An Ocean Drum: energetics and dynamics in a Physical Oceanography-Gravitation dialogue

José Luis Jaramillo

Institut de Mathématiques de Bourgogne (IMB)
Jose-Luis.Jaramillo@u-bourgogne.fr

ABSTRACT

The main goal of this talk is to discuss a physical setting where mutual transfer of concepts and tools between Physical Oceanography and Gravitational Physics seems appropriate. Specifically, we revisit the description of the (mesoscale) slow motions in the ocean, in the setting of the so-called quasi-geostrophic equations, by adopting a geometric perspective akin to the relativistic treatments of Gravity [1]. In a first stage, we introduce an effective Riemannian metric in the ocean basin allowing for a rewriting of quasi-geostrophic energetics in terms of the spectral problem of the associated Laplace-Beltrami operator. This leads to a toy model naturally admitting an equilibrium statistical mechanics treatment, aiming at a thermodynamical approach for the study of stratification and topographic features in the deep ocean. In a second stage, we briefly discuss the possible insights that this problem might offer into two distinct gravitational settings: i) stability of apparent black hole horizons, and ii) propagation of fields on a slowly evolving spacetime background in "wave-mean flow" theory approach.

References

[1] J.L. Jaramillo, *An Ocean Drum: quasi-geostrophic energetics from a geometric perspective*, J. Phys. A: Math. Theor. **49**, 194005 (2016).
doi: 10.1088/1751-8113/49/19/194005