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On role of kinetic fluctuations in laminar-turbulent transition in chemically nonequilibrium boundary layer flows[1] ANATOLI TUMIN, The University of Arizona — Zavolskii and Reutov (1983), Luchini (2008, 2010), Fedorov (2010, 2012, 2014) explored potential role of kinetic fluctuations (KF) in incompressible and calorically perfect gas boundary layer flows. The results indicate that role of KF is comparable with other disturbance sources in flight experiments and in quiet wind tunnels. The analysis is based on the Landau and Lifshitz (1957) concept of fluctuating hydrodynamics representing the dissipative fluxes as an average and fluctuating parts. We are extending analysis of the receptivity problem to the fluctuating dissipative fluxes in chemically reacting nonequilibrium boundary layer flows of binary mixtures. There are new terms in the energy, and the species equations. The species conservation equation includes the dissipative diffusion flux and the species generation due to dissociation. The momentum equation includes fluctuating stress tensor. The energy equation includes fluctuating heat flux, energy flux due to diffusion of the species, and fluctuating dissipative flux due to viscosity. The effects are compared for the cases stemming from constraints of the HTV project (Klentzman and Tumin, AIAA Paper 2013-2882).

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