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The influence of evaporation on instabilities of liquid layer with insoluble surfactant ALEXANDER MIKISHEV, Sam Houston State University, ALEXANDER NEPOMNYASHCHY, Techion-IIT — A horizontally infinite layer of an evaporating incompressible Newtonian liquid with insoluble surfactant on the free deformable surface is studied theoretically. The layer is subjected to a transverse temperature gradient. The evaporation process is described by 2D one-side model based on the assumptions of density, viscosity and thermal conductivity of the gaseous phase being small compared to the same properties of the liquid phase. Surface tension of the liquid-vapor surface linearly depends on temperature and concentration of surfactant. On the basis of experiments we assume that thermal resistance to the evaporation at the interface is a linear function of surfactant concentration. The evaporation mass flux depends on the interface temperature and vapor pressure. Using the long-wave approximation and assumption of slow time evolution the system of nonlinear equations is obtained. The equations retain all relevant physical effects which take place in the system. Linear stability analysis of the base state in the case of non-equilibrium evaporation is performed. The results are compared to those of the non-evaporating case.

Alexander Mikishev
Sam Houston State University

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