Review on « Dimension of aircraft exhaust plumes at cruise conditions: effect of wake vortices»
by Simon Unterstrasser et al.

Synopsis and major points

The paper presents a series of LES computing the dispersion of aircraft emissions during the vortex phase submitted to various atmospheric conditions (stratification, turbulence…). However only dynamical effects (i.e. without microphysical-chemical transformations) are studied and some characteristics of the aircraft plumes such as tracer dilution and plume area, are presented as function of ambient and aircraft (i.e. the circulation) parameters.
The simulations confirm in general some observations of experiments and previous simulations by others. As such the results are not completely new but provide some interesting physical interpretation of the dilution of aircraft emissions in an aircraft wake evolving in a complex medium as the atmosphere. Furthermore the determination of plume dimension as well as the dilution rate will be probably useful to initialize the large-scale modelling (CTM) used by atmospheric scientists.

However, I have some comments and some points need to be clarified about the methodology followed and the nature of the results.

Details comments:

• Abstract: I am not satisfied by the first sentence "dispersion…**for the first time** using 3D during the vortex phase…". Far as I know, a number of studies have already been performed using 3D LES calculations during the jet/vortex interaction and vortex phase. Please delete "for the first time".

• At the end of the first page, note that alternative computational strategies have been developed based on the offline coupling between a detailed chemistry model and a 3D-CFD solver (see for example Garnier et al., 1997, Atmos. Environ.).

• In section 2.1: Please specify the numerical scheme used to solve equations (1a to d)

• In section 2.3: In the introduction the authors stated that "…the vortex break up is crucial to know" and however this study is limited to the vortex phase "until the coherent vortex structures disappeared". Indeed, since this work is limited to the vortex regime, I wonder if the grid resolution is adequate, namely in the vortex core, when dealing with the break-up process. Could you check the number of grid points in the vortex core? This seems to be a quite coarse grid, even for LES, as many points are out of the vortex core itself (only 1 or 2 points per vortex core radius?). It is an important parameter to take into account correctly during the link (and break-up) process. Please clarify.

• In section 3.5: The authors discuss the influence of initial spatial distribution of the tracer on the final passive tracer dilution. Firstly could you explain more precisely R_{init}, namely in Fig 111? Please, add a legend. Furthermore, I understand that the authors conclude that the initial distribution has not a strong influence on the final result, in terms of passive scalars whose physical interpretation is somewhat limited as the microphysical and chemical processes are not taken into account. As an example, some works have shown that the initial distribution of soot particles in the engine jet has a non-negligible impact on the distribution and the size of ice-particles when microphysics models are involved in the simulations.