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Ship wakes and spectrograms: mathematical modelling and experimental data for finite-depth flows[1] SCOTT MCCUE, RAVINDRA PETHIYAGODA, TIMOTHY MORONEY, Queensland University of Technology, GREGOR MACFARLANE, JONATHAN BINNS, Australian Maritime College, University of Tasmania — We are concerned with how properties of a ship wake can be extracted from surface height data collected at a single point as the ship travels past. The tool we use is a spectrogram, which is a heat map that visualises the time-dependent frequency spectrum of the surface height signal. In this talk, the focus will be on presenting the theoretical framework which involves an idealised mathematical model with a pressure distribution applied to the surface. A geometric argument based on linear water wave theory provides encouraging results for both subcritical and supercritical flow regimes. We then summarise some recent findings obtained by comparing our analysis to experimental data collected at the Australian Maritime College for various sailing speeds and hull shapes*. Our work has the potential to inform ship design, the detection of irregular vessels, and how coastal damage is attributed to specific vessels in shipping channels.

*R Pethiyagoda, TJ Moroney, GJ MacFarlane, JR Binns & SW McCue (2017) Time-frequency analysis of ship wave patterns in shallow water: modelling and experiments, arXiv:1702.06275

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