

Interactive comment on “Anthropogenic aerosol forcing of the AMOC and the associated mechanisms in CMIP6 models” by Taufiq Hassan et al.

Anonymous Referee #2

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The manuscript acp-2020-769 “Anthropogenic aerosol forcing of the AMOC and the associated mechanisms in CMIP6 models” by Hassan et al. studies the AMOC variations in the 20th century CMIP6 simulations focusing on 1950 to 2020 as AMOC strengthens from 1950 to 1990 and weakens after 1990 in CMIP6 simulations. They have attributed these AMOC changes to changes in anthropogenic aerosol forcing. The main thesis of the paper is very interesting, but the authors did not really go deep enough to analyze the underlying physical processes, instead they mostly rely on the correlations. It is obvious that correlation does not mean causality. I would like the authors to do more in depth analysis on the physical processes instead of just correlation analysis before I can recommend this manuscript to be accepted for publication.

Comments: 1. The authors are mostly focused on the atmospheric side of changes and did not do any ocean related processes. They may look at the vertical structure change in the subpolar North Atlantic, such as an area mean vertical profile of T, S, and density. By doing so, it may get more insights on what processes cause the strengthening or weakening of the AMOC. 2. Some analysis on the mixed depth change may also be helpful. Such as link the changes of mixed layer depth to the aerosol forcing and explore how the aerosol forcing can affect the deep convection in the models. 3. A comparison of the Atlantic meridional streamfunction between all forcing runs and anthropogenic aerosol runs may also help to explore the underlying physical processes.

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