

## ***Interactive comment on “Stratospheric impact on the Northern Hemisphere winter and spring ozone interannual variability in the troposphere” by Junhua Liu et al.***

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This is an interesting new article on the role of the of the stratosphere on tropospheric ozone interannual variability during Northern Hemisphere winter and spring (when the STE flux is at a maximum). We however feel that our most recent study that looks at the stratospheric influence on tropospheric ozone should additionally be cited within the introduction:

"Characterising the seasonal and geographical variability in tropospheric ozone, stratospheric influence and recent changes" by Ryan S. Williams et al. (2019) (<https://www.atmos-chem-phys.net/19/3589/2019/>)

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We would suggest adding a citation to this paper either on P2, L38:

"Stratosphere-troposphere exchange (STE) has been shown to impact the tropospheric ozone distribution (e.g., Terao et al., 2008; Hess et al., 2015; Holton et al., 1995)."

Or alternatively on P2, L50:

"STE has been widely studied for several decades (Danielsen, 1968; Holton et al., 1995; Olsen et al., 2002; 2003; 2013; Stohl et al., 2003a; 2003b; Sprenger and Wernli, 2003; Thompson et al., 2007; Lefohn et al., 2011; Skerlak et al., 2014)".

Since our study does not look at STE explicitly (only implicitly using tagged stratospheric ozone tracers from the EMAC and CMAM CCMs), a citation on L38 would be more applicable in our view.

Furthermore, we feel that a mention to nudged, specified-dynamics CCM simulations should be later included in the introduction, in addition to free-running CCM simulations and CTMs (P2-3, L61-72), as a useful tool for assessment of the stratospheric influence on tropospheric ozone (using stratospheric tagged ozone tracers). Compared with free-running CCMs, "the influence on composition of dynamical biases and differences in variability between the reanalysis and the models can be assessed" - Morgenstern et al. (2017), P648 (<https://www.geosci-model-dev.net/10/639/2017/>). This point could also be made in highlighting the role of constraining the dynamics on influencing the distribution of model composition fields.

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