

Interactive comment on “Effects of various meteorological conditions and spatial emission resolutions on the ozone concentration ROG/NO_x limitation in the Milan area (I)” by N. Bärtsch-Ritter et al.

Anonymous Referee #1

Received and published: 2 April 2003

An important issue in the ozone chemistry are the pathways that are used in the processing of the precursors ROG and NO_x. The ozone production rate depends not only on the precursor concentrations but also on the ratio between NO_x and ROG. Similarly, to assess the effect of ozone abatement strategies it is important to realise whether the local atmosphere is NO_x limited or ROG limited in its ozone production. Meteorological conditions and allocation of emissions may (potentially) affect the NO_x and ROG limitations, and it is therefore important to investigate to what extent choices in emission resolution and uncertainties in modelled meteorological conditions change the NO_x and ROG limitations.

The study addresses variations in meteorological conditions and in emission resolutions. The choice of the various emission resolutions makes sense as being multiples of the finest resolution. One step further in coarser resolution (162x162 km) could have been considered simulating the equivalent of a box model in terms of emissions. However, the choice of the variations in meteorological conditions needs some clarification. Is it connected to uncertainties in the pre-processing of the meteorology or are there other considerations? In any way it should be discussed how realistic the variations are. They cover a large range, and practically I think that they are much smaller. Another problem is that most of the variations are not independent variations. For instance, temperature affects humidity. It might help in understanding the processes to consider these variations independently, but at the end they should be merged into a realistic combination. Indication of a realistic range of variation is important to assess the importance of accuracy in meteorological fields versus the resolution of emissions. Where to focus future efforts if more accurate ROG/NO_x contours are required?

The authors have chosen to discuss their findings on the basis of one particular hour with the occurrence of high ozone concentrations. Although such events occur frequently it is not clear whether or not the findings of this particular day can be seen as representative for other events.

The presentation of the results requires a lot of the stamina of the reader. Table 1 and 4 and the figures 3 and 4 contain an enormous amount of data. In the text too much numbers is presented which is sometimes confusing and distracting from the main body of information. There are 3 plumes, various components and much more variations. I suggest to reduce somehow this overload of information and focus in the presentation on changes in the key processes. The plume is interesting because it illustrates ROG limitations. The other two are mixtures, although Po Basin comes closer to NO_x limitation. An example of a pure NO_x limited area would be better. What is the main message from this study? The area of ROG limited ozone as a function of the imposed variations? Or changes in the chemical pathways that determine ROG or

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NO_x limitations? The discussion should have a more focussed structure.

Figure 1. Dashed circle is poorly visible. Figure 2 is too small.

Abstract line 11: what is meant with slope? The sentence is unclear. Line 12: does it mean that the areas of NO_x and ROG limitation change with humidity the total ozone production remains the same?

p.735, line 18-21: very unclear what is meant. Line 22: -its limitation- ?? Line 23-24: modified in order to get better agreement? What was the modification? And which measurements? Ozone, but what about other species? Line 25-26: totally unclear. Was the change between first and second model simulation a matter of modified emissions?

p. 736, line 2-4. Unclear line 5-6: why does this day have a good agreement with observations and the others not? Do you need to adjust the emissions for the other days as well? Do the other days produce the same sensitivity to the meteo variations as 13 May 1998? Line 15-17. Unclear, please formulate more carefully.

P. 737, line 13: based on Atkinson et al. (1997). Line 20. -we- is an active form which is used a couple of times, whilst the rest of the document is in the passive form. Line 23. I assume that wind direction is also required as output. Line 26: what means hybrid in this context? Does SAIMM include only local observations or also large scale features?

p.738, line 5: how many observations contributed to SAIMM? Is that enough for a 3x3 km resolution? Or does it come closer to interpolation of fields on a coarser resolution? Line 21. The inventory in the coarsest resolution was 54x54 km. What did you do in the west-east direction, 141 is not a multiple of 54?

p.739, line 15-16. -well described and observation close base case-. Strange formulation.

p. 740, line 21. Emissions of N₂O₅?

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p.741, line 1: according. Better: corresponding. This returns at several points.

p.742, line 7: Po Basin is just the middle square or not? line 16-19. A NO_x limited regime implies no response by ROG changes and substantial response by NO_x changes. The formula has the wrong sign. Line 28. Peak ozone and two means? Peak ozone where? In the -plume-?

p. 743, line.10 revise sentence. How much in volume does the plume become larger due to the increased mixing layer height? This part is difficult to read since there is not much structure in building up the message. This also holds for the other sections (B, C, etc..).

p. 744. line 23. The formation of PAN probably increases with increasing temperatures, but is exceeded by a much faster decomposition. line 25+ 13 ppb PAN, 25.9 ppb HNO₃. Very high values: are they also measured? Line 28-29. Is this statement true? If the PAN decomposition is temperature independent would that prevent the explosion of radicals?

p.750, line 12: probably the numbers referring to NO_x and ROG should be swapped.

p.752, line 21-23: what is the recommendation?

The quality of the paper would improve if: 1) the meteorological variations are put in perspective of a realistic range of variations, 2) the discussion is presented in a more structured way, without overloading of details, 3) the formulation of many statements is done more precisely. Too often statements are imprecise thereby puzzling the reader.

Interactive comment on Atmos. Chem. Phys. Discuss., 3, 733, 2003.

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