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Investigation of the flow in a rectangular cavity using tomographic and time-resolved PIV CHRISTIAN HAIGERMOSER, LUKAS VESELY, MICHELE ONORATO, Politecnico di Torino, POLITECNICO DI TORINO TEAM — The unsteady flow in a 2-dimensional cavity at low Reynolds number is investigated experimentally in water. Time-resolved Particle Image Velocimetry (PIV) shows the oscillatory character of the flow and a flapping of the shear layer connected with inflows and outflows. These inflows and outflows are related to instants of high and low cavity drag. The Strouhal number based on the cavity length St_L of the fluctuating cavity drag is evaluated to be 0.33. Instead, the vortex shedding frequency and the related Strouhal number appear to be of one order of magnitude higher. It is concluded, that due to the very low flow speed the acoustic pressure waves, which are radiated from the forward facing step when a vortex impinges thereon, are not strong enough to trigger instabilities in the shear layer and no feedback mechanism as proposed first by Rossiter (1964) is present. The 3-dimensionality of the flow was studied using tomographic PIV in a parallel wind tunnel experiment. The scope of this experiment was to identify the origin of the instantaneous 3-dimensional flow. The scales of the 3-dimensional structures in the flow are visualized and quantified using 2-point spacial correlations.

Christian Haigermoser
PhD student

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