

Asymptotics and Model Equations for Water Waves: Towards the KdV, with applications to tsunami – Part 1

In the first part of this series of expository talks, we cover some fundamentals of wave propagation: investigating the initial value problems for a typical hyperbolic equation (the wave equation) and a parabolic equation (the heat equation) to demonstrate the essential trait of *finite propagation speed* of disturbances. We introduce the notion of (linear) dispersion with some examples, and begin the nondimensionalization and linearization of the governing equations for water waves. This lays the groundwork for a rigorous derivation of simpler model equations via a multiple-scales analysis, which will take us in later lectures to the Korteweg de Vries equation, when the dual approximations of small amplitude and shallow water are made.