Homogeneous flow in a large scale bubble column: experimental investigation and CFD modelling

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The homogeneous flow regime in a gas-liquid bubble column - 0.24 m inner diameter and 5.3 m height - is studied by using experimental and numerical investigations. The two-phase flow is studied experimentally by using gas holdup measurements, image analysis and optical probes. The holdup measurements are used for studying the column hydrodynamic and for identifying the regime transition. The image analysis and the optical probes are, then, used for quantify the bubble size distributions and the local flow properties for five superficial gas velocities in the homogeneous flow regime. A CFD Eulerian two-fluid modeling of the column operating in the homogeneous flow is proposed by using a customize version of the commercial software ANSYS CFX release 14.5.7. The 3D transient simulations have been performed considering a set of non-drag forces and polydispersity, accordingly with the Baseline formulation proposed by the Helmholtz-Zentrum Dresden-Rossendorf. It is shown that the CFD model predicts the global holdup and the local properties fairly well in the range studied.