

Effect of Extratropical-Tropical Variability On Air Quality Over the Western United States

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Motivation:

- High levels of tropospheric ozone have negative impacts on human health
- One significant nonlocal source of tropospheric ozone over western North America is downward transport via stratospheric intrusions

Overview:

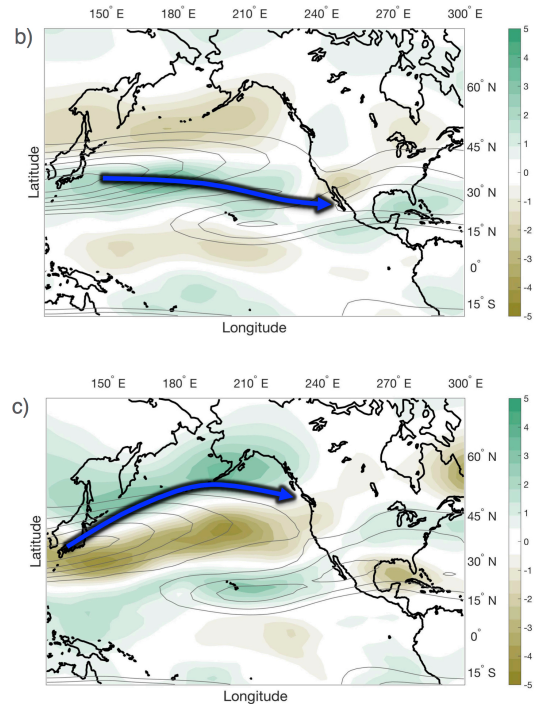
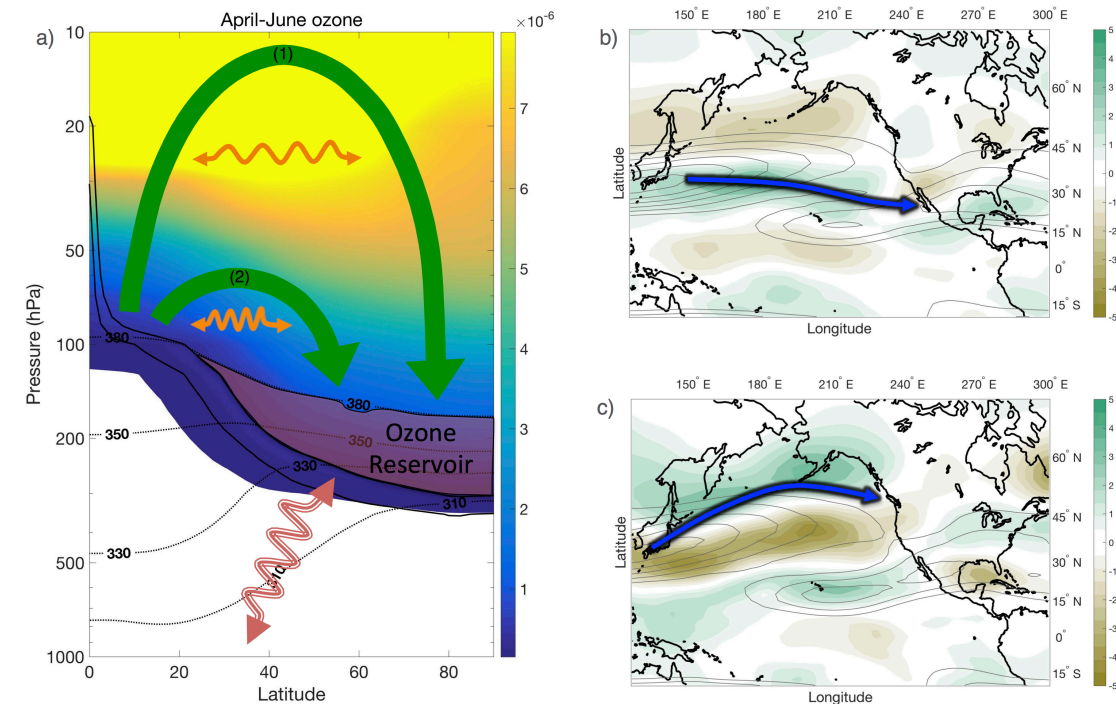
The El Niño-Southern Oscillation (ENSO) and the Northern Annular Mode (NAM) are investigated for their roles in modulating stratosphere-to-troposphere transport (STT) of ozone over the Pacific-North American region via two mechanisms:

Conclusions:

- StratVarO₃ is more important than JetVar for driving interannual variations in STT of ozone over the Pacific-North American region
- The abundance of ozone in the LMS at the end of winter is a robust indicator of the amount of ozone that will be contained in stratospheric intrusions during the ensuing spring
- The overall strength of the winter season stratospheric NAM is a useful predictor of ozone intrusion strength
- While ENSO-related jet variability is associated with STT variability, it is wave breaking frequency rather than typical ENSO teleconnection patterns that are responsible for the ENSO-STT relationship.

StratVarO₃ – Figure 1a: Winter season buildup of ozone in the lowermost stratospheric reservoir (LMS) that serves as the source of ozone available for STT. Green arrows denote stratospheric transport and pink wavy arrow denote intrusions

JetVar – Figure 2b,c: Jet shifts that govern the frequency and location of spring season intrusions. Shown are years with southward (b, 1992) and northward (c, 1999) shifts in the zonal jet that are consistent with typical El Niño and La Niña jet shifts



Citation:

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