# MICROLOCAL ANALYSIS OF INTERNAL WAVES IN 2D AQUARIA

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For a bounded smooth planar domain $\Omega$, we study the forced evolution problem for the 4th order PDE

$$(\partial_t^2\Delta+\partial_{x_2}^2)u(t,x)=f(x)\cos(\lambda t),\quad t\geq 0,\quad x\in\Omega \tag{1}$$

with homogeneous initial conditions and Dirichlet boundary conditions on $\partial\Omega$. This is motivated by concentration of fluid velocity on attractors for stratified fluids in effectively 2-dimensional aquaria, first observed experimentally in 1997.

The behavior of solutions to (1) is intimately tied to the *chess billiard* map on the boundary $\partial\Omega$, which depends on the forcing frequency $\lambda$. Under the natural assumption that the chess billiard $b$ has the Morse–Smale property, we show that as $t\to\infty$ the singular part of the solution $u$ concentrates on the attractive cycle of $b$. The proof combines various tools from microlocal analysis, scattering theory, and hyperbolic dynamics. Joint work with Jian Wang and Maciej Zworski.