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	authors	• Z. Yoshida • P. J. Morrison	**authors**	• Z. Yoshida • P. Morrison	DUPLICATES	1088
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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.	**abstract**	The infinite-dimensional mechanics of fluids and plasmas can be formulated as â€œnoncanonicalâ€ 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 adiabatic invariants â€”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 unfrozen by recovering a corresponding angle variable; such an increase in the number of degrees of freedom is, then, formulated as a 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.		
	versions		**versions**			