Identifikation and modeling of coherent structures in turbulent flows

Background:

The description of coherent structures in turbulent flows allows to capture a large portion of the temporal variation in the flow by simple models. These models allow robust monitoring of the flow via individual sensors for the purpose of active flow control and monitoring of system conditions. In the case of a turbulent flow the influences of stochastic disturbances caused by turbulent fluctuations have to be accounted for in the modelling in addition to the deterministic dynamics of the coherent structure. For this purpose the measurement results of different flow configurations will be investigated with current approaches for the identification and modelling of coherent structures in cooperation with the University of Calgary (Canada). The work at the University of Calgary is supervised by Prof. Robert Martinuzzi.

- Analysis of Particle Image Velocimetry Measuring data of an oscillating cylinder with Spectral Proper Orthogonal Decomposition
- Description of the temporal dynamics through reduced order models
- Quantification of the influence of turbulent disturbances by stochastic modelling
- Description of the phenomenon of vortex induced vibration with stochastic models

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