Numerical simulations of multiphase flow in vertical mounted Venturi flow meter

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The objective of the European EMRP project ENG58 "Multiphase Flow Metrology in the Oil and Gas Sector" is to explain and reduce the uncertainty in multiphase flow metering. The comparison of the measurements using multiphase metering systems with the results of computational fluid dynamic is used to achieve this goal. In this contribution, numerical simulations of two- and three-phase flows in vertical mounted Venturi flow meter are presented. According to the experimental set-up within the project, the simulations focus on the flow of water, oil, and gas in measurement system with pipe of diameter D=0.104 m. Different gas volume fractions and superficial fluid velocities lead to different flow patterns observed in horizontal pipe - namely stratified, stratified wavy, elongated bubble, and slug flow. The paper shows the behaviour of the flow with prescribed flow pattern after flowing in the Venturi meter. The velocity field, pressure distribution and pressure drop are presented in dependence on the flow pattern, superficial velocity and fluid properties. The results are compared with the measurements performed under the project and experimental observations described in literature.