

# **Thermodynamics in the presence of anomalous flows**

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Thermodynamic states of quantum many body systems often exhibit slow variation of their macroscopic parameters with time. The long time limits of systems with infinitely many degrees of freedom give rise to anomalous flows of almost invariant and macroscopically indistinguishable states after scaling. Mathematically the results are related to stable convolution semigroups and based on properties of functions with bounded mean oscillation [1,2]. The infinitesimal generator of anomalous flows are operators that are nonlocal in time. The results are applied to irreversibility and experiment.

[1] R. Hilfer, *Mathematics* 3 (2015), 623–643.

[2] R. Hilfer, *Analysis* 36 (2016), 49–64.