



Einladung zum Oberseminar Mathematik in den Naturwissenschaften

Julius-Maximilians-Universität Würzburg
Lehrstuhl für Mathematik in den Naturwissenschaften

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Linear instabilities of the Prandtl equations via the harmonic oscillator

Boundary layers are regions near a solid boundary where fluid flows exhibit strong gradients, often giving rise to instabilities, turbulence, and wave phenomena such as Tollmien–Schlichting modes. The Prandtl equations are among the most widely studied models, intended to represent the leading-order behaviour of viscous boundary layers in the vanishing-viscosity limit.

In a seminal result, Gérard-Varet and Dormy proved the ill-posedness of these equations in Sobolev spaces around certain non-monotonic shear flows, by implicitly constructing unstable quasi-eigenmodes whose growth in time is governed by a Gevrey-class 2 dispersion relation (a regularity level intermediate between Sobolev and analytic classes).

In collaboration with J. Kortum (University of Würzburg), we show that these unstable quasi-eigenmodes can in fact be constructed explicitly, using hypergeometric functions of the first kind and appropriate eigenfunctions of the harmonic oscillator. This explicit formulation helps clarify the nature of the instability mechanism and offers further insight into the conditions required for ill-posedness in more regular function spaces, such as the Gevrey classes.

Ort: Mathematik Ost, 40.03.003/Zoom

Zeit: Donnerstag, 26.06.2025 um 9:00 Uhr

You are cordially invited to this lecture. The speaker will be there in person. A hybrid meeting is possible. Please request the link from anja.schloerkemper@uni-wuerzburg.de.

gez. Anja Schlömerkemper