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The revised manuscript entitled “Distinct drivers of recent seasonal precipitation increase over Central Asia: roles of anthropogenic aerosols and greenhouse gases” by Jianing Guo, Xiaoning Xie, Gunnar Myhre, Drew Shindell, Alf Kirkevåg, Trond Iversen, Apostolos Voulgarakis, Toshihiko Takemura, Ke Shang, Xinzhou Li, Zhengguo Shi, Yangang Liu, Xiaodong Liu, Hong Yan.

Response to Editor:

In general, the authors have satisfactorily addressed the comments from the three reviewers. The reviewer who requested major revisions has re-reviewed the manuscript and now recommends acceptance.

However, two of the reviewers expressed initial concerns about interpreting the projected future summertime precipitation decreases shown in Figure 8 to aerosol decreases in the SSP scenarios. I echo that concern. In particular, I believe that the current text (line 304) is inaccurate in stating that aerosols decrease in all SSP scenarios. While SSP2 and SSP5 are forced with aerosol decreases in the 21st century, SSP3 is forced with nearly constant (or even increasing) aerosol forcing in some regions. See Lund et al. (2019): <https://doi.org/10.5194/acp-19-13827-2019>.

I ask the authors to clarify their text describing the future aerosol pathways in the SSP scenarios, making clear that SSP3 does not have the sizeable 21st century aerosol reductions found in the other two scenarios. Interpretation of the results in Figure 8 may also need to be modified accordingly.

Response: We thank the editor and the reviewers for their helpful comments. We agree with this point about the future aerosol changes in SSP-370. Aerosol decreases are more pronounced in SSP2-45 and SSP5-85, whereas SSP3-70 does not have the sizeable 21st century aerosol reductions found in the other two scenarios (with nearly constant or even increasing aerosols in some regions such as SAM and SAF in Figure

R1). Note that anthropogenic aerosols over East Asia and South Asia decrease in the late 21st century with a smaller magnitude relative to the other two scenarios, also shown in Figure R1. Therefore, aerosol reductions in East and South Asia under SSP3-70 may contribute to the projected summer precipitation reduction during 2015–2100. We have revised the manuscript to clarify that aerosol pathways differ substantially among scenarios as “*These scenarios represent different future changes in GHGs and anthropogenic aerosols (O’Neill et al., 2017; Rao et al., 2017; Samset et al., 2019; Turnock et al., 2020; Wilcox et al., 2020), with increasing GHG concentrations of different magnitudes and scenario-dependent aerosol changes. Asian aerosol decreases are more pronounced in SSP2-45 and SSP5-85, whereas SSP3-70 shows relatively weak aerosol reductions. Note that SSP3-70 is forced with nearly constant (or even increasing) aerosol forcing in some regions, such as South Africa and South America (Lund et al., 2019).*”

We have also modified the interpretation of Fig. 8 accordingly, as “*Furthermore, it shows a significant reduction of summer precipitation in most regions of Central Asia under future emission scenarios (Fig. 8). The regional precipitation reduction is likely driven by the future reduction of anthropogenic aerosol emissions over Asia (mainly including East Asia and South Asia) owing to the projected implementation of Asian clean air policies (O’Neill et al., 2017; Rao et al., 2017; Wilcox et al., 2020).*”

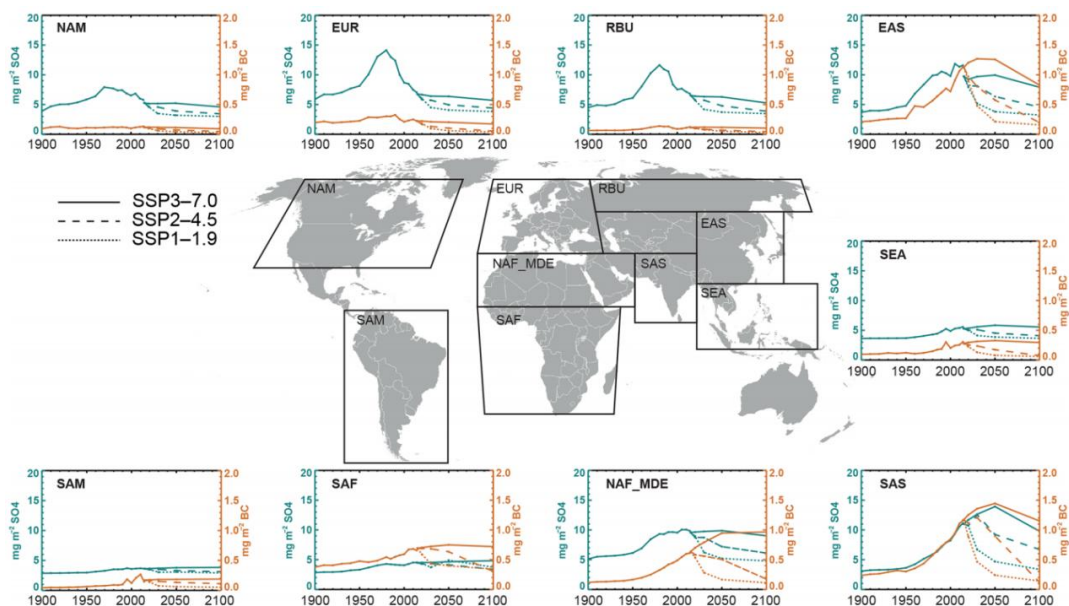


Figure. R1 (from Fig. 2 in Lund et al., 2019) Regionally averaged burdens of BC and sulfate aerosols from 1900 to 2100 using CEDS historical emissions and SSP1-19, SSP2-45 and SSP3-70.

Reference

Lund, M. T., Myhre, G., and Samset, B. H.: Anthropogenic aerosol forcing under the Shared Socioeconomic Pathways, *Atmos. Chem. Phys.*, 19, 13827–13839, <https://doi.org/10.5194/acp-19-13827-2019>, 2019.