Comments by Owen R. Cooper (TOAR Scientific Coordinator of the Community Special Issue) on:

Dynamical drivers of free-tropospheric ozone increases over equatorial Southeast Asia

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This review is by Owen Cooper (NOAA CSL), TOAR Scientific Coordinator of the TOAR-II Community Special Issue. I, or a member of the TOAR-II Steering Committee, will post comments on all papers submitted to the TOAR-II Community Special Issue, which is an inter-journal special issue accommodating submissions to six Copernicus journals: ACP (lead journal), AMT, GMD, ESSD, ASCMO and BG. The primary purpose of these reviews is to identify any discrepancies across the TOAR-II submissions, and to allow the author teams time to address the discrepancies. Additional comments may be included with the reviews. While O. Cooper and members of the TOAR Steering Committee may post open comments on papers submitted to the TOAR-II Community Special Issue, they are not involved with the decision to accept or reject a paper for publication, which is entirely handled by the journal's editorial team.

This paper is very well written, with a thorough meteorological analysis to demonstrate the impact of seasonal convection patterns on mid- and upper tropospheric ozone above equatorial Southeast Asia. I recommend some additional text to explain how the current study fits within the context of previous work on the same topic, and to provide some discussion on the relative contributions of changing meteorology and the continuing increase of anthropogenic emissions on the observed increase of ozone above this region.

1) The following statements in the introduction suggest that previous studies have not investigated the impact of climate variability and seasonal cycles on ozone trends and variability: "the possible effects of dynamics and climate change have been given little consideration." and "Seasonally or monthly resolved analyses are less common (e.g., Chang et al., 2023; Section 3.4)".
There is a very large body or work that addresses the impact of climate change on ozone, summarized by several review papers and IPCC AR6 (Jacob and Winner, 2009; Fiore et al., 2012; Fiore et al., 2015; von Schneidemesser et al., 2015; Szopa et al., 2021). Many studies have examined how trends vary by season or with climate variability (such as ENSO), and it is now standard procedure for modeling studies to quantify the impact of meteorological variability on ozone trends (Columbi et al., 2023; Cooper, M.J. et al., 2013; Li S. et al., 2023; Lin et al. 2014,2015,2017; Rowlinson et al., 2019; Wang et al. 2022a; Wang et al 2022b; Xue et al. 2020). To provide a broader context for the submitted paper it would be helpful to point out the new aspects of this study and how they build on earlier work.

2) Detailed budget studies on the drivers of ozone trends across the tropics began in the mid-1990s with the development of global scale three-dimensional atmospheric chemistry models. The earliest studies indicate that increasing anthropogenic emissions are the primary cause of increasing tropical ozone (Levy et al., 1997; Roelofs et al., 1997). Since that time models and emissions inventories have

continued to improve and successive generations of models (Szopa et al., 2021; Skeie et al, 2020; Griffiths et al., 2021; Liu et al., 2022) have attributed the observed ozone increases in the tropics to anthropogenic and biomass burning emissions, with anthropogenic emissions continuing to increase in the region of SE Asia (Li, M. et al., 2023). Two recent model studies explored the relative contributions of changing emissions and meteorological variability across SE Asia and concluded that rising emissions are driving the ozone increase (Wang et al., 2022b; Li. S. et al., 2023). The submitted paper does not address the impact of rising emissions on the observed ozone variability in the ozonesonde record, and some discussion is needed to quantify the relative contributions of dynamical changes and rising ozone precursors.

3) Several papers in the literature have discussed the impact of ozone sampling frequency and the challenges of detecting trends (Prinn 1988; Chang et al., 2020), or calculating accurate monthly or seasonal mean ozone values (Logan, 1999, Saunois et al., 2012). These earlier studies focused on northern mid-latitudes and a new study submitted to the TOAR-II Community Special Issue addresses this challenge at a tropical location (Chang et el., 2024). Some discussion is needed regarding the ozonesonde sample size and the confidence in the reported trends.

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