

General comments:

I read the manuscript with great interest. The paper addresses an important subject, the treatment of multiphase processes in atmospheric 3d models. The authors describe and discuss a new cloud chemistry module recently implemented in the regional-scale Meso-NH model. The module has been tested on three idealized applications, which emphasize different features of the approach. Unfortunately, the coupling between chemistry, microphysics and the transport processes are not described in detail. In my feeling, this can contribute to a better understanding of the whole algorithm as well as to a fair evaluation of the test results. Is the usual “operator splitting” approach applied for integrating the different terms in system (1)-(2)? In this case, the authors should give more information about the choice of the step sizes, the influence of the used splitting sequence and the expected splitting error.

I agree with the two other referees and recommend the paper for publication after minor revision, which takes into account the specific comments given in the reviews.

Specific comments:

p. 966, typo in formula (6): Replace “rc” by “ r_c ”

p. 969, first paragraph:

The authors point out that a polynomial equation of degree 8 has to be solved for determining the pH. Does a positive solution of the equation exist in all cases? Usually, the solution is not unique. How is the corresponding pH value selected?

p. 970 and p. 972, first paragraph:

The authors should check the equations (13) and (14). Why the second terms on the right hand side (“ g_{rau} ”) are not multiplied by X_{ice} ?