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The influence of liquid/vapor phase change onto the Nusselt number. ELENA-ROXANA POPESCU, CATHERINE COLIN, SEBASTIEN TANGUY, Institut de Mecanique des Fluides Toulouse — In spite of its significant interest in various fields, there is currently a very few information on how an external flow will modify the evaporation or the condensation of a liquid surface. Although most applications involve turbulent flows, the simpler configuration where a laminar superheated or subcooled vapor flow is shearing a saturated liquid interface has still never been solved. Based on a numerical approach, we propose to characterize the interaction between a laminar boundary layer of a superheated or subcooled vapor flow and a static liquid pool at saturation temperature. By performing a full set of simulations sweeping the parameters space, correlations are proposed for the first time on the Nusselt number depending on the dimensionless numbers that characterize both vaporization and condensation. As attended, the Nusselt number decreases or increases in the configurations involving respectively vaporization or condensation. More unexpected is the behaviour of the friction of the vapor flow on the liquid pool, for which we report that it is weakly affected by the phase change, despite the important variation of the local flow structure due to evaporation or condensation.

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