Summary of the CaFE project deliverable: **D1.2 "DNS derived pressure"**

provided by ESR 1 Ogloblina Daria under the guidance of Prof. Nikolaus A. Adams,
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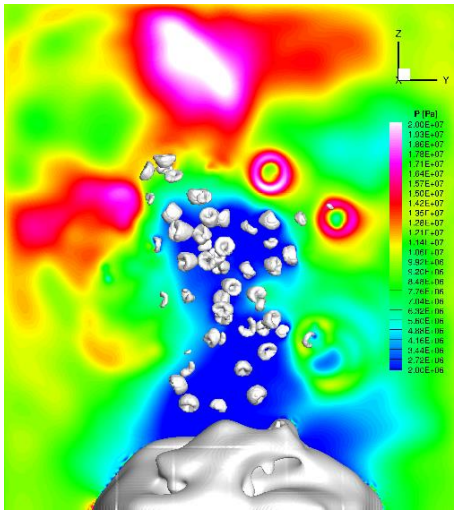

Pressure and vapor structures between the primal and first rebound collapses, middle slice in y-z plane. Non-spherical focused collapse of individual bubbles and large vapor region at the wall. The bubble deformation is characterized by induced jets pointing towards the cloud center.

Following the work package description, **Task 1.2** for ESR 1 read: **Simulate representative cases for single bubble collapse and bubble cloud collapse to be utilized** (later on). The methodology successfully assessed in **task 1.1** and presented in the previous report is extended to handle collapsing bubble clusters (clouds). At first, a random bubble generator is developed and seven suitable test-cases are generated. The test-cases differ by suitable non-dimensional parameters, such as the cloud interaction parameter and the stand-off distance of the cloud to a rigid wall. The test-cases were designed in order to allow a straight forward adoption by other groups in this project. Measurements of pressure in the flow, pressure at the wall and the time history of the vapor volume are presented and are ready to be used by other ESRs. As intermediate data was stored during the computations, a reduced dataset which suits best to the demands of other project partners can be extracted and highly resolved data can be generated by fast re-computation starting at storage instances. The obtained results **fulfill the scheduled milestone** and showed unexpected physical details, such as the finding that the intensity of the collapse-induced load at the rigid wall can be higher in secondary collapse events than in the primary ones

The driving pressure initially is 10 MPa in the liquid. Computations are carried out by using a fully compressible single-fluid flow model in combination with a conservative finite volume method (FVM). The investigated bubble clusters (referred to as "clouds") differ by their initial vapor volume fractions, initial stand-off distances to the wall and by initial bubble radii. The effects of collapse focusing due to bubble-bubble interaction are analyzed by investigating the intensities and positions of individual bubble collapses, as well as by the resulting shock-induced pressure field at the wall. Stronger interaction of the bubbles leads to an intensification of the collapse strength for individual bubbles, collapse focusing towards the center of the cloud and enhanced re-evaporation. The obtained results reveal collapse features which are common for all cases, as well as case-specific differences during collapse-rebound cycles. Simultaneous measurements of maximum pressures at the wall and within the flow field and of the vapor volume evolution show that not only the primary collapse but also subsequent collapses are potentially relevant for erosion.