Diploma / Master Thesis

Numerics of Acoustic Streaming

The passing of an acoustic wave through a fluid (gas or liquid) can cause a net directed flow of the medium. This might be surprising, as usually only oscillatory (back and forth) motion of the medium is associated to the wave. However, due to attenuation and nonlinearity of the fundamental equations, non-zero time averages of fluid mass transport occur, which is termed acoustic streaming. The intensities of such streaming stimulated by sound can range from very slow, viscosity dominated creeping flows up to intense turbulent jet flows, where the inertia of the medium plays a significant role. Applications of the phenomenon include, for instance, increased convection and mixing of the fluid, or the disturbance of surface boundary layers for improved cleaning of solids in liquids.

In the project, the investigation of several aspects of numerical treatment of acoustic streaming is proposed. Based on modern methods of computational fluid dynamics (CFD), standard textbook problems should be (re-)considerd for tests and error estimates. In the next step, an extension to new and actual research situations is planned. In particular, more complicated geometrical arrangements, additional attenuation mechanisms (like gas bubbles in liquid), and nonlinear wave propagation are under interest. In the framework of the project, it is expected that existing numerical schemes are reviewed, and possibly revised and optimised schemes are proposed or developed.

The thesis will be supervised by Prof. H. C. Kuhlmann, Institute of Fluid Mechanics and Heat Transfer, in collaboration with Dr. Robert Mettin, Christian Doppler Laboratory for Cavitation and Micro-Erosion (http://www.dpi.physik.uni-goettingen.de/en/CDLCME), University of Göttingen.

For further information please contact

Prof. Dr. H. C. Kuhlmann
Institute of Fluid Mechanics and Heat Transfer
Resselgasse 3, 1040 Wien
Tel: +43-(0)1-58801-322 12
hendrik.kuhlmann@tuwien.ac.at

or

Dr. Christiane Lechner
Institute of Fluid Mechanics and Heat Transfer
Resselgasse 3, 1040 Wien
Tel: +43-(0)1-58801-322 11
christiane.lechner@tuwien.ac.at