Thick Arnold tongues and cellular flows.

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Abstract

This problem was originally motivated by an observation that the rotation of Earth creates a very small but also very steady force upon icebergs, suggesting the question: what is the effect of a small steady force on dynamics of a particle carried by a fluid flow? An interesting effect arises in the model problem: the flow is Hamiltonian in $\mathbb{R}^2$, with a cellular structure, i.e. periodic in both variables, with the particle subjected to a steady force acting in a given direction. It is clear that the drift depends on the direction of applied force, but how? Numerical experiments show somewhat surprising dependence. I will describe end explain this unexpected phenomenon and show how Arnold tongues arise. Unlike the Arnold tongues for circle maps, these occupy the set of full measure. The phenomenon is robust. This is joint work with Alexey Okunev.
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