

# New amplitude equations for wave problems

Jim Thomas

*Woods Hole Oceanographic Institution, USA and Department of Oceanography,  
Dalhousie University, Canada  
jimthomas.edu@gmail.com*

## Abstract

In this talk I will discuss the application of multi-time-scale asymptotic methods to derive amplitude equation models for wave problems. Amplitude equations are reduced models that are much faster and easier to integrate than the full set of equations, while accurately capturing important physical features of the solution. Two physical problems will be presented in this talk – acoustic waves being refracted by vortices and scattering of surface gravity waves by topography. Both these problems are characterized by a lack of a spatial scale separation between the wave and vortex/topography field. Consequently, popular techniques such as ray tracing or Born approximation do not apply for these problems.

**Keywords:** Acoustic waves, surface gravity waves, vortices, topography.

## References

- [1] J. Thomas, *New model for acoustic waves propagating through a vortical flow*, J. Fluid. Mech., 823: 658-674.