

Beyond fixed points: transient quasi-stable dynamics emerging from ghost channels and ghost cycles

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Dynamical description of natural systems has generally focused on fixed points, with saddles and saddle-based phase-space objects such as heteroclinic channels/cycles being central concepts behind the emergence of quasi-stable long transients. Reliable and robust transient dynamics observed for real, inherently noisy systems is, however, not met by saddle-based dynamics, as demonstrated here. Generalizing the notion of ghost states, we provide a complementary framework that does not rely on (un)stable fixed points, but rather on slow directed flows on ghost manifolds from which ghost channels and ghost cycles are generated. Moreover, we show that these novel objects are an emergent property of a broad class of models, typically used for description of natural systems.

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