Controlling chaotic transport in Hamiltonian systems

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ABSTRACT

With the aid of an original reformulation of the KAM theory, it is shown that a relevant control of Hamiltonian chaos is possible through suitable small perturbations whose form can be explicitly computed. In particular, it is shown that it is possible to control (reduce) the chaotic diffusion in the phase space of a 1:5 degrees of freedom Hamiltonian which models the diffusion of charged test particles in "turbulent" electric fields across the confining magnetic field in controlled thermonuclear fusion devices. Though still far from practical applications, this result suggests that some strategy to control turbulent transport in magnetized plasmas, in particular tokamaks, is conceivable.

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