Spectral theory of internal waves in fluids

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The connection between the formation of internal waves in fluids, spectral theory and the dynamics of homeomorphisms of the circle was investigated by oceanographers in the 90s and resulted in novel experimental observations (Maas et al, 1997). The specific homeomorphism is given by a chess billiard and has been considered by many authors (John 1941, Arnold 1957, Ralston 1973, ... , Lenci et al 2021). 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!). Using a model of tori and of zeroth order pseudodifferential operators, it has been a subject of recent research, first by Colin de Verdière-Saint Raymond 2020 and then by Dyatlov, Galkowski, Wang and the speaker. In this talk I will review those results and present new work, with Dyatlov and Wang, on the more physically relevant boundary value problem.