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Numerical study of quantum turbulence. MAKOTO TSUBOTA, Osaka City University — The relationship between classical and quantum turbulences has attracted much attention recently. The former arises from the complicated dynamics of eddies in a classical fluid. However, it is difficult to investigate how statistical properties are related to the dynamics of eddies, because of the obscure definition of eddies. In contrast, quantum turbulence comprises a tangle of quantized vortices that are stable topological defects characteristic of Bose-Einstein condensation. Here, we investigate our recent numerical study on the dynamics and statistics of quantized vortices in quantum turbulence by solving a modified Gross-Pitaevskii equation. To obtain the steady state of turbulence, we introduce a dissipation term that is applicable only at scales below the vortex core size, and an external potential term is introduced as the energy source at large scales. By calculating the energy dissipation rate and energy flux, we first clarify the inertial range and energy cascade in quantum turbulence. Furthermore, the energy spectrum is consistent with the Kolmogorov spectrum, which suggests a similarity between classical and quantum turbulences. We discuss the decay of a vortex tangle after turning off the energy source at large scales. This study shows that quantum turbulence can be studied as a prototype of turbulence much simpler than classical conventional turbulence.

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