Toward a Hamiltonian evolution dynamics – or why complex dynamical systems crash from time to time

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What are the explanations of natural science in view of systemic meltdowns such as the financial markets and possibly the economic system? Surprisingly little. Systems like the economy, financial markets or the biosphere evolve according to a set of so-called evolution equations, which have been studied or almost a century. Since economy or biology involve millions of goods and services, and species respectively, these equations become practically useless for understanding systemic characteristics of these systems, such as their robustness under shocks, their potential for being self-diversifying, or recovery rates after shocks. We suggest a Hamiltonian interpretation of evolution systems, such that it becomes possible to solve them in terms of their phase structure, especially for extremely high dimensions. These systems exist in two phases, one flourishing, highly diversified phase and a phase of very low diversity, with practically nothing in between. In this framework, the probability for crashes to occur can be directly translated to the 'distance' of the system from the phase transition surface. Our results might provide new ways of thinking about systematic risks and of how to consciously avoid crashes in rational and systematic ways.