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Landscape, kinetics, paths and statistics of curl flux, coherence, entanglement and energy transfer in non-equilibrium quantum systems ZHEDONG ZHANG, JIN WANG, SUNY Stony Brook — We developed a population and flux landscape theory for general non-equilibrium quantum systems. We illustrated our theory by modelling the quantum transport of donor-acceptor energy transfer. We found two driving forces for the non-equilibrium quantum dynamics. The symmetric part of the driving force corresponds to the population landscape contribution which mainly governs the equilibrium part of dynamics while the anti-symmetric part of the driving force generates the non-equilibrium curl quantum flux which leads to the detailed-balance-breaking and time-irreversibility. The multi-loop structure of the flux emerges which forms the flux-landscape. Improving the voltage and electronic coupling in general facilitates the quantum transport by reducing the population landscape barriers between major states and increasing the mean value of the flux. A limit-cycle mode emerges when the underlying flux-landscape becomes funnelled with a significant gap between the largest flux loop and the rest of them. On the kinetic level, we found that multiple kinetic paths between quantum states emerge and illustrate the interference effects

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