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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Perturbation of the European free troposphere aerosol by North American forest fire plumes during the ICARTT-ITOP Experiment in summer 2004" *by* A. Petzold et al.

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Subject described in this paper is of real importance for our community : - vertical distributions of aerosol properties are not well known and aerosol impact calculation suffers for such a lack - a few studies only exist on boreal fire emissions and aerosol ageing properties are missing for biomass burning modeling. - It is urgent to better understand the intercontinental transport of gases and particles from boreal fires towards Europe especially in terms of height injection of pollutants and pollutant ageing.

This paper includes new and interesting results which partly answer to the previous questions. However the presentation is not well organized and the new results are

somewhat obscured behind what is really existing before : so it is difficult to read the paper and understand what is exacly measured or modelled. I am not really sure of the correct use of modelling results to support and enlight the experimental results. Also I think that too many conclusions are obtained from a lot of assumptions : perhaps it would be good to summarize some parts and to go into more details in others (e.g. the photochemistry part seems to be detailed in a joint paper which needs to be linked with aerosol measurements). Detailed comments : - introduction is clear enough, except : AOD of 4-5 units : what are the exact values? - ECHAM use : could be better used with sensitivity tests on boreal fire height injection on aerosol sizes... Could be better used if the year of study was the same : difficult to reach any comparisons with fire impact when modelled fire emissions and meteorological fields do not correspond to the observations. High interannual emission changes during the period 1997-2001 = difficult to compare with 2004. - If I well understood, you have a complete set of size distribution measurements for all flights : however PCASP data are only available for a few flights : need to be clearer on that. - Calibration between absorption measurements and BC are highly linked to particle sizes but also to emission sources. Same calibration can not be used for CBL polluted layers and boreal layers. - I dont understand a constant conversion from CO to BC : why dont keep to the FLEXPART transport of CO ? - As shown in the paper, it seems that PM25 mass concentrations are measured : here they are obtained from many assumptions (density, size ..) : it should be more clearly presented, in a second time. ⇨ for the latter points I think that the authors should keep to the true measured data to reach their conclusions ; size, absorbing coefficient, CO ..

- paragraph 3.2 needs to be rewritten for the interest of the paper. Example of problem : line 2 of p4938 in contradiction with line 28 in the same page. - ECHAM/MADE results could be better used - The author should be more clear in comparisons with previous experiments and for the different polluted layers Ĕ it seems that everything is mixed and it is difficult to retrieve what is new or not : effort of synthesis needs to be conducted : all comparisons with previous experiments should be gathered in the

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same paragraph. Same for modelling comparisons - Chemical composition ; no aerosol chemical composition is done for flights. This paragraph should mention this point. Conversion between absorption and BC is subject to many uncertainties. It would nice to have the photochemical measurements here to compare with aerosol sizes and absorption. - Unfortunately absorption measurements were not performed on July 30 (younger plume). It would be interesting to show absorption measurements for another flight also sampling younger plumes than for July 22. - I am not sure that the ssa calculation from available measurements is really convincing (too many uncertainties) - Smoke plume of various ages have been already studied in many tropical campaigns : DECAFE 91, EXPRESSO 98, SCAR C, SCAR BĚ - Need to be mentioned : FT transport and low particulate deposition => need to be verified in other conditions (another month for example?)

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 4925, 2007.