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Review text:

The evolution (in time) of an open quantum system usually tends to an ultimate steady state. In such a case the "natural" (often called "von Neumann's") entropy does not, in general, offer any "measure of distance from the equilibrium" (since it does not depend monotonically on time) while the Jakob's and Stenholm's one (cf. refs. [10 - 13]) does. The present authors amend this result (1) by the rigorous proofs to some technicalities (e.g., of the pseudo-Hermiticity (i.e., basically, Krein-space Hermiticity) of the Liouvillean for any (finite-dimensional) Hilbert space of density matrices, or of the necessary and sufficient conditions of positivity of similar maps), (2) by the extension of attention to the so called quasi-Hermitian Hamiltonians (which were recognized as fully compatible with the standard quantum theory by Scholtz, Geyer and Hahne in 1992, cf. ref. [16]; the present reviewer would prefer calling them cryptohermitian: cf. SIGMA 5 (2009) 001) and, finally, (3) by the introduction of the two new Lyapunov entropy-mimicking functionals covering also the degenerate cases.