

Interactive comment on “A new aerosol wet removal scheme for the Lagrangian particle model FLEXPART” by Henrik Grythe et al.

Anonymous Referee #1

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General comments: This paper describes the incorporation of a new aerosol wet scavenging scheme into the FLEXPART model. The authors included a new parameterization for wet removal within and below clouds considering the physical state of water in the clouds and the precipitation type. This parameterization was set for three different types of aerosols and compared against available measurements. A series of sensitivity analysis were also performed to test the range of results obtained under different parameterization assumptions.

Specific comments:

- Although it is very commendable the inclusion of comparisons between measurements and model results, I have serious concerns regarding the uncertainties in other processes (e.g. emissions) that might hinder the conclusions reached by this work.

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Consequently, to give the readers a sense of the relative changes introduced by the new parameterizations, I would suggest including the results from the old parameterization for each of the three applications presented in this work.

- Line 160. How did you come up with a value of 6.1 for icr ? Is this basically an empirical factor?

- Including a list of recommended values for the parameterizations for different aerosols will enhance the value of this work.

Technical corrections:

Line 40. Please add chemical processes for completeness in the sentence.

Line 85-86. HYSPLIT has a new option for in-cloud wet scavenging parameterization (See Stein et al 2015, supplement). NAME has also updated its wet deposition scheme (see <http://www.metoffice.gov.uk/media/pdf/c/a/FRTR584.pdf>)

Line 91 non-linear chemistry has been included in this kind of models (e.g. Chock, D. P., and S. L. Winkler, 1994: A particle grid air quality modeling approach: 1. The dispersion aspect. *J. Geophys. Res.*, 99, 1019–1031, doi:10.1029/93JD02795. Chock, D. P., and S. L. Winkler, 1994b: A particle grid air quality modeling approach: 2. Coupling with chemistry. *J. Geophys. Res.*, 99 (D1), 1033–1041, doi:10.1029/93JD02796.)

Line 247. Sulfate is not a primary aerosol. Please correct the sentence.

Line 520- 524 This is very speculative. There is no empirical evidence that this is why the model shows a latitudinal bias.

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