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A Wall Law for Two-Phase Turbulent Boundary Layers

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Abstract : The presence of bubbles in the boundary layer introduces corrections into the log law, which must be taken into account. In this work, a logarithmic wall law was presented for bubbly two phase flows. The wall law presented in this work was based on the postulation of additional turbulent viscosity associated with bubble wakes in the boundary layer. The presented wall law contained empirical constant accounting both for shear induced turbulence interaction and for non-linearity of bubble. This constant was deduced from experimental data. The wall friction prediction achieved with the wall law was compared to the experimental data, in the case of a turbulent boundary layer developing on a vertical flat plate in the presence of millimetric bubbles. A very good agreement between experimental and numerical wall friction prediction was verified. The agreement was especially noticeable for the low void fraction when bubble induced turbulence plays a significant role.

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