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**Viscosity stratified fluids in turbulent channel flow** ALFREDO SOLDATI, University of Udine; TU WIen, SOMAYEH AHMADI, ALESSIO ROCCON, University of Udine, FRANCESCO ZONTA, TU Wien — Direct Numerical Simulation (DNS) is used to study the turbulent Poiseuille flow of two immiscible liquid layers inside a rectangular channel. A thin liquid layer (fluid 1) flows on top of a thick liquid layer (fluid 2), such that their thickness ratio is $h_1/h_2 = 1/9$. The two liquid layers have the same density but different viscosities (viscosity-stratified fluids). In particular, we consider three different values of the viscosity ratio $\lambda = \nu_1/\nu_2$: $\lambda = 1$, $\lambda = 0.875$ and $\lambda = 0.75$. Numerical Simulations are based on a Phase Field method to describe the interaction between the two liquid layers. Compared with the case of a single phase flow, the presence of a liquid-liquid interface produces a remarkable turbulence modulation inside the channel, since a significant proportion of the kinetic energy is subtracted from the mean flow and converted into work to deform the interface. This induces a strong turbulence reduction in the proximity of the interface and causes a substantial increase of the volume-flowrate. These effects become more pronounced with decreasing $\lambda$.

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