

## Response to Reviewer #1

We sincerely thank Reviewer #1 for the positive evaluation of the manuscript and helpful suggestions. Our point-to-point response to the comments is provided below.

*Q1.1: Minor correction: Please consider a small language edit for consistency. In the manuscript, the terms “stratospheric intrusion” and “stratosphere-to-troposphere transport (STT)” are sometimes used interchangeably. Adding a brief clarification early in the introduction to distinguish these terms would help readers.*

**A1.1:** We thank the reviewer for this suggestion. Stratosphere-to-Troposphere Transport (STT) denotes the general process of air mass transport from the stratosphere to the troposphere, while Stratospheric Intrusion (SI) refers to specific, transient events in which stratospheric air penetrates into the troposphere, representing an episodic manifestation of STT. Following the reviewer’s suggestion, we have clarified these distinctions in **L25-29** in the Introduction section and revised the corresponding sentence as follows:

“STT is the general process of air mass transport from the stratosphere to the troposphere, playing a critical role in introducing ozone-rich stratospheric air into the troposphere (Hong et al., 2024; Stohl et al., 2003; Langford et al., 2015). When the folds occur, STT manifests as stratospheric intrusions (SIs), characterized by their episodic nature and rapid descent, significantly altering the total tropospheric ozone burden (Williams et al., 2019; Neu et al., 2014).”