



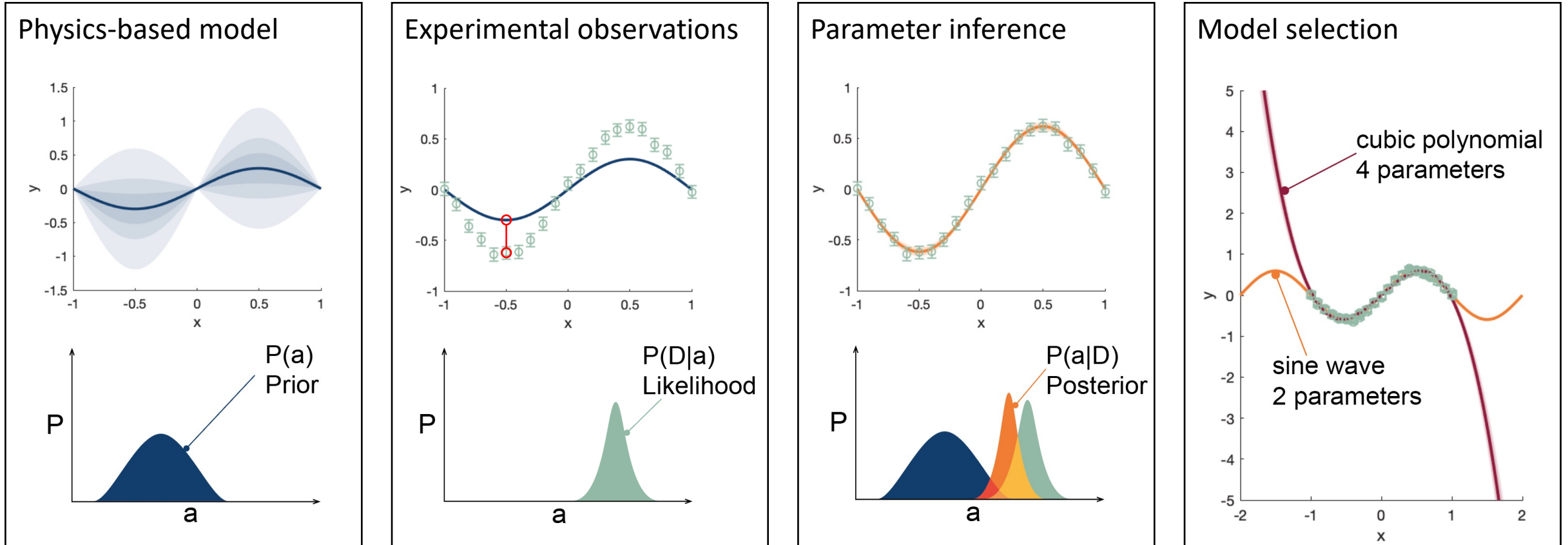
UNIVERSITY OF
CAMBRIDGE

Bayesian Experimental Design for Data Assimilation in Thermoacoustics

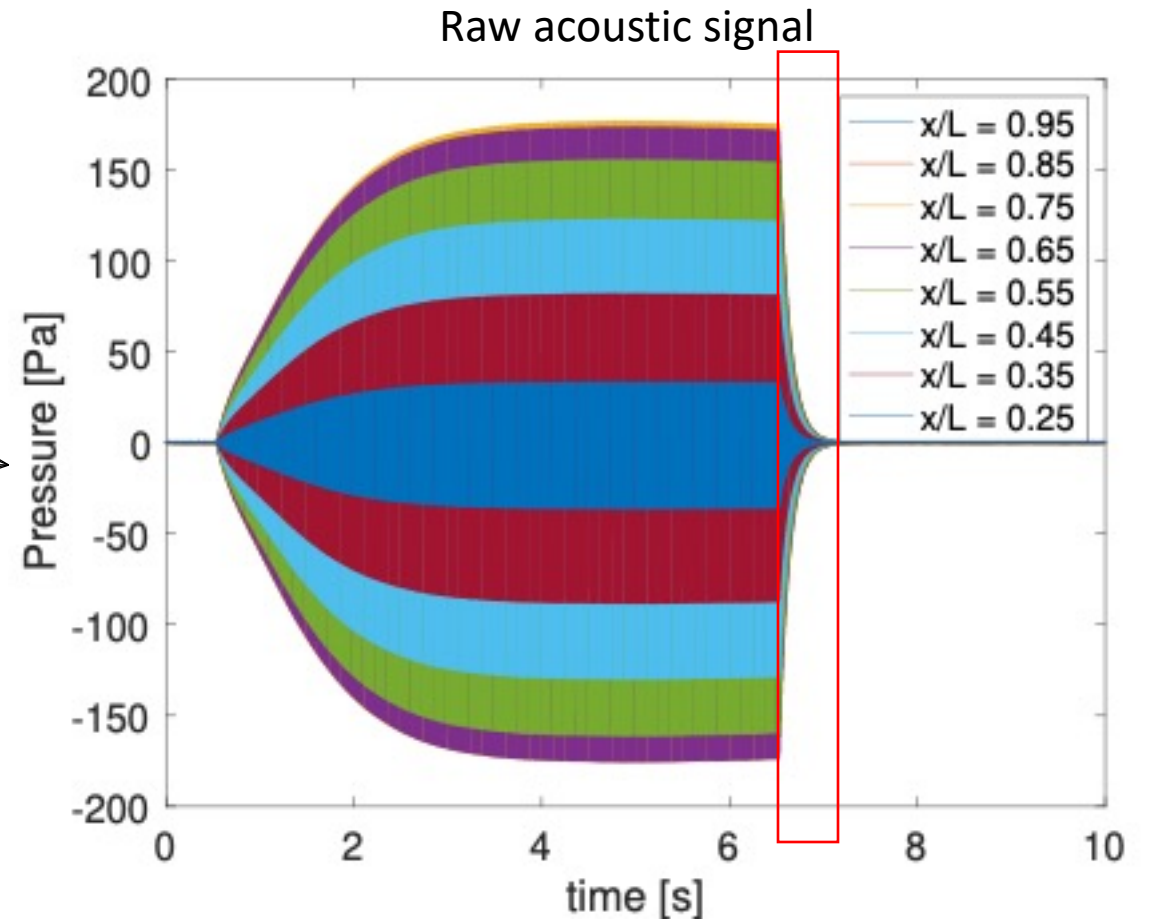
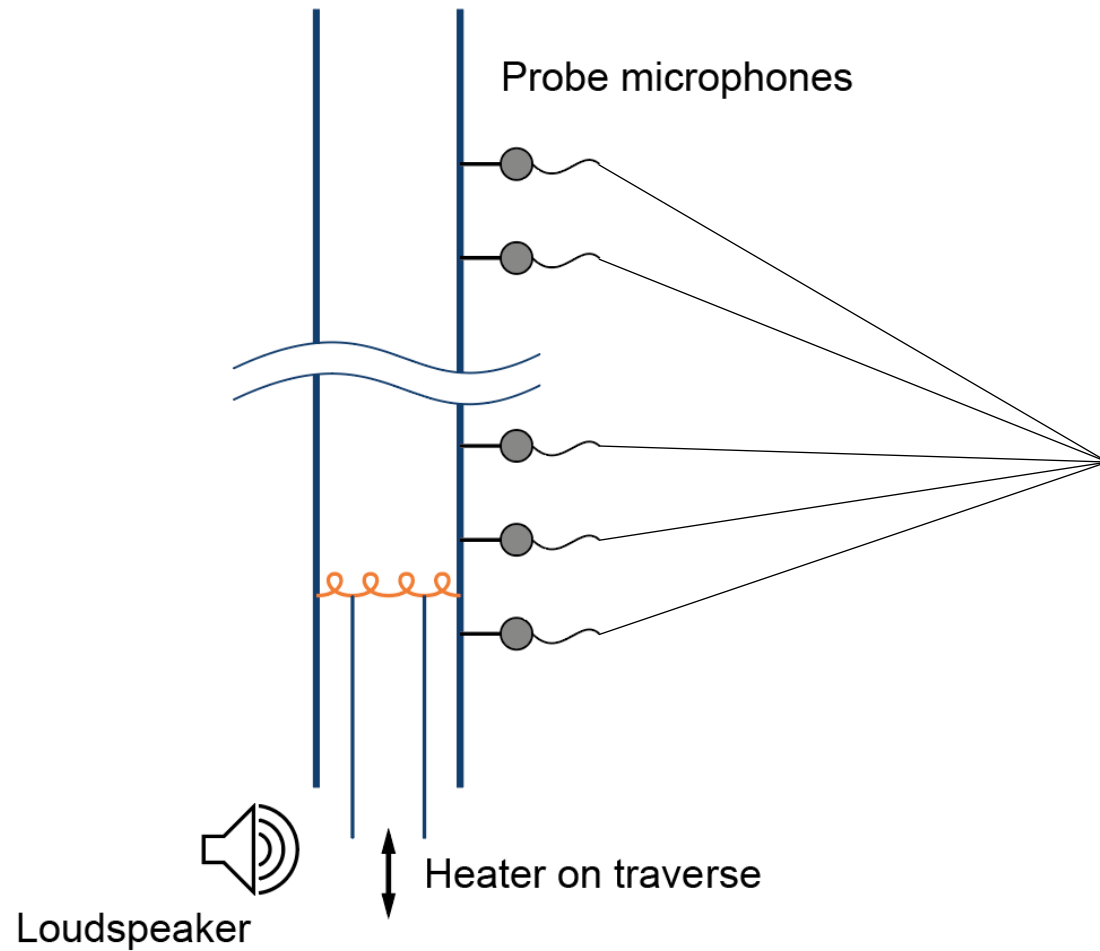
Matthew Yoko & Matthew Juniper

Workshop: Data Driven Methods in Fluid Dynamics

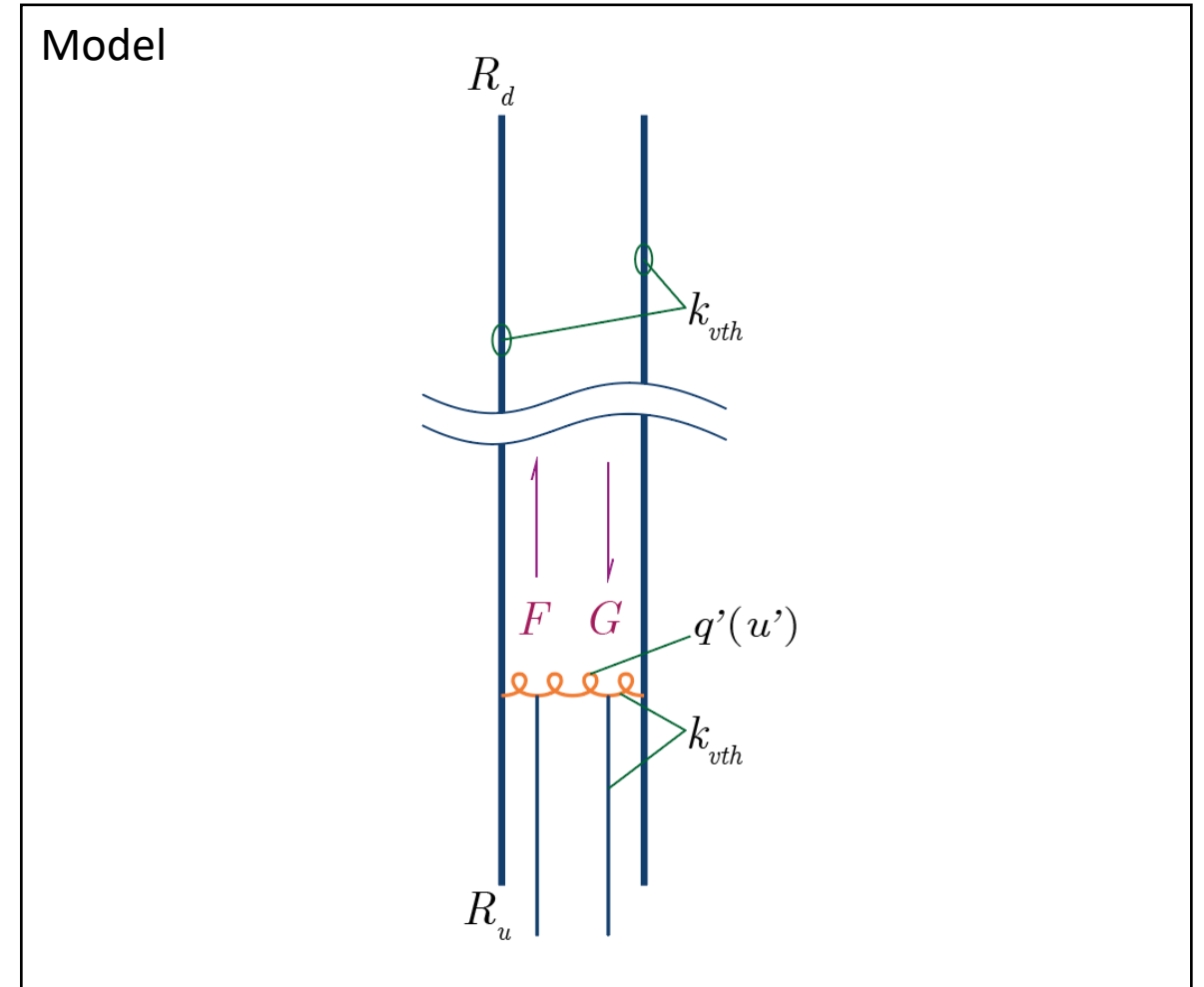
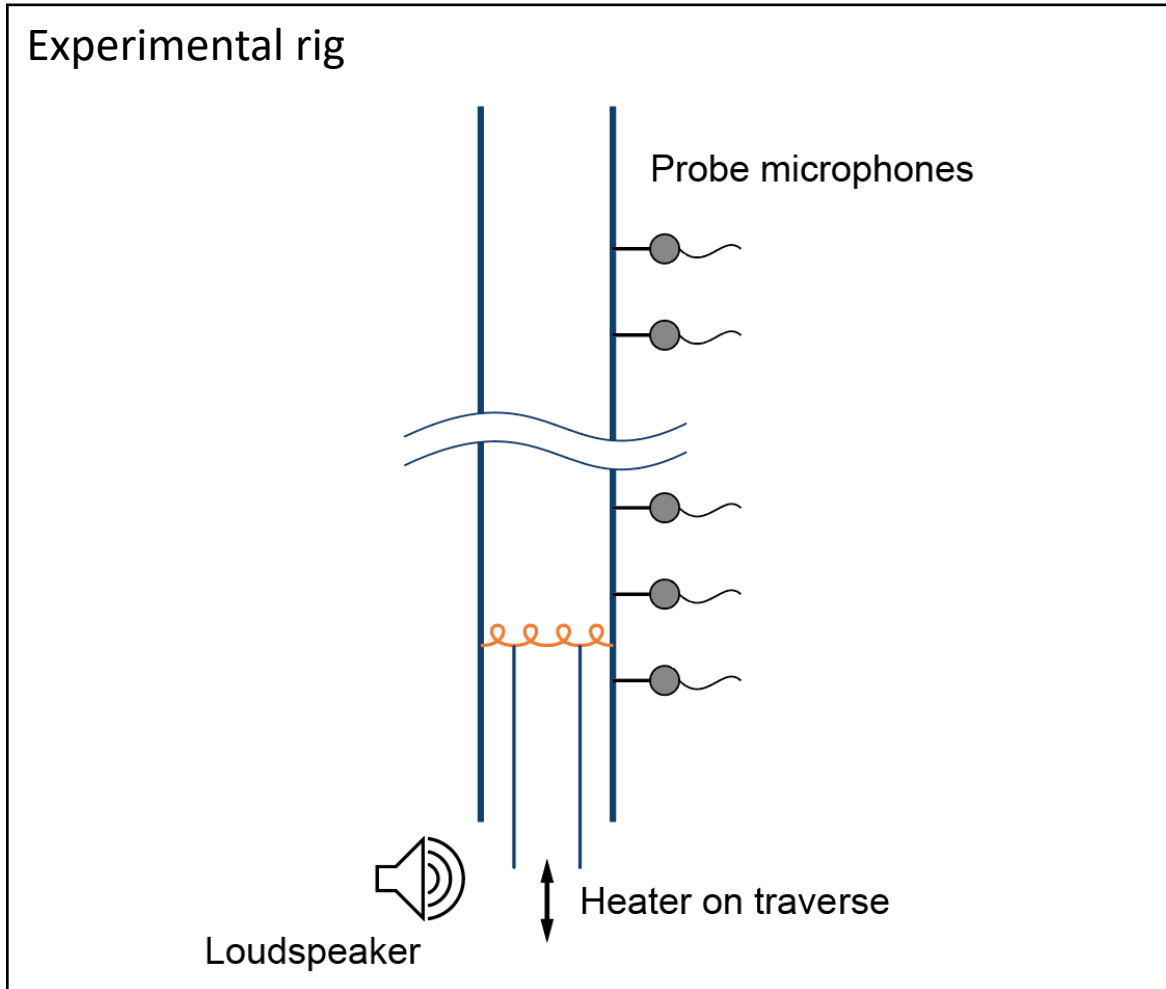
Context – Bayesian data assimilation



Context - Experiment

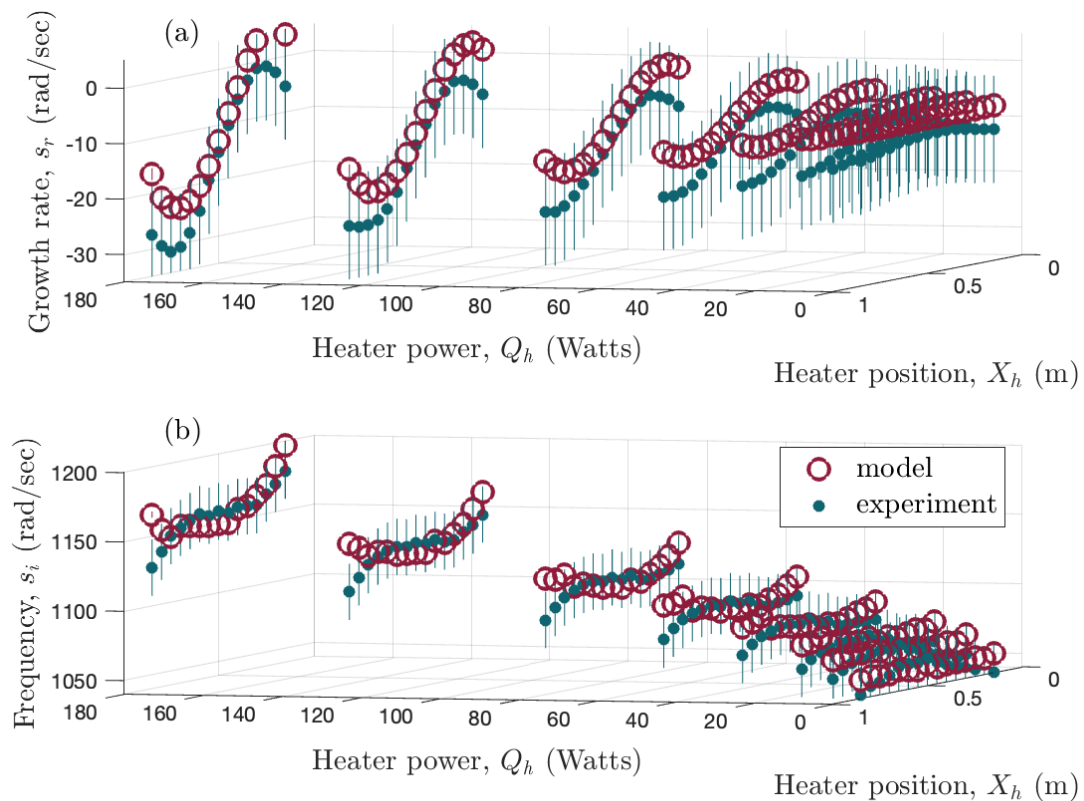


Context - Model

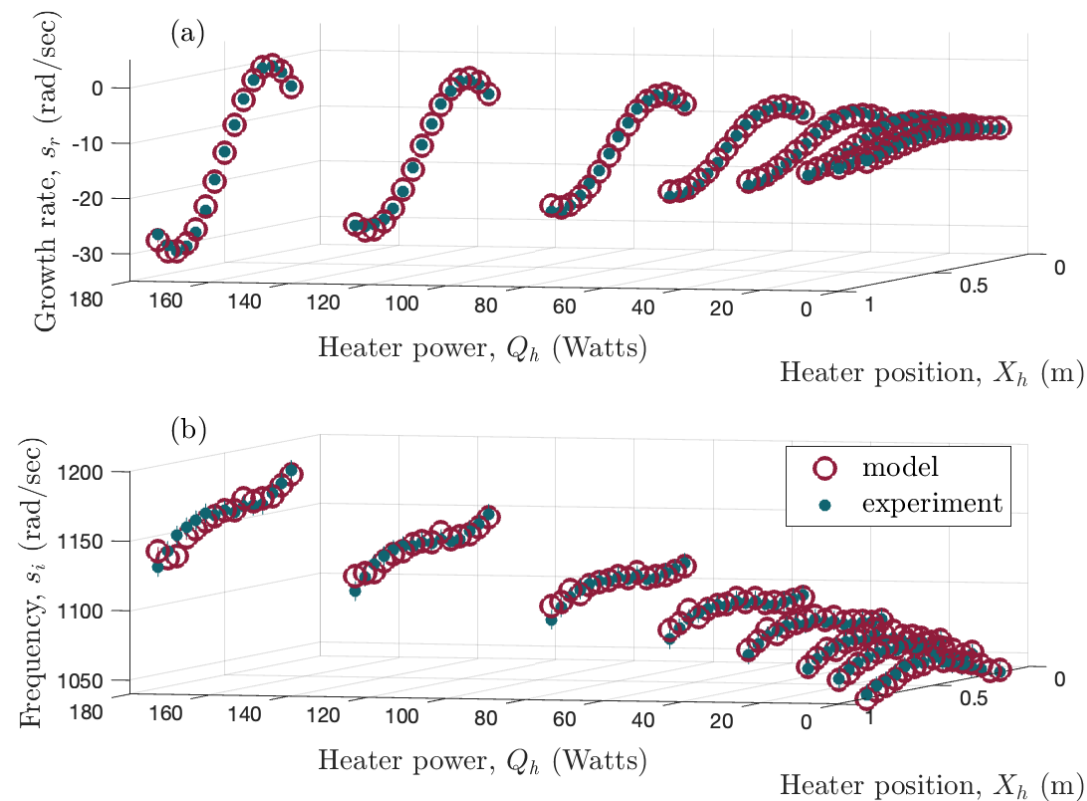


Context

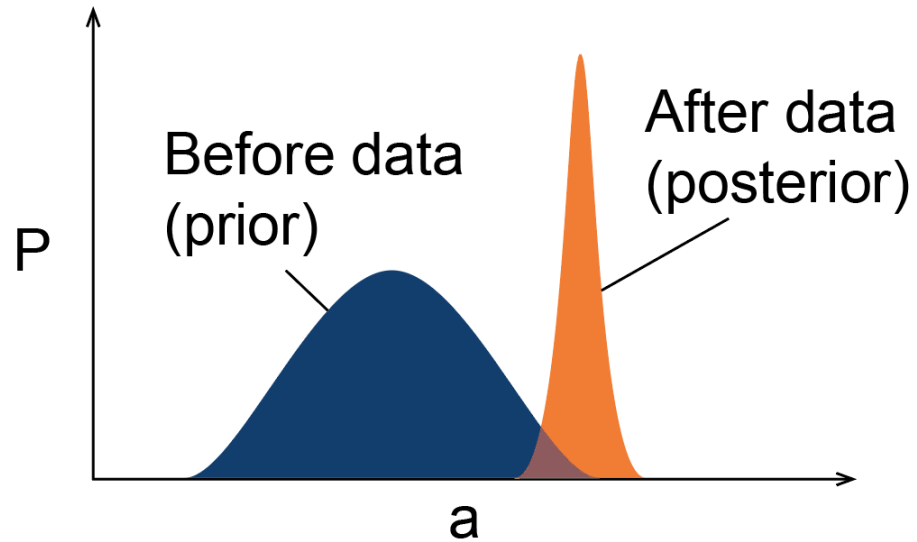
Best correlations from literature



Model & parameters from Bayesian data assimilation

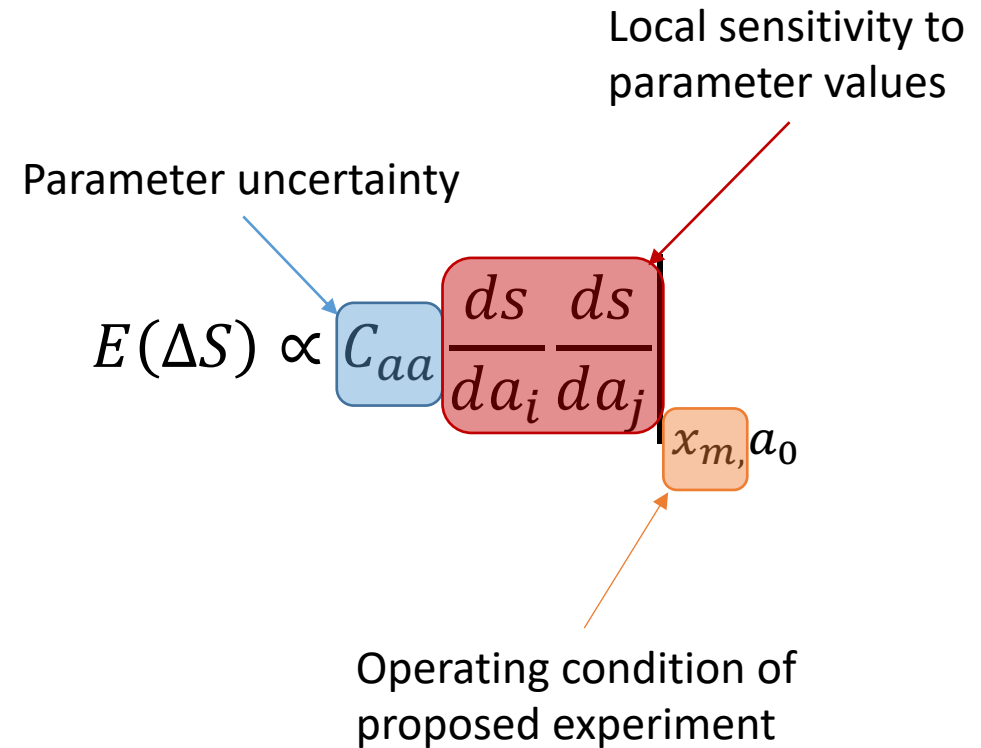


Information Theory

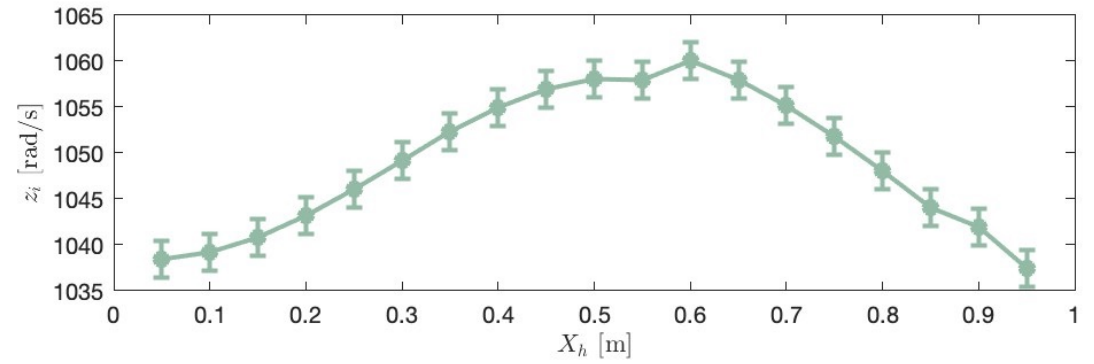
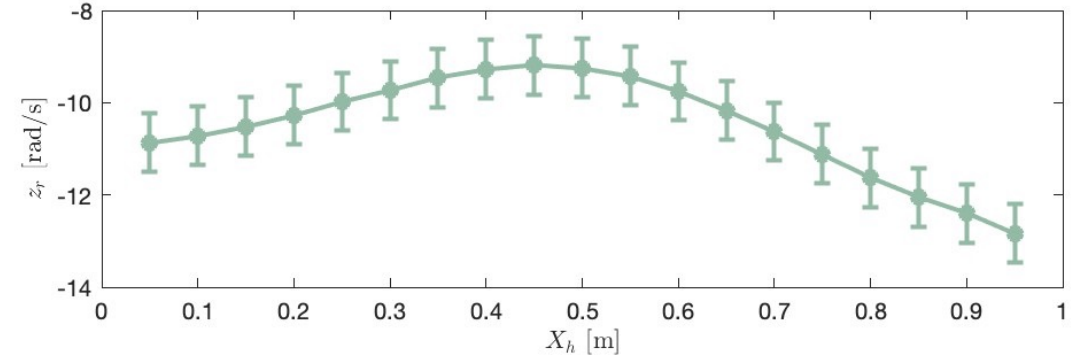
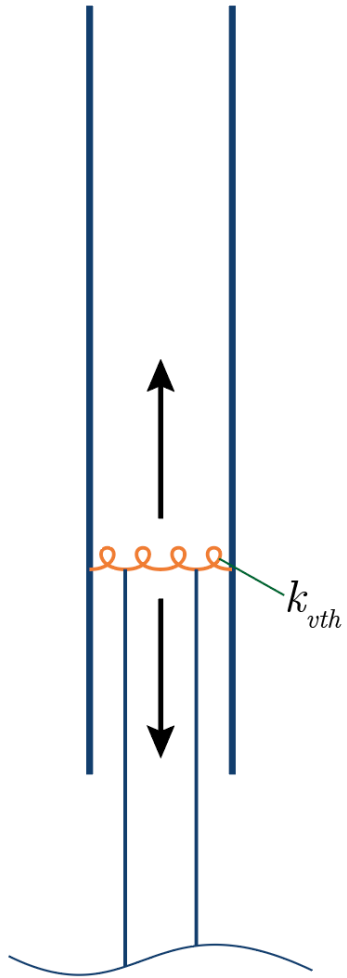


$$S = -\int P(a) \log_2 P(a) da$$

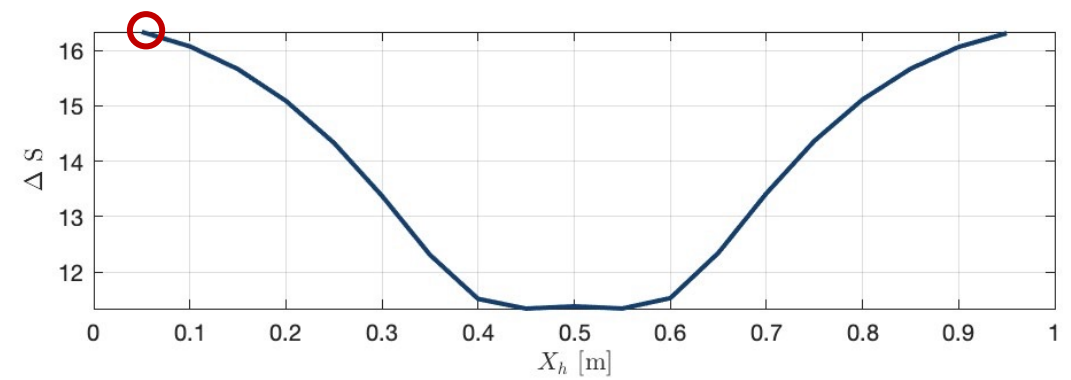
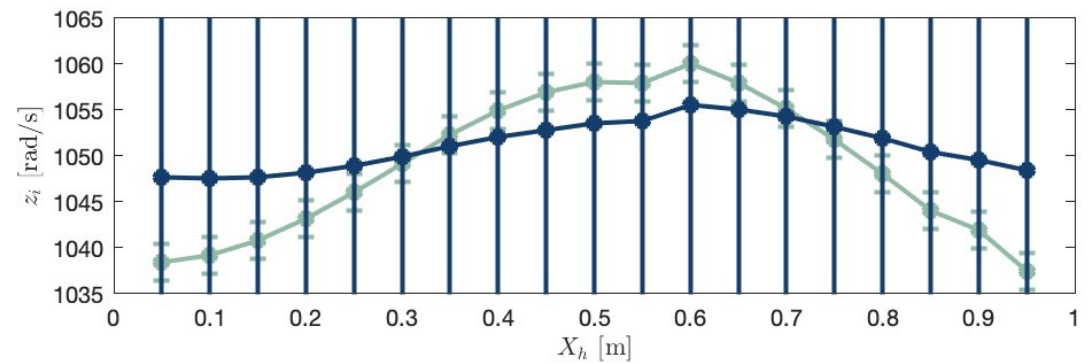
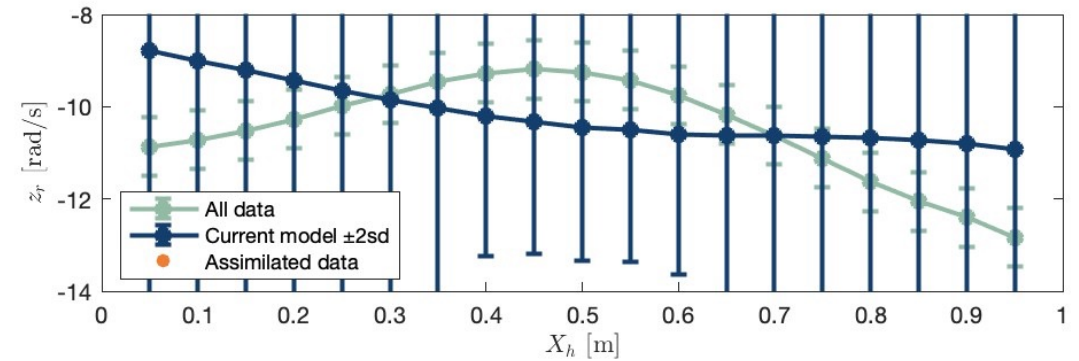
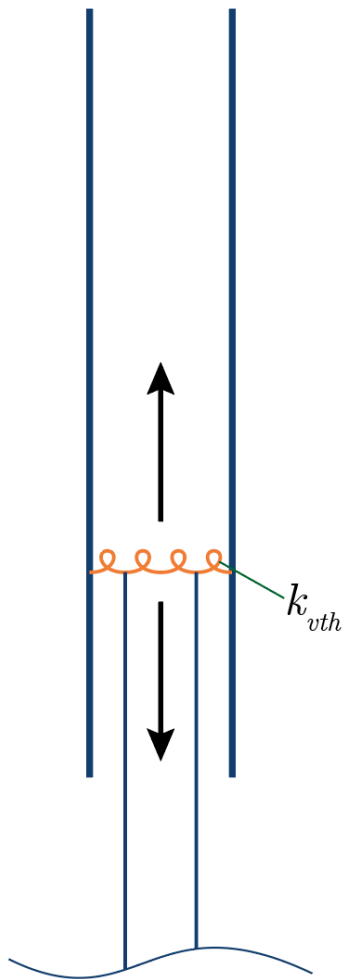
$$\Delta S = S_{\text{prior}} - S_{\text{posterior}}$$



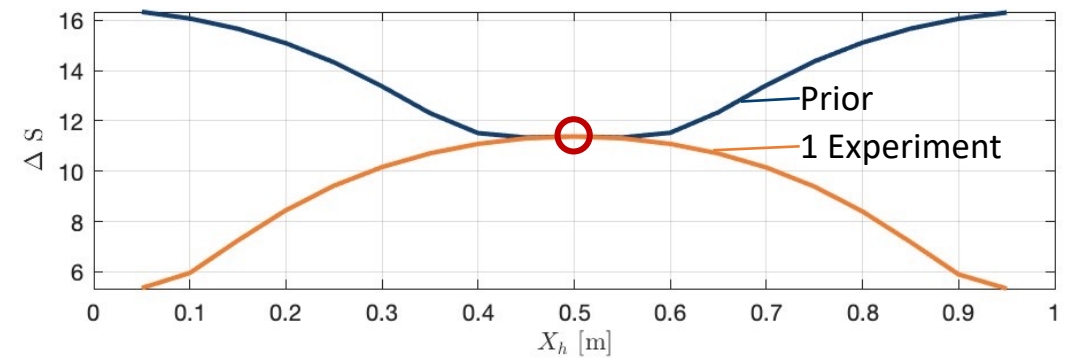
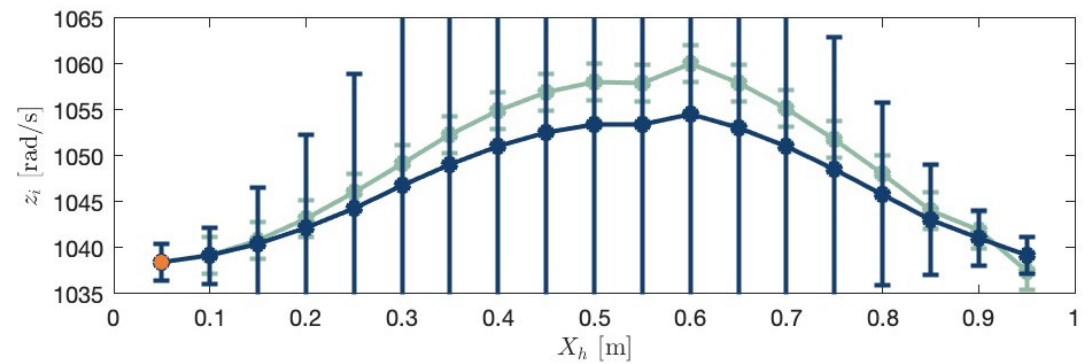
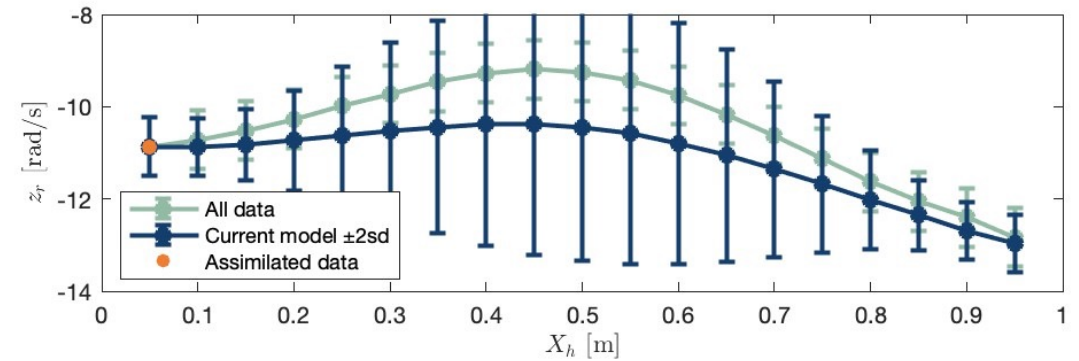
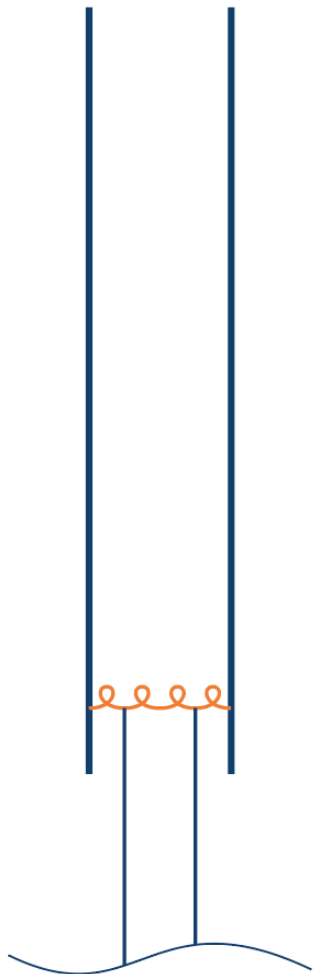
Simple Example



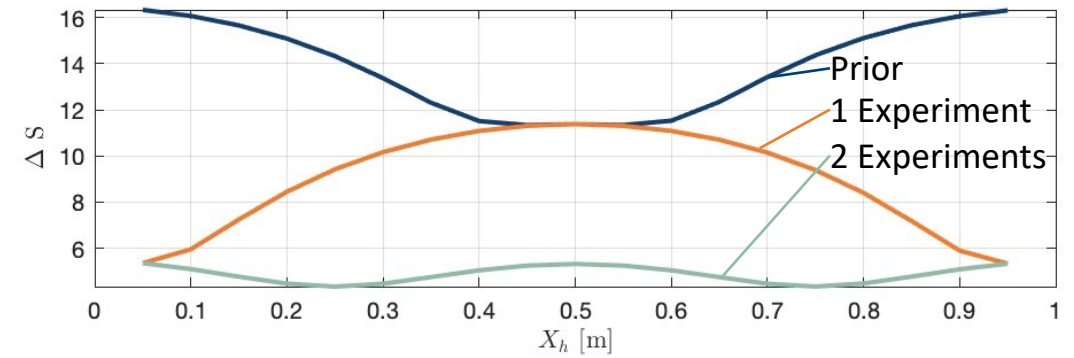
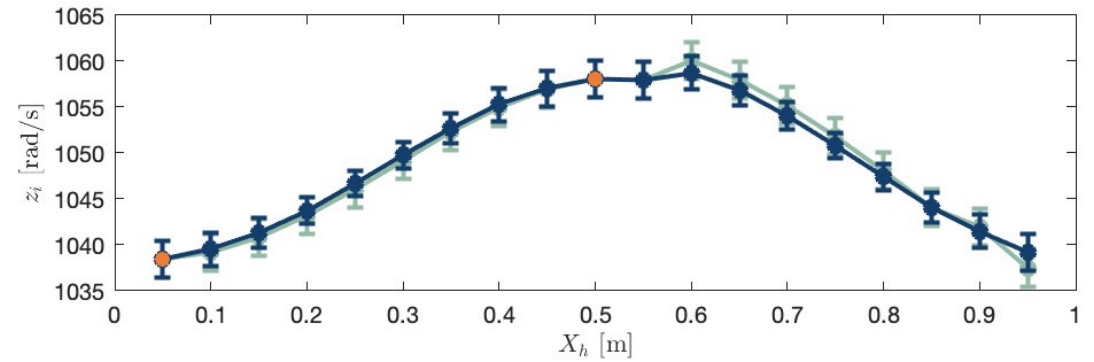
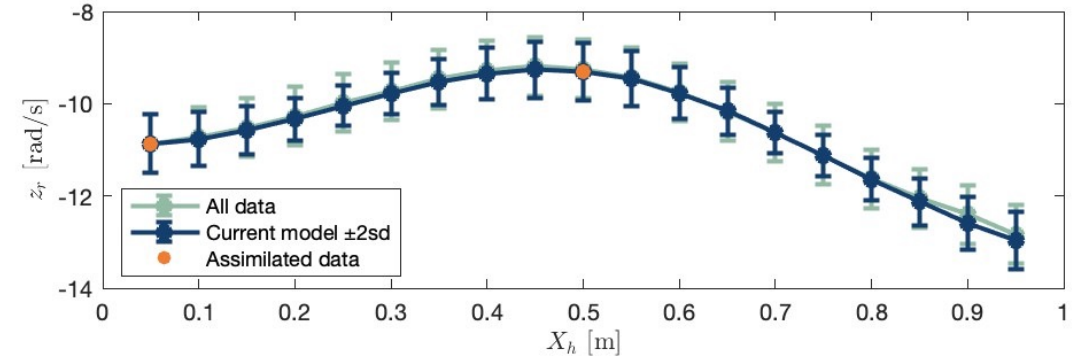
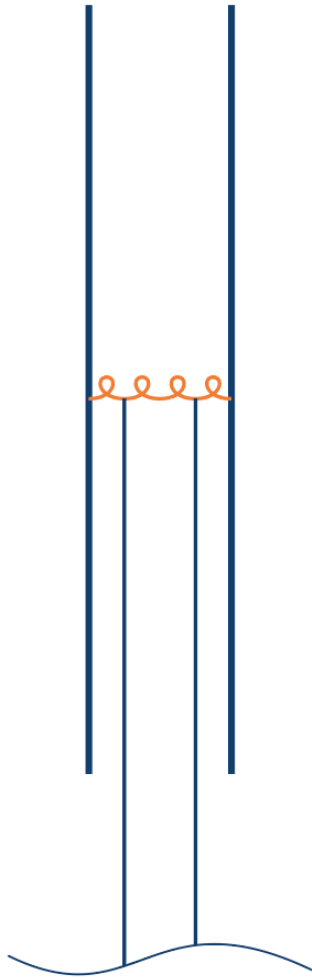
Simple Example



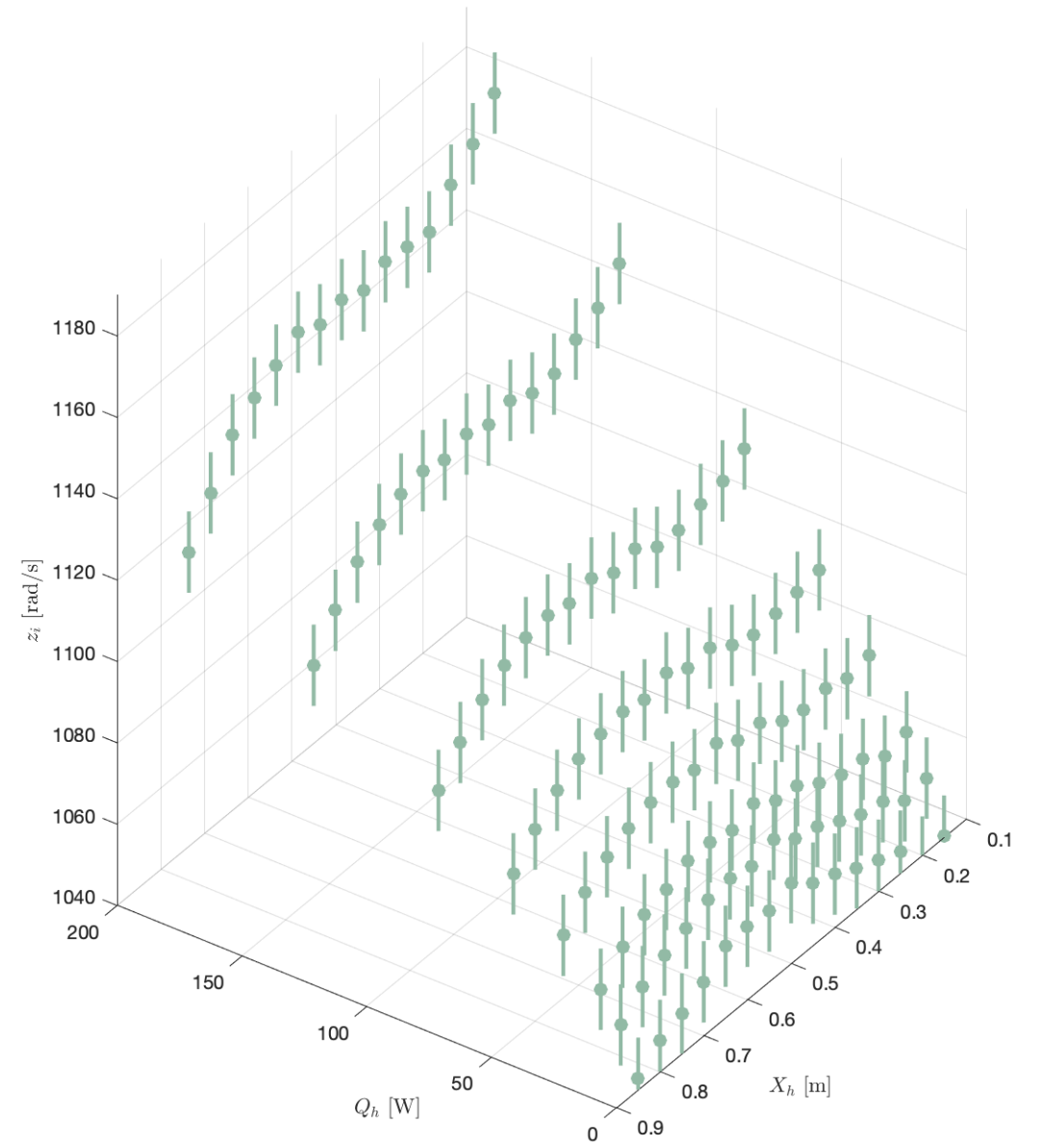
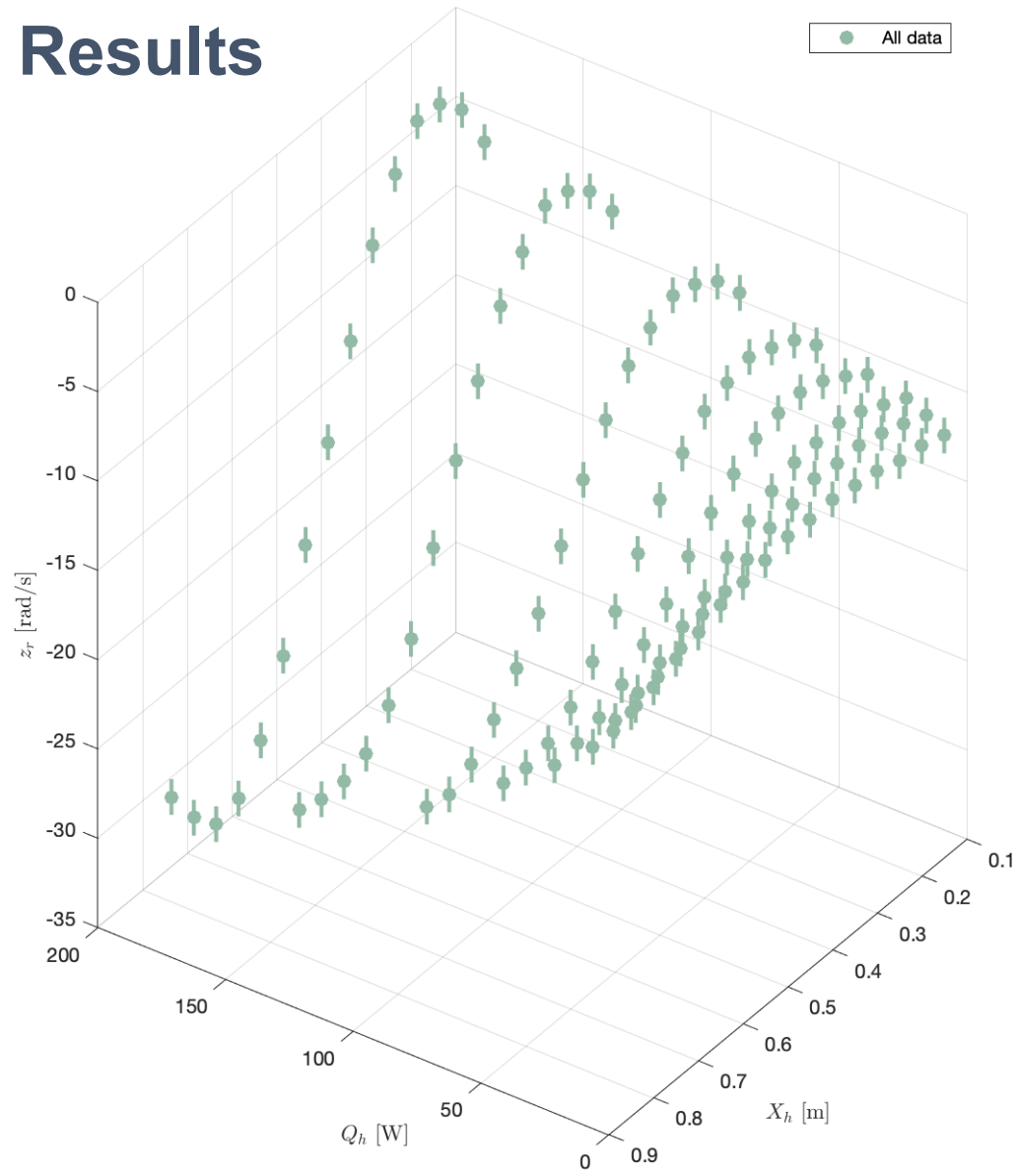
Simple Example



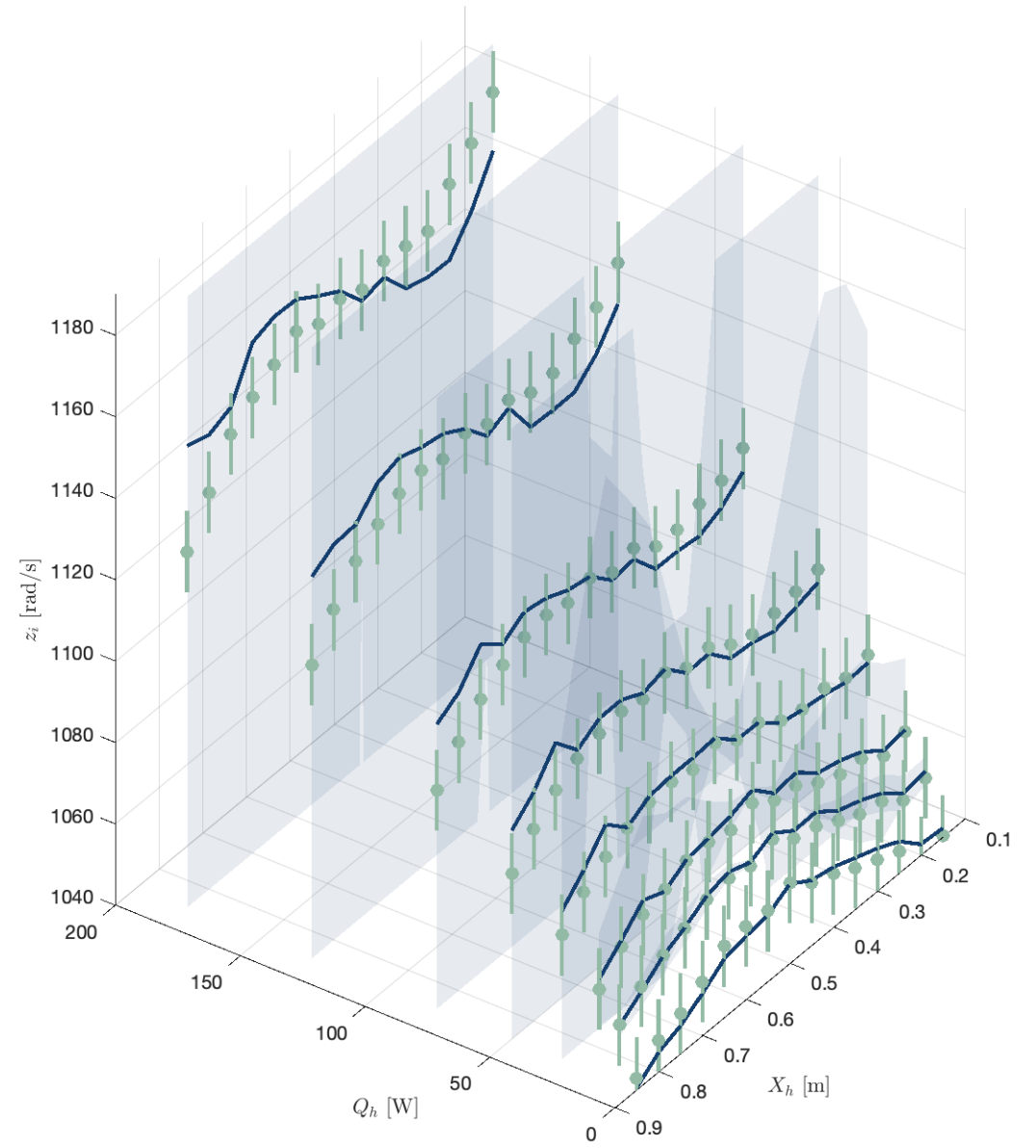
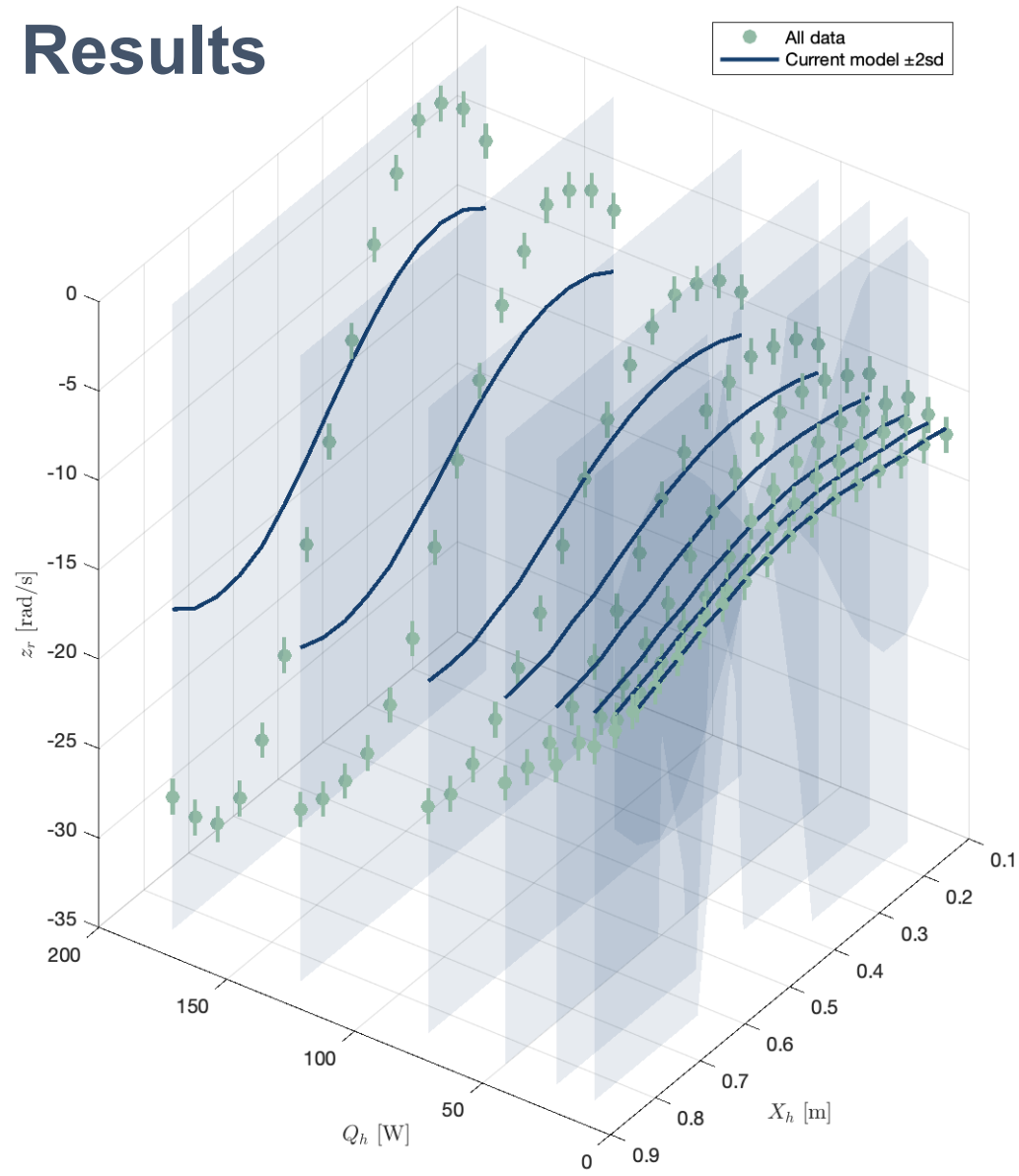
Simple Example



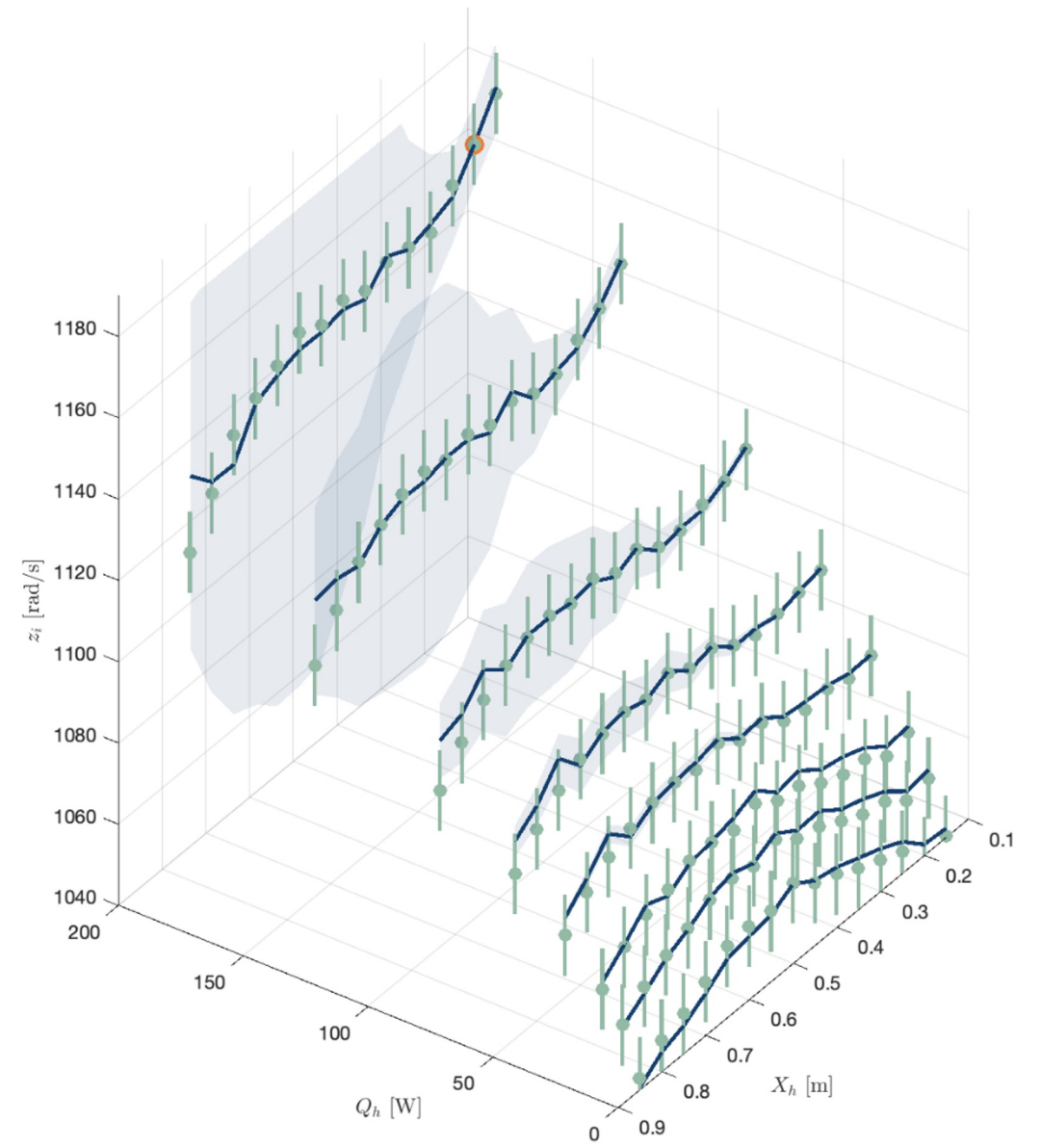
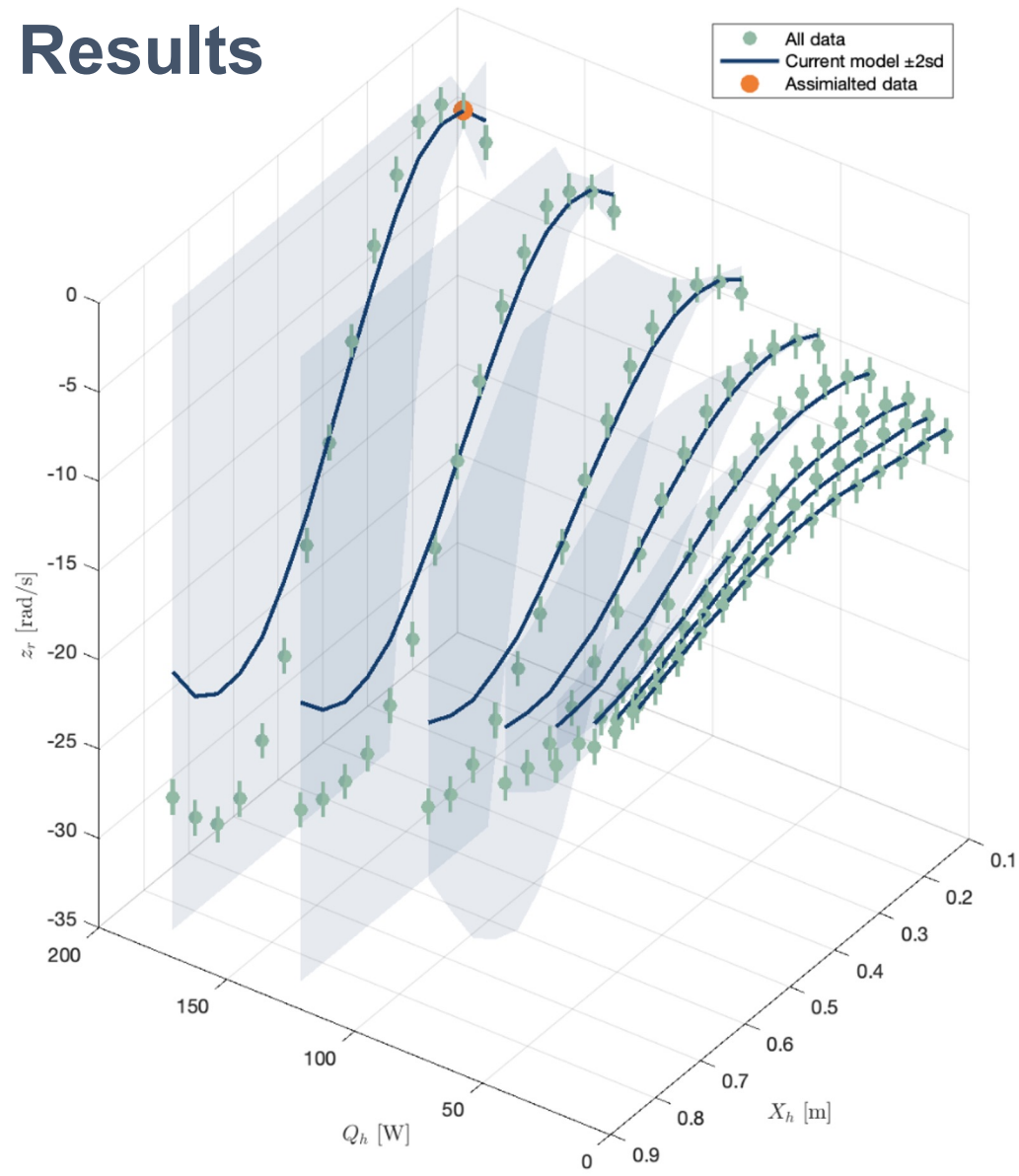
Full Results



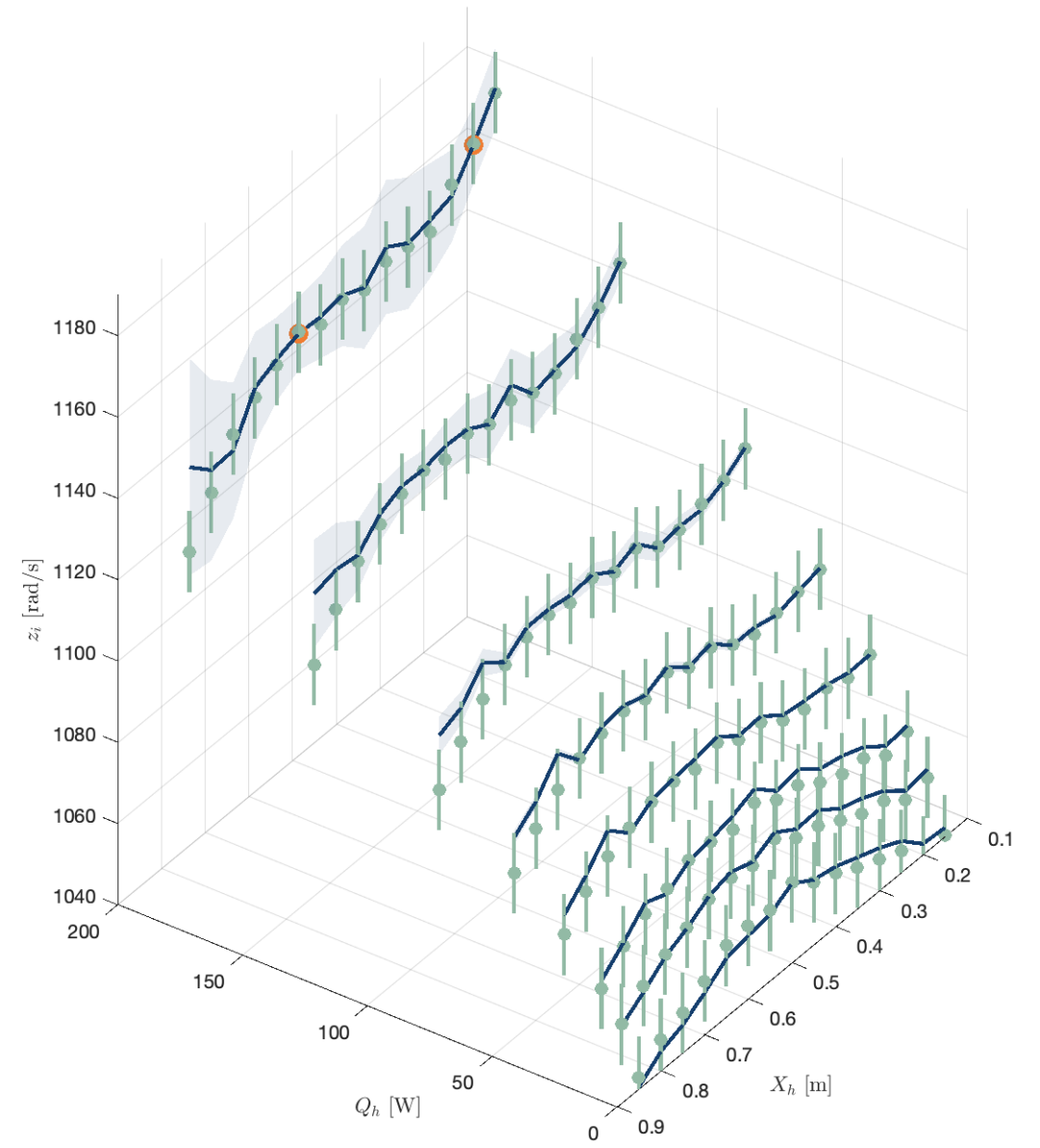
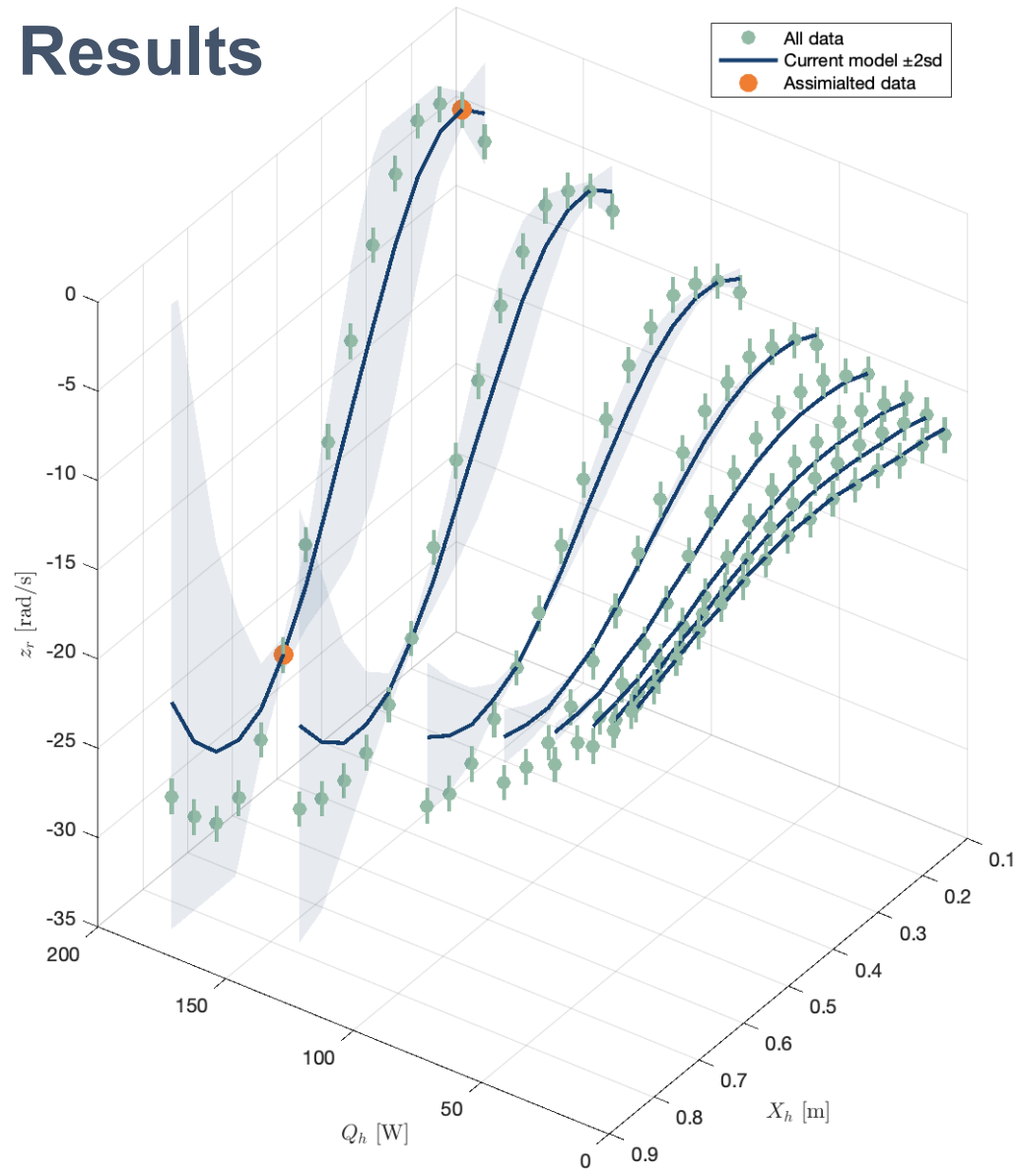
Full Results



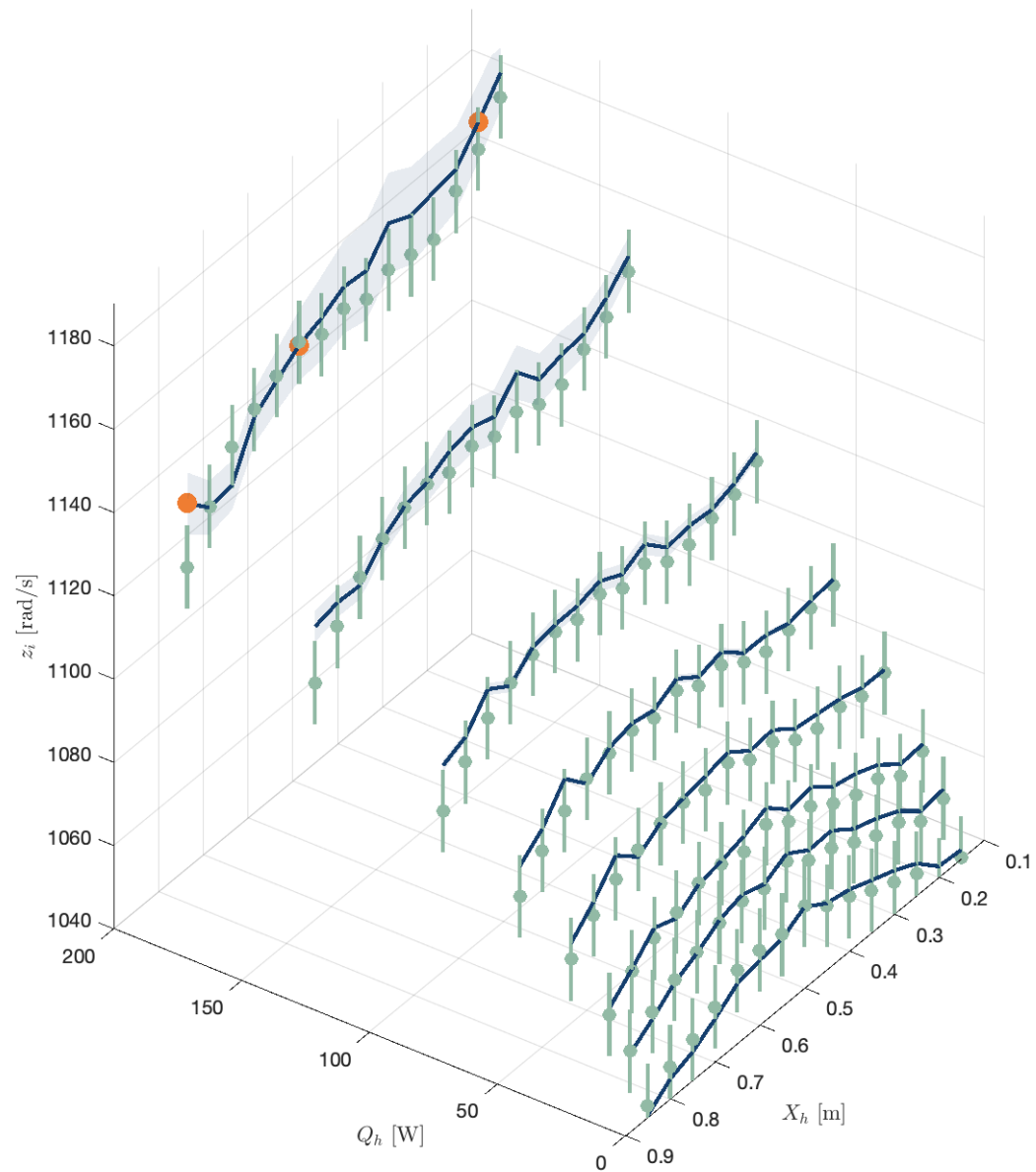
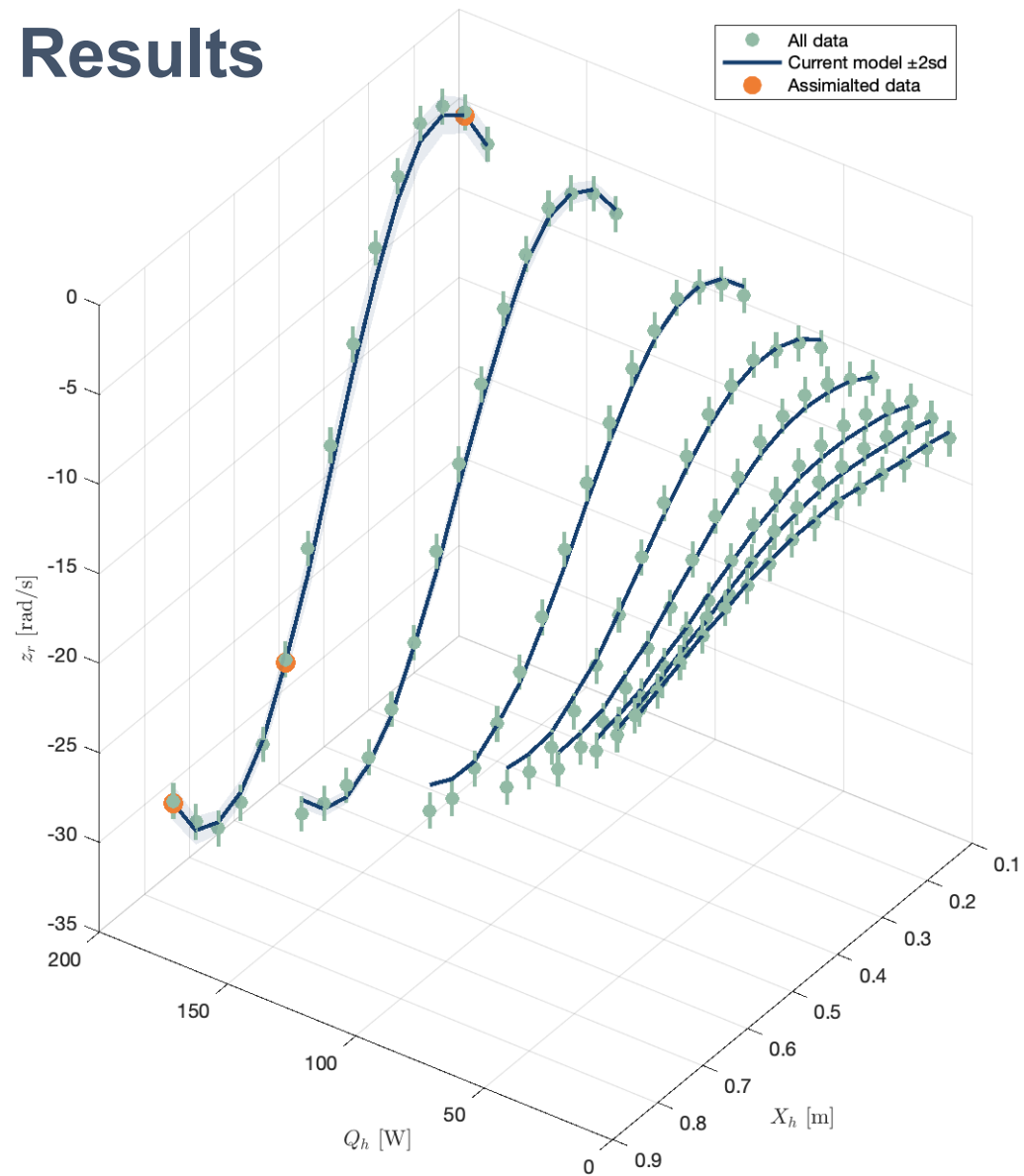
Full Results



Full Results

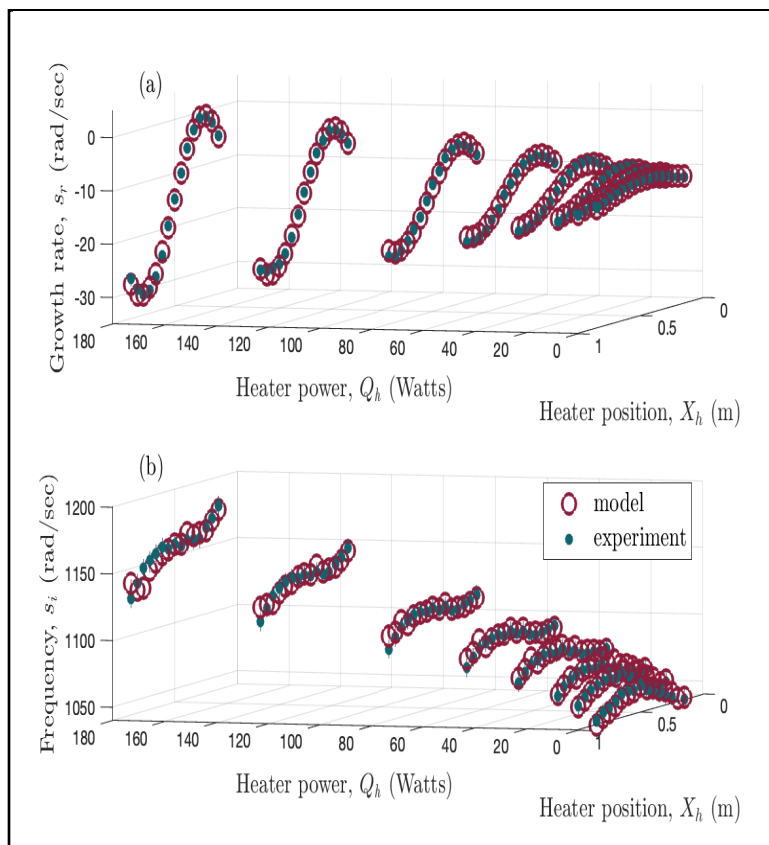


Full Results

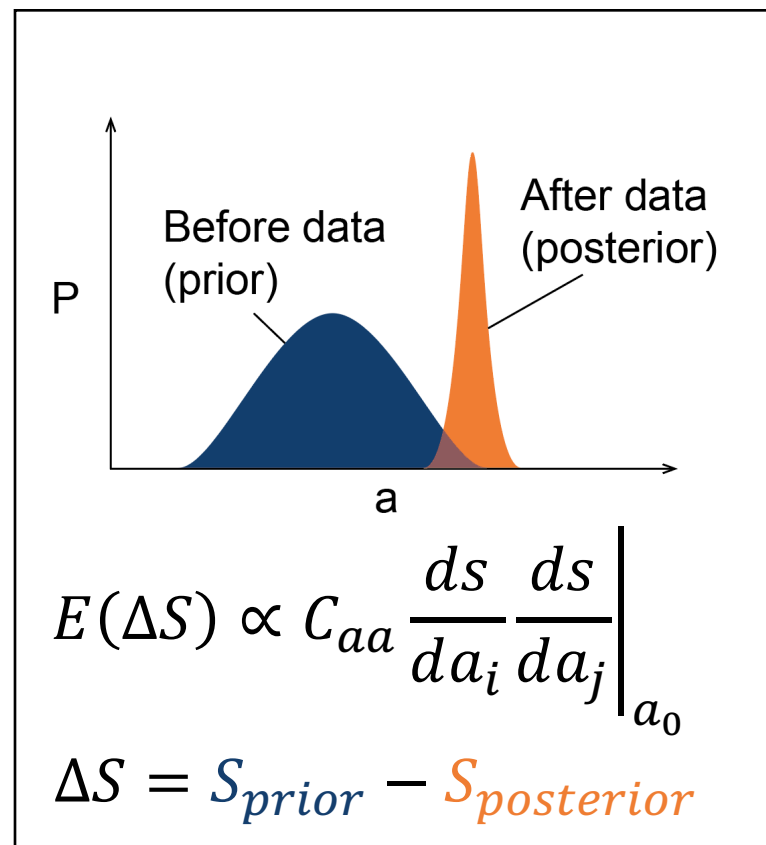


Conclusions

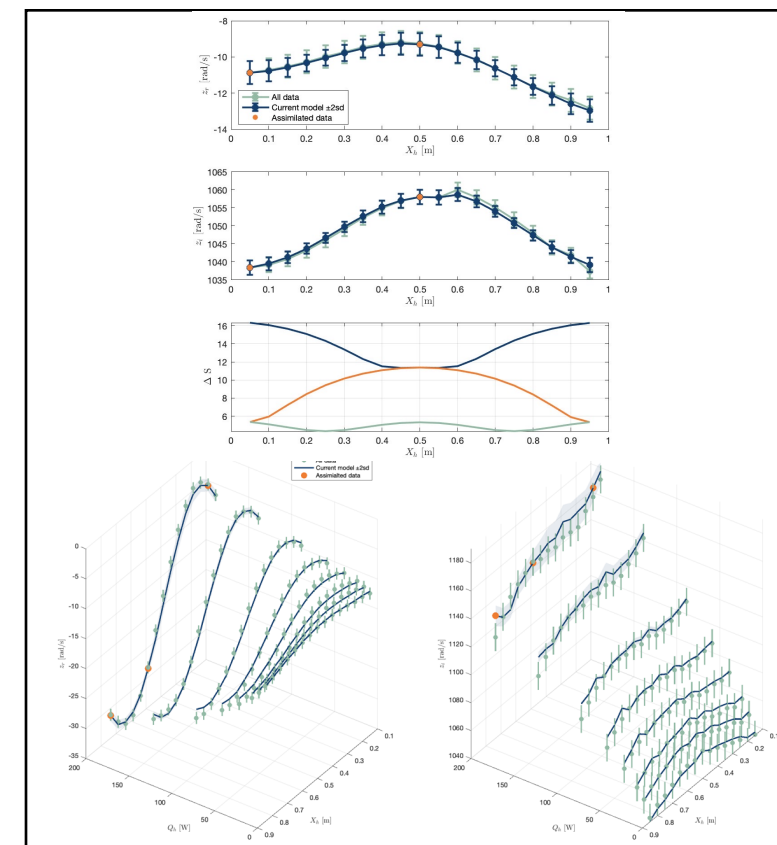
Bayesian data assimilation in thermoacoustics



Information content of an experimental data point



Planning experiments to maximise information gain



Appendix

