Atmos. Chem. Phys. Discuss., 11, C528–C530, 2011
www.atmos-chem-phys-discuss.net/11/C528/2011/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Regional scale effects of the aerosol cloud interaction simulated with an online coupled comprehensive chemistry model" *by* M. Bangert et al.

Anonymous Referee #2

Received and published: 3 March 2011

This paper studies aerosols and their interaction with clouds in a regional mesoscale model with a domain covering Western Europe. The regional model COSMO-ART has been extended with sophisticated aerosol chemistry/physics and cloud microphysics, and has become a powerful tool for investigations of aerosol effects on regional weather and climate. I find the paper suitable for publications in Atmospheric Chemistry and Physics after the following comments and corrections have been taken into account:

1) Dust aerosols seem to be neglected in these model simulations, even though Saharan dust outbreaks are known to influence aerosol loadings over Europe. Although dust particles are not soluble, they may still act as CCN when internally mixed with

other aerosol species. Please discuss how this missing aerosol type could affect simulations. Or, if the assumption is that dust particles wouldn't have much influence, argue for why that would be the case
2) A grid-box mean vertical velocity, modified with a term representing turbulence, is used to calculate the fraction of aerosols activated to form cloud droplets. Although this model has a much higher resolution than e.g. GCMs, there will still be significant sub-grid scale variability in vertical velocities. Discuss what consequences using a mean vertical velocity value rather than a probability density function could have for the simulations.
3) Because the effect of aerosols on precipitation release is a focus in this paper, it would be good to know more about the autoconversion parameterization.
4) How and at what temperatures do droplets freeze in the simulations? This is relevant because many of the clouds in the domain are mixed-phase clouds.
5) It is hard to tell how much the vertical velocity contributes to the higher CDN concentrations in mountainous regions, because CCN(0.1%) also have a maximum in these regions (meaning the Alps).

MINOR COMMENTS:
-Page 3, Line 8-12: Add "in the scientific literature" at the end of the sentence
-Page 5, line 15-17: This sentence is a pain to read, please rewrite
-Equation (1): Shouldn't Dl be median diameter, not mean diameter?
-Page 8, line 3: I believe you mean W, not Wcb, here.
-Page 9, line 7: "ration" should be "ratio"
-Page 11, Item 2.: Use "between" rather than "of"
-Page 15, line 25: I suggest using "identified" instead of "looked"
-Page 16, line 17: "fraction" should be "ratio"
-Page 19, line 2: This sentence makes sense if you write "more CCN" rather than "less CCN"

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 1, 2011.