universität innsbruck

Growth of Instabilities in Shear Flows

Context: Astrophysical plasmas; Numerical Simulations; Instabilities

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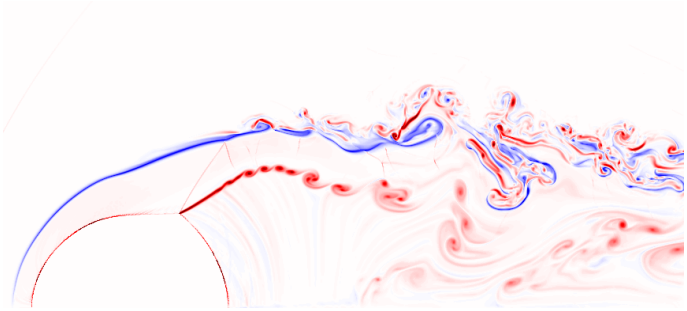
Abstract

There are many astrophysical systems with high-velocity gas flows like, e.g., jets from galaxies or compact objects, stellar winds, etc. In such high-velocity flows there can be regions, with very high velocity shear. That means that there is a large difference in the velocity of adjacent fluid parcels. Such a high velocity shear can lead to instabilities - in particular the Kelvin-Helmholtz instability - that lead to the exponential growth of disturbances in the fluid. In this bachelor project the student will investigate such a shear flow via numerical simulations and compare the growth of the fluctuations with analytical predictions. This is, e.g., relevant for the collision region of the stellar winds in so-called colliding-wind binary systems, where relative velocities can reach 1000 km/s. In this project, it will be interesting to see, how fast the fluctuations grow in a numerical code, and what are the smallest and largest disturbances that can grow for a given resolution of the simulations.

Helpful Skills

- Basic programming knowledge
- Interest in fluid mechanics and numerical simulations



Instabilities in a numerical simulation of a stellar wind