Scale relativity applied to geophysical turbulence

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A new formalism has been developped for the study of turbulence using the scale relativity framework [1]. In this work, we extend the previous studies. Peecisely, we discuss the application of the scale-relativity approach applied to a turbulent fluid in rotation. It explores the transformation of the time derivative of the Navier-Stokes equation in the usual x-space into a Schrdinger-like equation in velocity space. This transformation involves introducing an external vectorial field to account for rotation and a local Velocity Harmonic Oscillator (VHO) potential in velocity space. The coefficients of the VHO potential are determined by second-order x-derivatives of the pressure. Then we derive formulae for the Probability Distribution Functions (PDF) of velocity and acceleration. Thus, predictions are then compared with data from 'oceanic drifters' velocity measurements. We show a good agreement between the predicted acceleration PDF and the observed data from oceanic drifters [2].

References

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