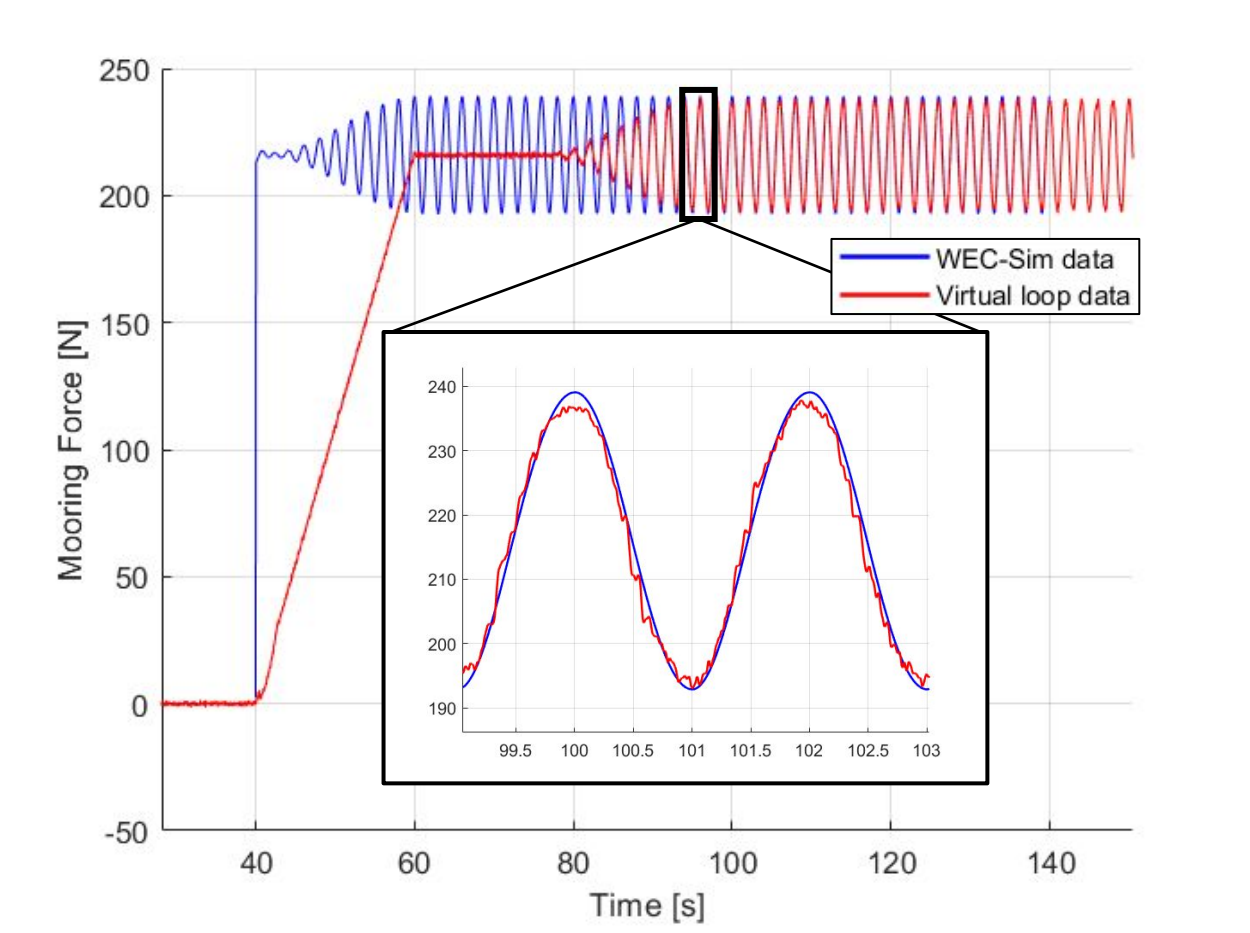




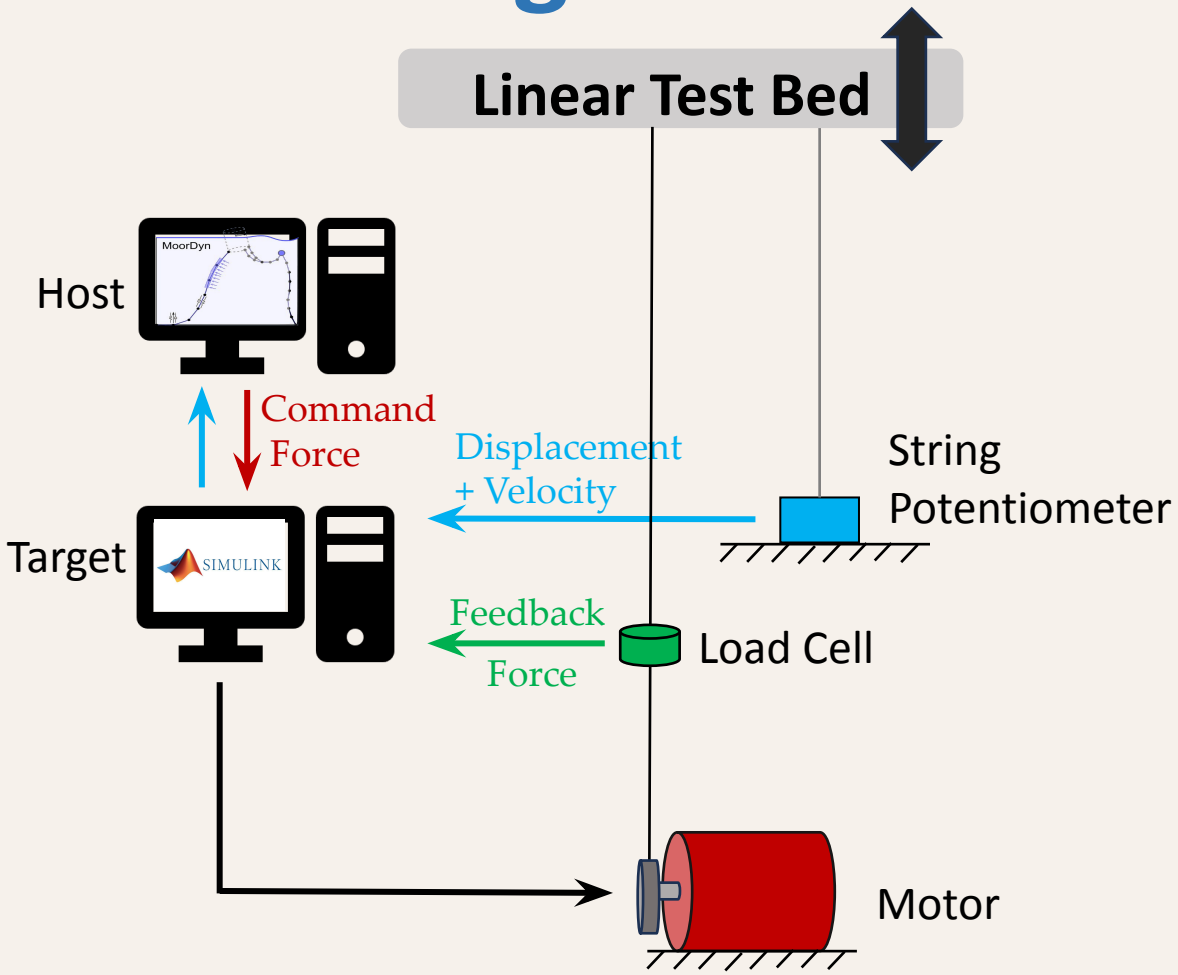
Virtual loop



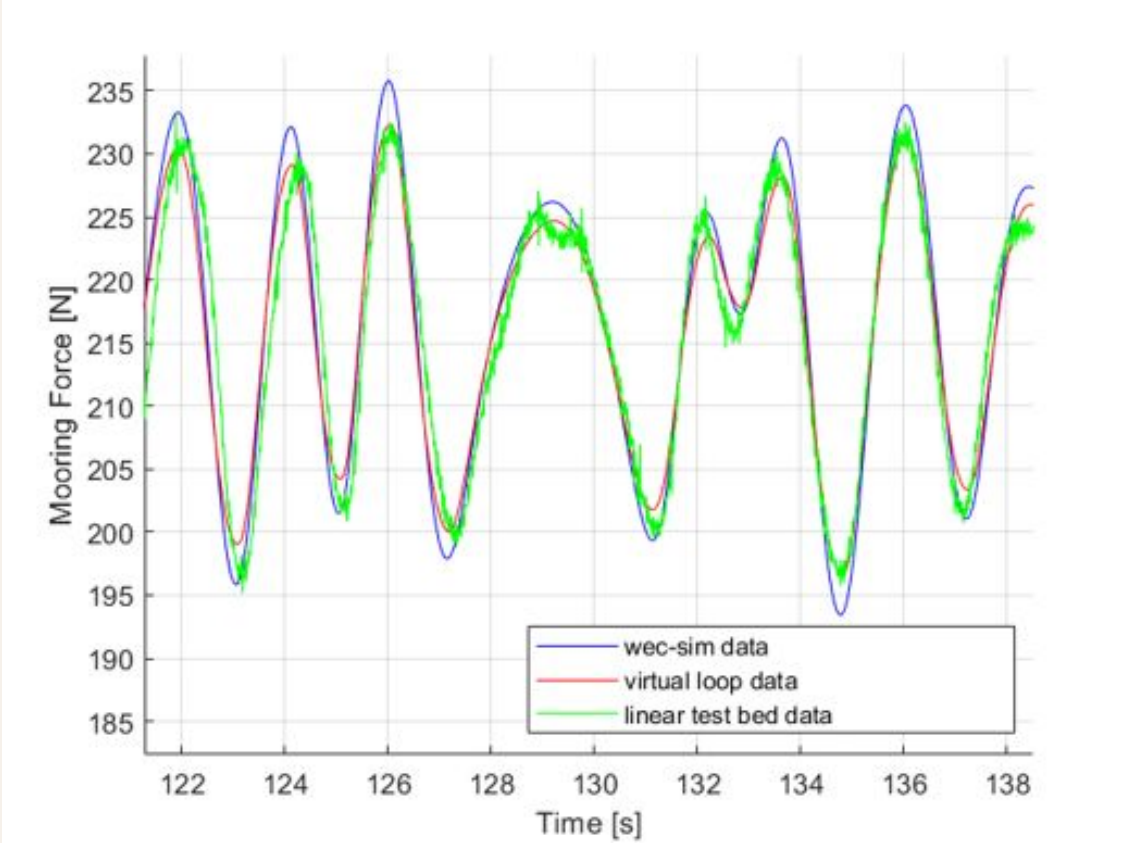
Virtual loop results

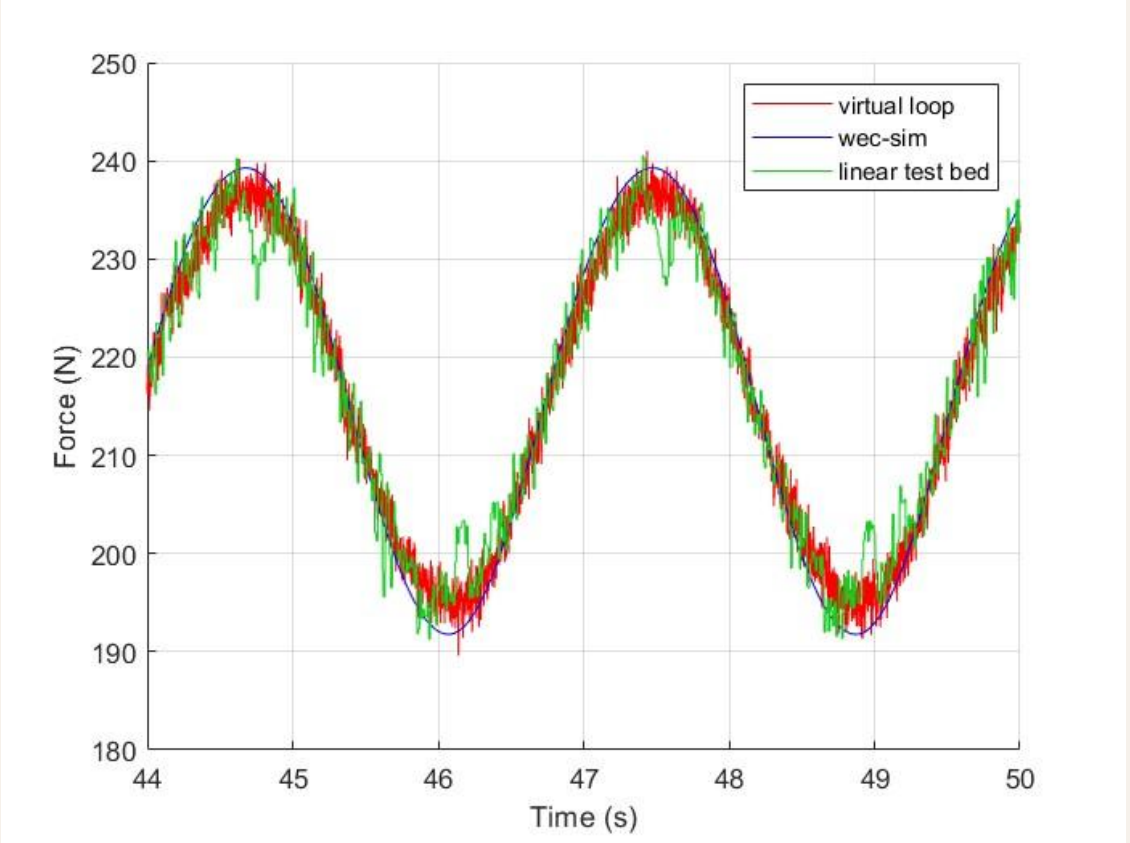


Single-loop linear test bed testing

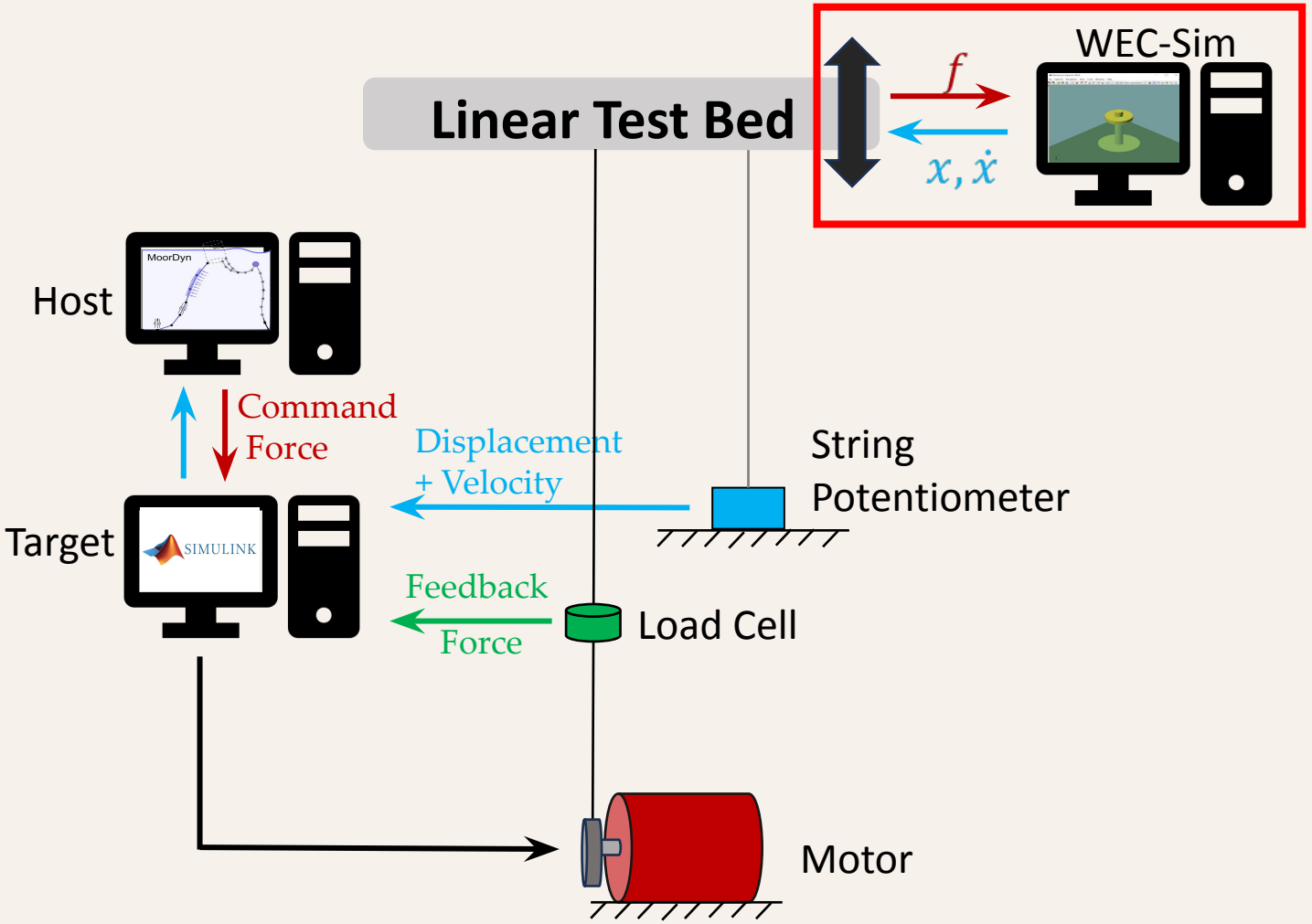


Single-loop linear test bed testing results

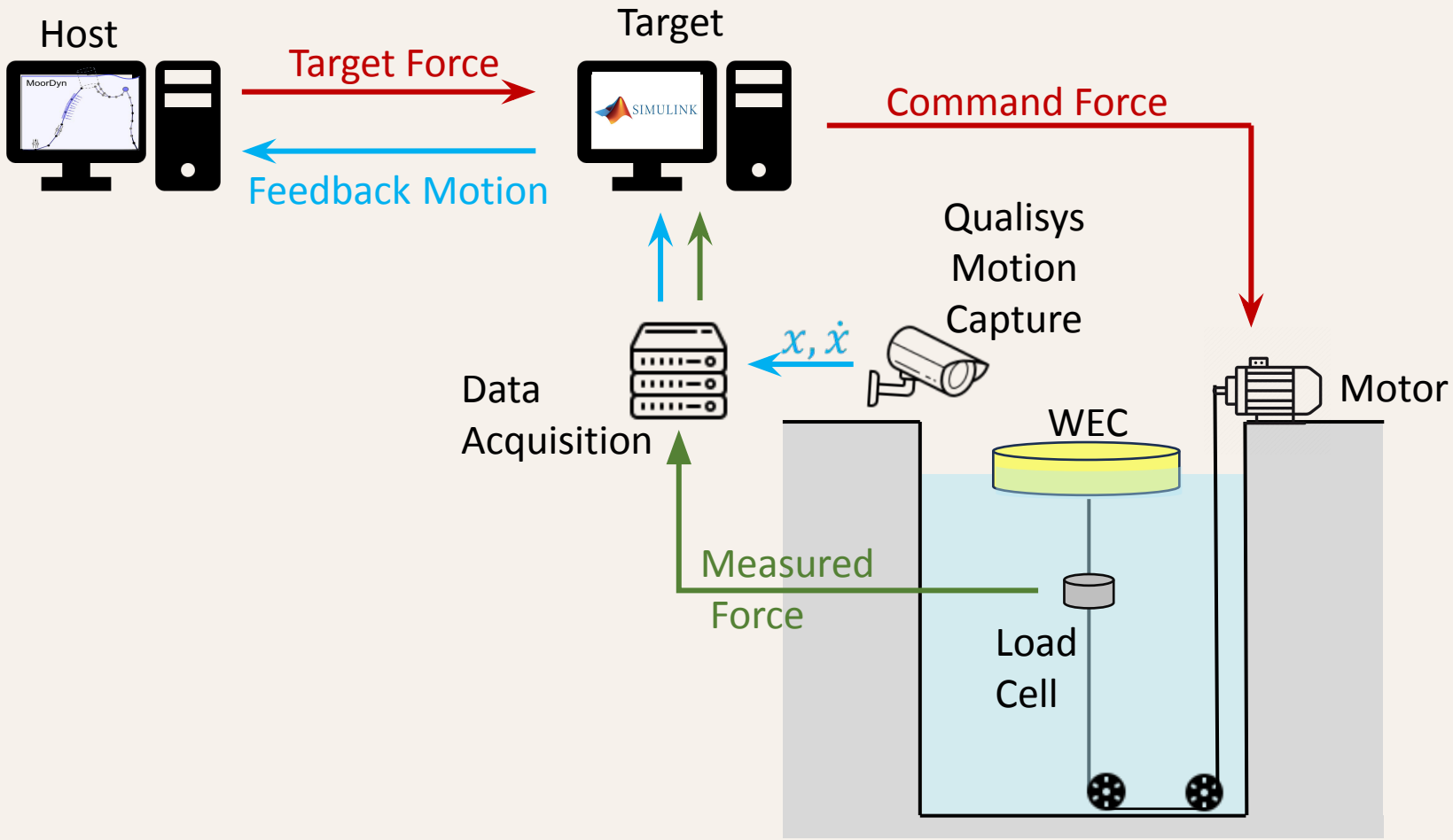




Dual-loop linear test bed testing



Wave flume testing



Next steps and key takeaways

- Dual-loop testing – August 15-29
- Wave flume testing – November 17-December 5

- Virtual loop and linear test bed tests help isolate and address issues in low-cost, low-stakes environment.
- Physical testing reveals practical limitations not apparent in virtual RTHS (noise, drift, etc.).
- Sensor noise and filter delay are the primary challenges in real-world tests.

Questions

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