

LadHyX Seminar – February 8th, 10:45

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Experimental observation of gapped internal gravity waves in a periodic stratification

Stratified fluids such as the ocean or the atmosphere can carry internal gravity waves that can transport energy and momentum over large distances, and affect large-scale circulation patterns. When the density stratification is not uniform, internal waves can exhibit resonances, tunneling, and frequency-dependent transmissions. In the ocean, the interplay between heat diffusion and salt diffusion can lead to extended regions with spatially periodic density profiles called thermohaline staircases. In this talk, we report on the experimental observation of band gaps for internal gravity waves in a laboratory setting with similar periodic stratification. We also find the existence of surface states that are exponentially localized near interfaces and controlled by boundary conditions. Using analytical and numerical modeling, we show that these are formally equivalent to topological surface states found in one-dimensional topological insulators and photonic crystals. Our results suggest that energy transport by internal waves could be profoundly altered by the presence of periodic stratifications that occur in regions such as the Arctic Ocean.