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authors	• Zensho Yoshida • Philip J. Morrison	• Z. Yoshida • P. J. Morrison
title	Unfreezing Casimir Invariants: Singular Perturbations Giving Rise to Forbidden Instabilities	Unfreezing Casimir invariants: singular perturbations giving rise to forbidden instabilities
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abstract		The infinite-dimensional mechanics of fluids and plasmas can be formulated as "noncanonical" Hamiltonian systems on a phase space of Eulerian variables. Singularities of the Poisson bracket operator produce singular Casimir elements that foliate the phase space, imposing topological constraints on the dynamics. Here we proffer a physical interpretation of Casimir elements as \emph{adiabatic invariants} ---upon coarse graining microscopic angle variables, we obtain a macroscopic hierarchy on which the separated action variables become adiabatic invariants. On reflection, a Casimir element may be \emph{unfrozen} by recovering a corresponding angle variable; such an increase in the number of degrees of freedom is, then, formulated as a \emph{singular perturbation}. As an example, we propose a canonization of the resonant-singularity of the Poisson bracket operator of the linearized magnetohydrodynamics equations, by which the ideal obstacle (resonant Casimir element) constraining the dynamics is unfrozen, giving rise to a tearing-mode instability.
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DUPLICATES	1071