Atmos. Chem. Phys. Discuss., 5, S1965–S1967, 2005
www.atmos-chem-phys.org/acpd/5/S1965/
European Geosciences Union

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Technical note: The Lagrangian particle dispersion model FLEXPART version 6.2" *by* A. Stohl et al.

A. Stohl et al.

Received and published: 5 August 2005

1. General response

We thank reviewer 2 for her/his careful review and comments, which will help remove some shortcomings of the paper. On the manuscript's length, we will contact the editor after the end of the open discussion, but we are certainly willing to convert the appendix into an electronic supplement and, perhaps, shorten the more technical sections.

2. Response to specific comments

Page 4745, line 10: We now write: The pre-processor selects the shortest forecasts available for that date from the ECMWF archives and deaccumulates the flux data.

Page 4746, equation 4: R is a constant (0.74) from Berkowicz and Prahm (1982). We now write 0.74 explicitly instead of R, in order to avoid possible confusion with the gas constant.

Page 4747: We now explain that this means local time and abbreviate it with LT instead of LST in the following.

Page 4748, equation 10: 2 is a subjective scaling factor. We now give a little more information on the reasoning behing equation 10: Under convective conditions, the envelope ABL height is, thus, the diagnosed ABL height plus the subgrid topography (assuming that the ABL height over the hill tops effectively determines the dilution of a tracer cloud located in a convective ABL). Under stable conditions, air tends to flow around topographic obstacles rather than above it, but some li fting is possible due to the available kinetic energy. $\frac{V}{N}$ is the local Froude number (i.e., the ratio of inertial to buoyant forces) times the length scale of the sub-grid topographic obstacle. The factor $c\frac{V}{N}$, thus, limits the effect of the subgrid topography under stable conditions, with $c = 2$ being a subjective scaling factor.

Page 4751, line 13: We now write: The computationally faster one (`ctl`$<$0 in file `COMMAND`) does not adapt the computation time step to the Lagrangian timescales τ_{L_i} (where i is one of the three wind components).

Page 4757: Yes, if the time scale is (too) short and the initial number of particles large, the number of particles increases dramatically. It is the user's responsibility to use a reasonable time scale for particle splitting. This depends very much on the nature of the problem (and particle splitting is recommended mostly for dispersion from point sources, where initially relatively few particle suffice), but it is suggested to target a maximum number of particles at the end of the simulation and adjust the initial number of particles and the time constant such that this number is reached at the end. For very few particles, the computation time of FLEXPART is independent of the particle number, as certain computations need to be made, regardless of how many particles are present. However, for a very large number of particles, the computation time scales linearly with the number of particles. Therefore, particle splitting is very efficient if there are, for instance, numerous point sources.

Page 4759: Yes, of course, several species can be calculated if the run is repeated. If a run is repeated with exactly the same model input, the output is also identical. The random number generator is seeded with a pre-set initial number and, thus, with everything else being equal, the sequence of random numbers generated is exactly identical. This is advantageous for debugging, as otherwise an error that might occur could never be reproduced. However, one can easily change the initial seed number, in order to generate a completely independent series of random numbers, if this is needed.

Page 4762: The factors are empirical and taken from Hertel et al. (1995) where they are explained in more detail. The aim is to avoid assuming that precipitation occurs in the entire grid cell, which would lead to an overestimation of washout.

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 4739, 2005.