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Energy spectra of weak internal wave turbulence

It has long been proposed that small-scale oceanic dynamics results from nonlinear processes involving internal gravity waves. The scales in question are not resolved in oceanic models but are accounted for by ad-hoc parameterizations. Physically modeling their turbulent dynamics would therefore be a major lever for improving parameterizations in climate models. In this context, a promising avenue is the weak wave turbulence theory. Its implementation in the case of internal waves in density stratified fluids has nevertheless proved complex and remains an open problem. It is the subject of delicate questions concerning the convergence of the so-called "collision integral" which drives the dynamics in wave turbulence problems. In this lecture, I will present two recent works, one theoretical and one experimental, which both aim at identifying solutions to the internal gravity wave turbulence problem.

References

[1] N. Lanchon, P.-P. Cortet, Physical Review Letters, 131, 264001 (2023)

[2] N. Lanchon, D.O. Mora, E. Monsalve, P.-P. Cortet, Physical Review Fluids, 8, 054802 (2023)