A model for wind-driven water waves as an instability of viscous fluids

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How a gust of wind generates waves on the surface of water is a classic problem in fluid mechanics and yet it still eludes a complete understanding. Several models for wind driven waves have been suggested over the years, ranging from laminar to turbulent theories. Often these descriptions are limited to a fully-developed wind state and the resulting wave field. In this talk, we will focus on the initial-value, i.e., how wind sets up a wave by viewing the process as an instability of a base flow. The free surface is modelled as an interface between two viscous fluids and thus the momentum transfer is mediated by a background flow as well as viscous stresses. Using some simple estimates as well as numerical calculations, we present a characterisation of the unstable growing modes and their associated rates.