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# Vertical diffusivity in the UTLS in the Lagrangian transport model CLaMS and comparison with in situ aircraft observations of turbulence

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Contrary to the Eulerian approach, Lagrangian models have no spurious numerical diffusion, which is an advantage to describe advective transport in the stratified Upper Tropospheric-Lower Stratospheric (UTLS) flow. However, Lagrangian models also lack the "turbulent diffusion" induced by physical mixing, which thus needs to be parameterized for chemistry and tracer transport. In the CLaMS (Chemical Lagrangien Model of the Stratosphere) model, the mixing parameterization is driven by the shear and deformation of the flow. This mimicks what is expected from the actual turbulent mixing in the UTLS, but the impact needs to be quantified.

In this presentation, we compute the vertical diffusivity induced by the mixing parameterization in CLaMS and compare it to in situ estimates from aircraft measurements in the tropical tropopause layer (TTL) during the Airborne Tropical Tropopause Experiment (ATTREX). Both the model and the observations show a sharp decrease of diffusivity from the tropical upper troposphere to the lower stratosphere. Furthermore, the model simulations allow to study the climatological patterns of vertical diffusivity. In the lower stratosphere, the modelled diffusivity is closely related to the structure of the upper tropospheric jet and to shear phases associated with the Quasi-Biennal Oscillation (QBO). The realism of such features will be discussed. Finally, we will examine the sensitivity of the modelled diffusivity to model resolution and parameters of the mixing scheme.