

## Responses to the editor

We thank the editor for his valuable comments. We answer point to point to the comments in blue:

Please address the following specific comments:

### P. 1

L. 8: I suggest "...is similar to the annual cycle of the ozone observations, but..."

Done

L. 14: Introduce NO<sub>x</sub>, as you do on p.2.

We replace "the No<sub>x</sub>-limited regime" by "the nitrogen oxide (NO<sub>x</sub>=NO+NO<sub>2</sub>)-limited regime"

L. 16: I suggest "...the benefits from the reduction..."

Done in the abstract and the entire paper.

### P. 2

L. 2: Assessments of what? Chemical and dynamical processes in the atmosphere?

We removed the term « and assessments » to clarify this point.

L. 5: "...of the residual..."

Done

L. 21: What exactly do you mean by "hot-spot"?

We change the sentence containing « hotspot » by : « This region is sensitive to climate change (Giorgi, 2006) that is due to its particular location and diversity of ecosystems. »

L. 26: changes. Changes owing to what?

We replace the sentence "the future change of surface ozone in Europe" by "the future changes of surface ozone due to climate change and ozone precursors evolution"

L. 29: I suggest the form "..., e.g., ..."

Done

L. 33: The assessment -> An assessment  
Done

L. 34: “At the regional scale...”  
Done

### P. 3

L. 4: Omit “the”  
Done

L. 7: “...emissions, and meteorological...”  
Done

L. 12 and elsewhere: I suggest you do not start a sentence with an acronym  
replace the “ACCMIP” by “This intercomparison project (ACCMIP)”

L. 13-14: Perhaps it would be better to write. “...and analyses the driving forces...”  
Done (see p3, L15)

L. 18: changes  
Done (see p3, L19)

L. 19: these changes  
Done (see p3, L20)

L. 26+: Introduce acronyms for the models when first used

Most of the model’s names is a mix of name from their lab and different model, which could make the text unclear. However, we introduce the acronyms for the models as much as necessary in the revised version of the paper. In addition, we added the following reference which give many information on the different models used in our paper: Lamarque et al. 2013 : “<https://www.geosci-model-dev.net/6/179/2013/gmd-6-179-2013-supplement.pdf>”

#### **P. 4**

L. 17: "...according to the radiative..."

Done (see p4, L20)

L. 24: I suggest "...), and one very..."

Done (see p4, L27)

L. 27: Secondly -> Second. To match the use of "first" earlier

Done (see P4, L30)

#### **P. 5**

L. 14: I suggest you use "one" and "four" instead of "1" and "4"

Done (see P5, L17)

#### **P. 6**

L. 6: "...from a local..."

Done (see P6, L10)

L. 25: Is the bias positive? If so, indicate

Done (see P6, L30)

#### **P. 7**

L. 13: For multiple citations order the citations by alphabetical or chronological order but do not mix. In particular, for citations in the same year, order alphabetically

Done (see P7, L18-19)

L. 23: Introduce the acronym for "sd" - you do so in P. 13

The acronym has already been defined just earlier (P7, L25)

#### **P. 8**

L. 27: Do you really mean global scales? Earlier, you suggest you focus on the Mediterranean Basin. Please clarify

In our study, we compare the performances of the different models for the regional MB scale vs the global scale.

To clarify this we rewrote this sentence by (see P8, L30-31) "In our study, we use the ACCMIP simulations of surface ozone over a specific region,

namely over the MB, but we compare the performances of the models at the regional MB and global scales »

## **P. 9**

L. 5: “...that the CMAM...”

Done (see P9, L9)

L. 8: Perhaps better to write “...bias is positive at the regional and global scales for all models except...” Is this what you mean?

Done (see P9, L12)

L. 10: “...in the recent past...”

Done (see P9, L14)

L. 15: “...and future...”

Done (see P9, L19)

## **P. 10**

L. 26: “...The CH4...” I suggest you do not start sentences with an abbreviation or acronym

Done (see P10, L31)

## **P. 11**

L. 2: “Tukey’s fences rule...” Omit “the”

Done (see P11, L7)

## **P. 12**

L. 7: bias -> biased

Done (see P12, L12)

L. 16: I suggest you mention first the earlier year, e.g., “2000 (REF) and 2030”

Done (see P12, L21)

## **P. 13**

L. 4: “...due to evaporation...”

Done (see P13, L8)

L. 23: showed -> show  
Done (see P13, L26)

#### **P. 14**

L. 18: has -> have  
Done (see P14, L23)

L. 20: "...is similar in magnitude for the two scenarios..."  
Done (see P14, L25)

L. 26: Quantify the "intense" mentioned. "Latter" what?

We change the sentence "We note that, for the RCP8.5, the change in surface ozone over the MB is less intense than the global tropospheric ozone change."

by (see P14, L30-32)

We note that, for the RCP8.5, the relative changes in summer surface ozone in 2030 (2100) over the MB is less intense with values of -1.3% (-0.8%) than for the global tropospheric ozone change with values of 7% (18 %). This global tropospheric ozone change has already been highlighted by Young et al. (2013).

#### **P. 15**

L. 9: "...combined with a..."

Done (see P15, L16)

L. 28: "For the 2030..."

Done (see P16, L1)

#### **P. 16**

L. 4: Could you quantify this proportional behaviour?

We replace "Dry deposition of ozone decreases for all scenarios from 2030 to 2100, in a proportional way to that of the surface ozone."

by (see P16, L10-12)

"For all scenarios from 2030 to 2100, dry deposition of ozone decreases like

surface ozone concentration with a more pronounced decrease for RCP2.6 and RCP6.0 than for RCP4.5”

L. 7: You mean that the net effect is one of randomness. Clarify

To clarify we change the sentence by (see P16, L13-15) “For the RCP8.5, the surface ozone budget terms of each model evolve differently which explains the non-significant changes in surface ozone and its stagnation over the MB.”

### **P. 17**

L. 22: You suggest these other results are significant. If so, at which level?

We changed the sentence “which show an ozone decrease”  
by (see P17, L22)

“Which show a statistically significant ozone decrease (using the Student t-test with 95% confidence level)”

L. 23-24: Quantify the “intensively” and “less strongly” qualifications

We replace the sentence “... decreases intensively from 2030 to 2100 for RCP2.6, RCP4.5 and RCP6.0 and less strongly for the RCP8.5”  
by (see P17, L24)

“... decreases intensively (15%-25%) from 2000 to 2100 for RCP2.6, RCP4.5 and RCP6.0 and less strongly (10%) for the RCP8.5”

L. 26+ paragraph: Quantify the decreases mentioned  
Done (see P17, L24-27)

L. 31: I suggest you avoid the use of “etc”  
Done

### **P. 18**

L. 3-4: Indicate how this builds on the work done in this paper.  
We removed this sentence that does not bring any added value to our paper.

L. 8: improve -> improved  
Done (see P18, L9)

### P. 26

Fig. 2: thin line -> thin lines.  
Done

Mention in the caption the legends in the two figures  
We added in the caption the following sentence “The different models and the observations are represented by a color as shown in the legends of each figure.”

### P. 30

Fig, 6: Please rephrase the penultimate sentence; it is not clear to me

We replaced the following sentence “The median is indicated by the thick horizontal black line, the multi model mean by a filled diamond, the (25-75%) range by the colored box and minimum/maximum excluding outliers by whisker. “

by

« The median is indicated by the horizontal black solid line and the multi model mean by a filled black diamond. The range (25-75%) is represented by the length of each colored box and the minimum/maximum (excluding outliers) by the whisker. »

### P. 33

Fig. 9: When talking about the anomalies, I suggest you mention first the earlier year, e.g., “2030-2100”  
Done

### P. 35

Fig. 11: “...the multi-model mean...”; “...by the whisker...”. Same for Fig. 12.  
Done