Secondary Casimir Effect in Fluctuation Hydrodynamics

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I will discuss the thermal, fluctuation-induced hydrodynamic interaction forces in a classical, compressible, viscous fluid confined between two rigid, planar walls with no-slip boundary conditions and calculated via the linearized, stochastic Navier–Stokes formalism of Landau and Lifshitz. The mean fluctuation-induced force acting on the fluid boundaries vanishes in this system, so we evaluate the two-point, time-dependent force correlations. The equal-time, cross-plate force correlation, on the other hand, decays with the inverse inter-plate distance and is independent of the fluid viscosity at large distances; it turns out to be negative over the whole range of plate separations, indicating that the two bounding plates are subjected to counter-phase correlations. The long-range hydrodynamic correlations represent a ‘‘secondary Casimir effect’’, because the mean fluctuation-induced force, which represents the primary Casimir effect, is absent.