Deriving a thermodynamic system from a Hamiltonian one
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We reconsider the problem of coarse-graining infinite-dimensional Hamiltonian dynamics to obtain a macroscopic system which includes dissipative mechanisms. In particular, we study the thermodynamical implications concerning Hamiltonians, energy, and entropy and the induced geometric structures.

The Hamiltonian model is described by a unitary group, and is time-reversible. The coarse-grained description includes dissipative effects, is described by a contraction semigroup and is thus irreversible.

The concepts of dilations and contractions will be described, as they provide a link between dissipative semigroups and unitary groups.

The coarse-grained version will be shown to have GENERIC (General Equations for Non-Equilibrium Reversible Irreversibe Coupling) structure, with conserved energy, nondecreasing entropy and an Onsager operator describing the dissipation.

This is joint work with Alex Mielke and Mark Peletier.