Typ: Talk

## Optical measurement technices for the study of applied and fundamental fluid dynamics

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A good understanding of fluid flows inside the ocean is crucial to develop digital twins of it. In our new *Laboratory of Numerical Mechanics and Flow Measurement Technology* at the *University of Applied Sciences in Kiel (FH Kiel)* we are currently conducting measurements of fluid structures with optical measurement techniques such as *Particle Image Velocimetry (PIV)* and *Temperature-Sensitive Paint (TSP)* in order to validate our numeric simulations of fluid flows with *Computational Fluid Dynamics (CFD)*.

The flow around different geometric objects, such as cylinders, flat plates and airfoils have been tested inside our *FlowLab*, a small water tunnel which has been specially designed for PIV measurements. In a recent experiment inside the *FlowLab* a flapping airfoil was tested to study vortex formation and visualization of unsteady fluid dynamics. In a different setup TSP was used to study vortex formation behind a cylinder and visualize the formation of horse shoe vortices. Together with the *German Aerospace Center (DLR)* the TSP technology has also been used to study the influence of steps and gaps on the location of laminar-turbulent transition on a flat plate inside a cryogenic wind tunnel.

Currently we are also conducting CFD calculations of wind turbine rotor blades in order to compare them with experimental measurements obtained with the help of an *aerodynamic glove* mounted to the rotor blade. This innovative approach of combining measurements with numeric calculations can also be promising for upcoming developments of digital twins of the ocean together with GEOMAR.

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