Internal waves in 2D aquaria and homeomorphisms of the circle

Maciej Zworski
University of California Berkeley

Abstract

Abstract: The connections between the formation of internal waves in fluids, spectral theory, and homeomorphisms of the circle were investigated by oceanographers in the 90s and resulted in novel experimental observations (Leo Maas et al, 1997). The specific homeomorphism is given by a "chess billiard" and has been considered by many authors (Fritz John 1941, Vladimir Arnold 1957, Jim Ralston 1973...). The relation between the nonlinear dynamics of this homeomorphism and linearized internal waves provides a striking example of classical/quantum correspondence (in a classical and surprising setting of fluids!). I will illustrate the results with numerical and experimental examples and explain how classical concepts such as rotation numbers of homeomorphisms (introduced by Henri Poincaré) are related to solutions of the Poincaré evolution problem (so named by Elie Cartan). The talk is based on joint work with Semyon Dyatlov and Jian Wang.