Turbulence annihilation in surface tension stratified flow ALFREDO SOLDATI, SOMAYEH AHMADI, ALESSIO ROCCON, FRANCESCO ZONTA, TU Wien, Institute of Fluid Mechanics and Heat Transfer — In this work we use Direct Numerical Simulation (DNS) together with a Phase Field technique to study the turbulent Poiseuille flow of two immiscible liquid layers inside a channel. A thin liquid layer (fluid 1) flows on top of a thick liquid layer (fluid 2), such that their thickness ratio is $h_1 = 9h_2$. The two liquid layers have the same density but different viscosities $\eta$. In particular, we consider the case $\eta_2 < \eta_1$. The problem is described by the shear Reynolds number ($Re$), by the Weber number ($We$, which quantifies surface tension effects) and by the viscosity ratio $\lambda$ between the two fluids. Compared to a single phase flow at the same shear Reynolds number ($Re = 300$), in the two phase flow case we observe an increase of the flow rate of fluid 1 and a strong modification of the turbulence structures near the liquid-liquid interface. Alltogether, these observations support the presence of a significant Drag Reduction (DR), whose efficiency depends strongly on the interface deformability ($We$) and on the viscosity ratio between the two fluids ($\lambda$).