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Towards fast machine learning parameterizations of stratospheric ozone feedbacks in climate change simulations

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There is a plethora of ways in which the representation of upper tropospheric and stratospheric ozone ('ozone feedbacks') can affect the outcome of climate change simulations. Prominent examples include modulations of the tropospheric and stratospheric circulation, climate sensitivity, cloud formation, and stratospheric water vapour (e.g. [1-8]). Here I first revisit some recent work providing evidence for such effects. I then provide an update on a recently developed machine learning parameterization for ozone using the UK Earth System Model (UKESM1, [9]). Such a parameterization could adequately represent ozone feedbacks without adding the high computational expense of a fully interactive atmospheric chemistry scheme. The parameterization could also provide several notable scientific advantages, for example concerning the treatment of important chemistry-climate model biases. Finally, I put my results into the context of several other methods suggested as potential means for addressing ozone-related effects in idealized climate sensitivity simulations, also considering the still substantial uncertainties related to modelling ozone [10,11] and associated climate feedbacks [5,12].

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