Abstract Submitted
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PIV measurements of in-cylinder, large-scale structures in a water-analogue Diesel engine[1] A. KALPAKLI VESTER, KTH Mechanics, Royal Institute of Technology, Y. NISHIO, Tohoku University, Sendai, P.H. ALFREDSSON, KTH Mechanics, Royal Institute of Technology — Swirl and tumble are large-scale structures that develop in an engine cylinder during the intake stroke. Their structure and strength depend on the design of the inlet ports and valves, but also on the valve lift history. Engine manufacturers make their design to obtain a specific flow structure that is assumed to give the best engine performance. Despite many efforts, there are still open questions, such as how swirl and tumble depend on the dynamics of the valves/piston as well as how cycle-to-cycle variations should be minimized. In collaboration with Swedish vehicle industry we perform PIV measurements of the flow dynamics during the intake stroke inside a cylinder of a water-analogue engine model having the same geometrical characteristics as a typical truck Diesel engine. Water can be used since during the intake stroke the flow is nearly incompressible. The flow from the valves moves radially outwards, hits the vertical walls of the cylinder, entrains surrounding fluid, moves along the cylinder walls and creates a central backflow, i.e. a tumble motion. Depending on the port and valve design and orientation none, low, or high swirl can be established. For the first time, the effect of the dynamic motion of the piston/valves on the large-scale structures is captured.

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