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*Is mathematical complexity worth the price? Two case studies from stratified fluid dynamics*

Fluid dynamics has had a long-standing and profound influence on the mathematics of partial differential equations. In this talk I will present two case studies from the dynamics of stratified fluids. The first case study will consider the Dureuil–Jacotin–Long equation for fully nonlinear, internal solitary waves. I will demonstrate that the price of a more complex mathematical description yields several novel physical predictions, and that these predictions are missed by simpler, weakly nonlinear theories. The second case study will consider the so-called nontraditional component of the Coriolis force in a rotating frame of reference. I will show that the introduction of this term alters classical normal modes for a basin (a lake, for example) and that Kelvin waves are formally no longer possible. However, as numerical simulations indicate, this point is largely irrelevant for time scales on the order of days. I will contrast the two case studies and speculate on some general implications of the results.