The importance of the ozone layer for the response of the climate system to natural and anthropogenic forcings

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The important role of the ozone layer for the climate system -- notably how the ozone layer responds to natural and anthropogenic forcings, and how that response then feeds back on the climate itself -- remains largely unexplored, apart from the effects associated with gases regulated by the Montreal Protocol. This is because, to date, most climate models do not account for the complex interplay between stratospheric ozone chemistry, dynamics and radiation. We here present some recent results illustrating the importance of such interplay in two circumstances. First, we show that the inclusion stratospheric ozone chemistry significantly reduces the climate sensitivity to solar forcing, as well as the hydrological response (Chiodo & Polvani, 2016). Second, we demonstrate how changes in the ozone layer from increased levels of carbon dioxide can have a substantial effect on the circulation response to that forcing, while barely altering the climate sensitivity (Chiodo & Polvani, 2017; Chiodo et al, 2018). Such findings demonstrate that stratospheric ozone feedbacks play a key role in shaping the climate response to natural (solar) and anthropogenic forcings. It is therefore important, when running models without coupled stratospheric ozone chemistry, to use forcing-consistent ozone data-sets, notably for the CMIP integrations.

References:

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