



Interactive comment on “Towards an online-coupled chemistry-climate model: evaluation of COSMO-ART” by C. Knote et al.

Anonymous Referee #3

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Knote et al. have made a thorough evaluation of an online-coupled regional air quality/meteorology model, including a large set of observations, some of them used for the first time. Model performance is assessed for different seasons and for a large number of species. The paper is well within the scope of GMD, and the presentation quality is high.

I was nominated to act as a referee only recently, after the first two reviews and a short comment had already been published, and I feel I do not have much to add to the comprehensive set of comments. Most of the comments seem to have been carefully addressed in the replies by the authors.

I will not engage in the discussion whether or not the model performance is overstated. Similar discussions have been ongoing for years and as long as we don't have a com-

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monly accepted way of judging model performance, there are mainly two things that are important: (known) important processes that are missing in the model have to be clearly identified, and the skill score of the model has to be quantified to the extend possible so that the experienced reader can assess the performance against other similar studies, many of which are now found in the literature.

As pointed out in earlier reviews, this model system is not complete (e.g. the absence of wet removal is an important lack!). However, this is made clear at several places in the manuscript and is also implied in the title. GMD is dedicated to the description, development and evaluation of numerical models of the Earth System and its components. The question is as to when the stage of model development is appropriate for a peer-reviewed publication. The current version of COSMO-ART is sufficiently advanced, has been used within research, and a detailed evaluation seems in order.

The paper is at least on par with a typical 'model development or technical paper' which is among the main GMD purposes. This model evaluation is an important landmark for use in current research activities where the model is already applied.

I will try not to repeat comments that have already been made and addressed. I suggest publication after the following minor issues have been resolved:

Abstract, first line: It's been some time since I was a modeler, but isn't a 'chemical transport model' offline by definition? Would it be better to say 'The regional online-integrated chemistry and meteorology model COSMO-ART...'

p.1815, l.15: write "by up to"

p.1816: "While this gives more realistic aerosol concentrations at the boundaries, the total inflow will still be underestimated." I don't quite understand why this approach necessarily should lead to underestimation. If trivial, please add a sentence.

p.1817: "lowest level at 10m" - do you mean centered at 10m, or is this the layer thickness? (important for AQ modelling)

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p.1817, l.21: write "AIRBASE (European AIR quality dataBASE, <http://airbase.eionet.europa.eu/>) data provide" or "AIRBASE (European AIR quality dataBASE, <http://airbase.eionet.europa.eu/>) provides"

p.1818, l.2: I'd replace 'reasoned by' with 'related to' in this case. 'reasoned by' sounds philosophical (also some other occurrences, but that's not critical).

p.1818, l.9: remove 'via', add comma before 'and'

p.1820: 'typically springlike' -> 'typical of spring' (or only 'springlike')

p.1821, l.16: 'data was used' -> 'data were used' p.1822, 'hours 12:00–18:00 LT' - remove hours, write 'local time'

p.1823, l.15: 'An overestimation of SO₂ emissions in the TNO/MACC inventory' - is it an established fact that SO₂ emissions have been overestimated by TNO/MACC? - If not, write 'A possible overestimation...'

p.1826, l.12: '13:30 LT, approx. 12:30UTC over Europe'

p.1830, bottom: 'Both, MODIS and AERONET data, are' - remove commas 'To capture the onset of a cloud is difficult to determine, so' -> 'Capturing the onset of a cloud is difficult, so'

p.1834, l.13: 'occurence' -> 'occurrence'

p.1839, l.19: 'Thus is it' -> 'Thus it is'

p.1841, l.12: 'compared the' -> 'compared to the'

p.1842: "and could have as result considered" doesn't sound right, rephrase.

p.1843, l.9: write 'suggests'

Fig.8 is borderline small. Consider dividing.