Area scaling relations for homoclinic lobes

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The splitting of integrable separatrices into homoclinic tangles and the formation of homoclinic tangles around resonant islands are phenomena generic to perturbed Hamiltonian systems. These tangles are topological structures consisting of infinite sets of lobes, each of which has a well defined area that provides a measure of the phase space flux exiting a particular region. Consequently, homoclinic lobes are influential in transport between resonance regions in phase space and in the transition from order to chaos. However, the growth of these lobes as a function of perturbation amplitude has only been studied in the limit of small perturbations. Here we report the first direct numeric evidence (based on computations in five mapping-based model Hamiltonian systems: the Standard Map, Suris Map, Tokamap, Tripmap, and TRIP3D Map) that area scaling relations for homoclinic lobes known to be valid for small perturbations continue to provide empirically useful approximations in regimes of physically interesting perturbation strengths.

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