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"Shortwave instabilities of ideal fluid and the cocycle theory"

ABSTRACT:
Shortwave instabilities of an ideal fluid flow are instabilities generated by highly oscillating localized wavepackets, which propagate according to a finite-dimensional system of ODEs. We will show that the dynamical (Sacker-Sell) spectrum of the cocycle generated by this system describes the essential spectrum of the linearized Euler equation up to rotation. In some cases this approach gives exact spectral pictures, such as a solid ring or bicycle weel. We will survey other results that can be obtained via the cocycle analysis such as inherent instability of 3D flows with periodic streamlines, pseudo-differential structure of the Euler and Navier-Stokes semigroups, spectrum under vanishing viscousity limit.