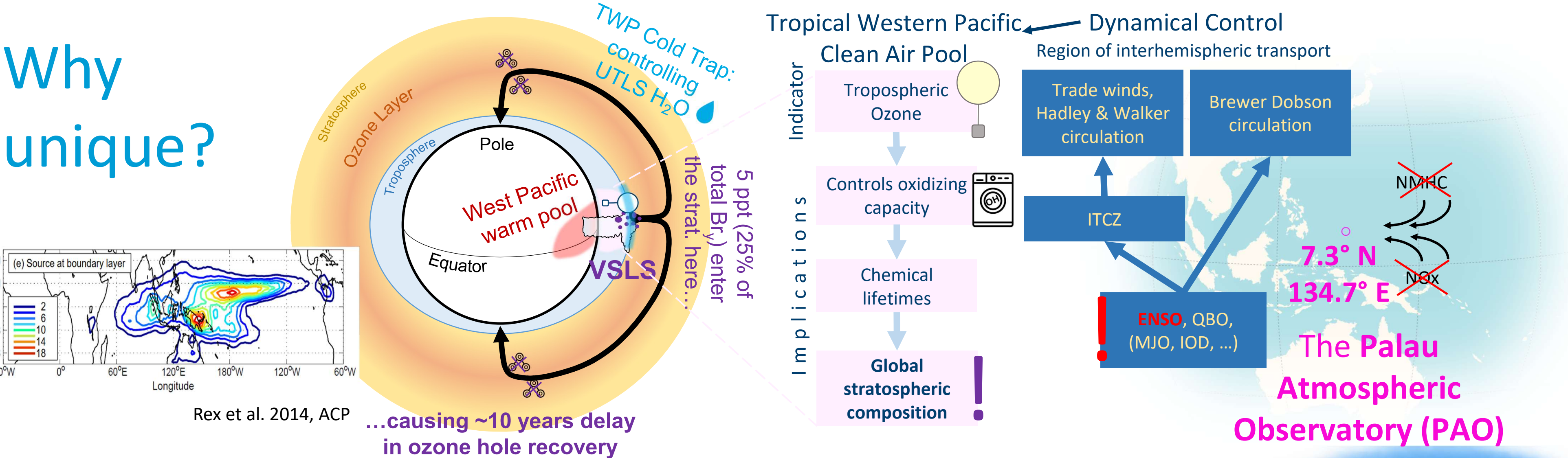


# Palau within SHADOZ: a unique perspective on tropical tropospheric ozone variability

Katrin Müller<sup>1</sup> (katrin.mueller@awi.de), Tim Röpke<sup>1</sup>, Adeline Schulte<sup>1</sup>, Xiaoyu Sun<sup>2</sup>, Ryan M. Stauffer<sup>3</sup>, Debra E. Kollonige<sup>3</sup>, Anne M. Thompson<sup>3,4</sup>, Raphael Köhler<sup>1</sup>, Markus Rex<sup>1</sup>

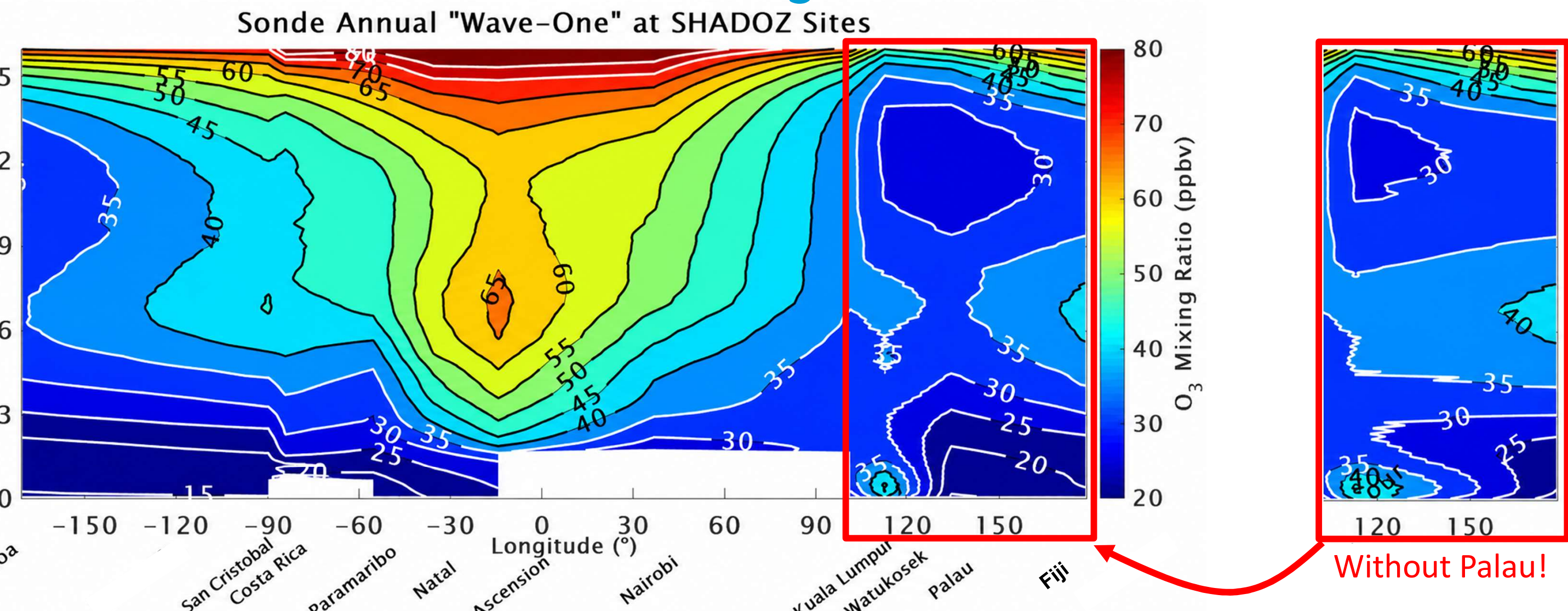
<sup>1</sup>Alfred Wegener Institute, Helmholtz Center for Polar and Marine Research, Potsdam, Germany <sup>2</sup>University of Bremen, Bremen, Germany <sup>3</sup>Atmospheric Chemistry and Dynamics Laboratory, NASA GSFC, Greenbelt, MD, USA <sup>4</sup>University of Maryland-Baltimore County, Baltimore, MD, USA

## Why unique?

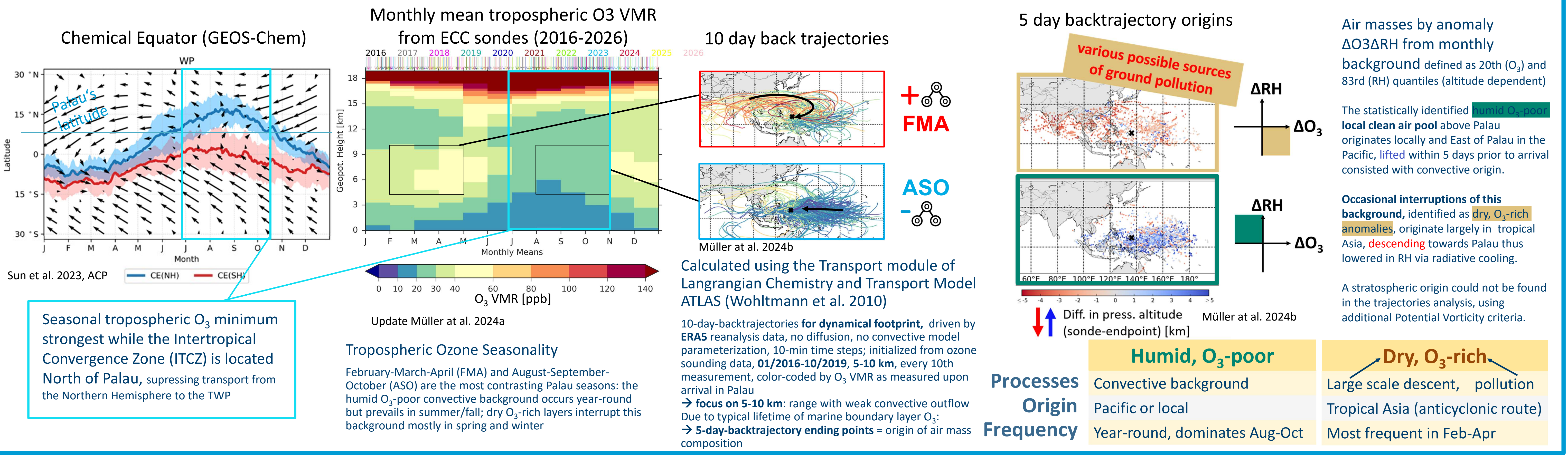


The Tropical Western Pacific (TWP) is a key gateway for air entering the stratosphere during boreal winter, making its composition critical for global atmospheric chemistry and dynamics. Its low tropospheric oxidizing capacity affects chemical lifetimes, while the local tropical tropopause layer (TTL) cold-trap regulates stratospheric water vapor (Rex et al. 2014, Sun et al. 2025). Since 2016, the Palau Atmospheric Observatory (PAO; 7°N, 134°E) has filled a long-standing observational gap in the TWP using regular balloon-borne ozonesondes, water vapor and aerosol sondes and remote sensing (Müller et al. 2024a). As part of SHADOZ (also NDACC, B2SAP and PGN) the PAO extends the network's longitudinal coverage across the western Pacific. With growing integration into global networks, PAO is uniquely positioned as a reference site for satellite validation and long-term monitoring of stratospheric trace gases and large-scale circulation changes.

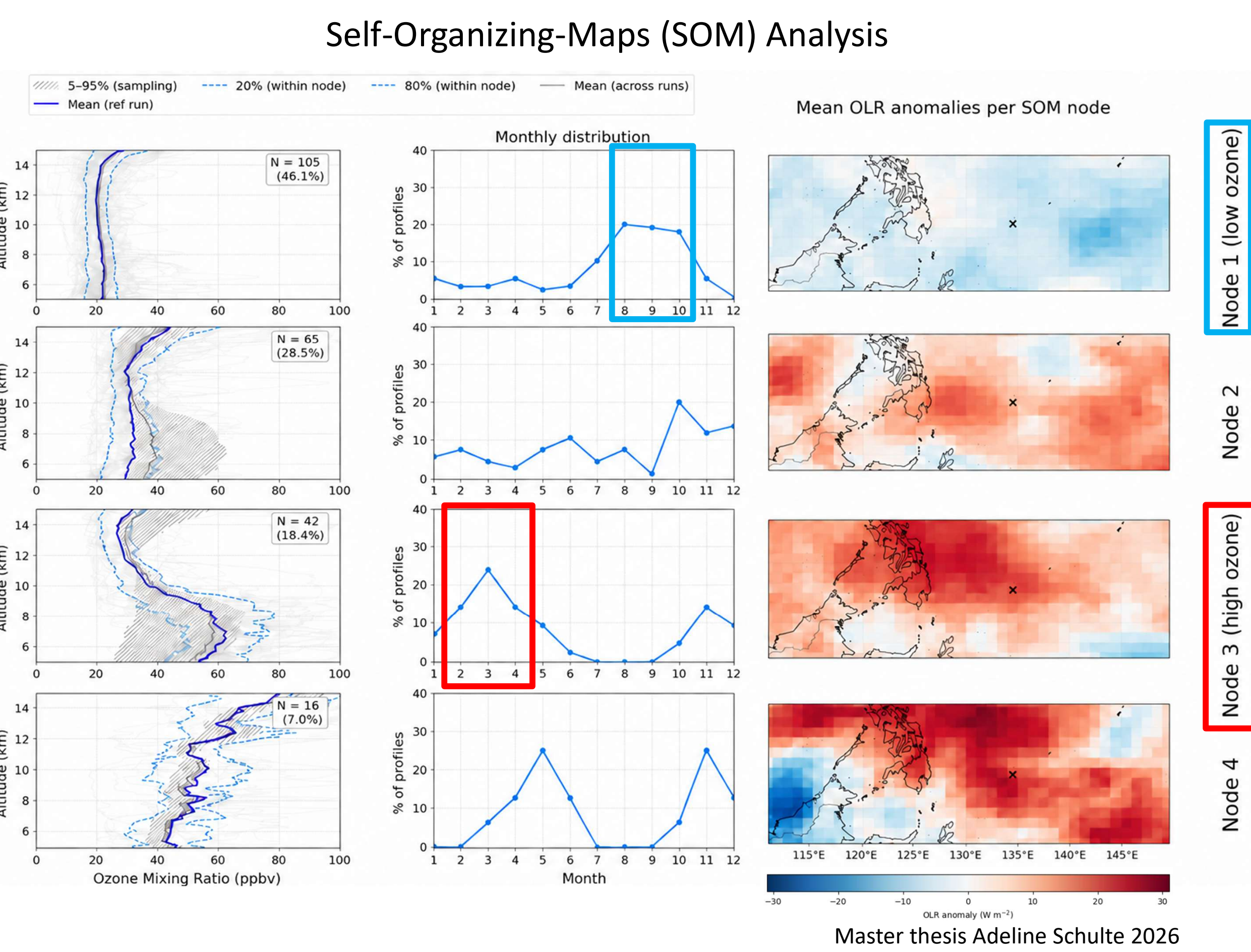
## Global tropospheric O<sub>3</sub> minimum



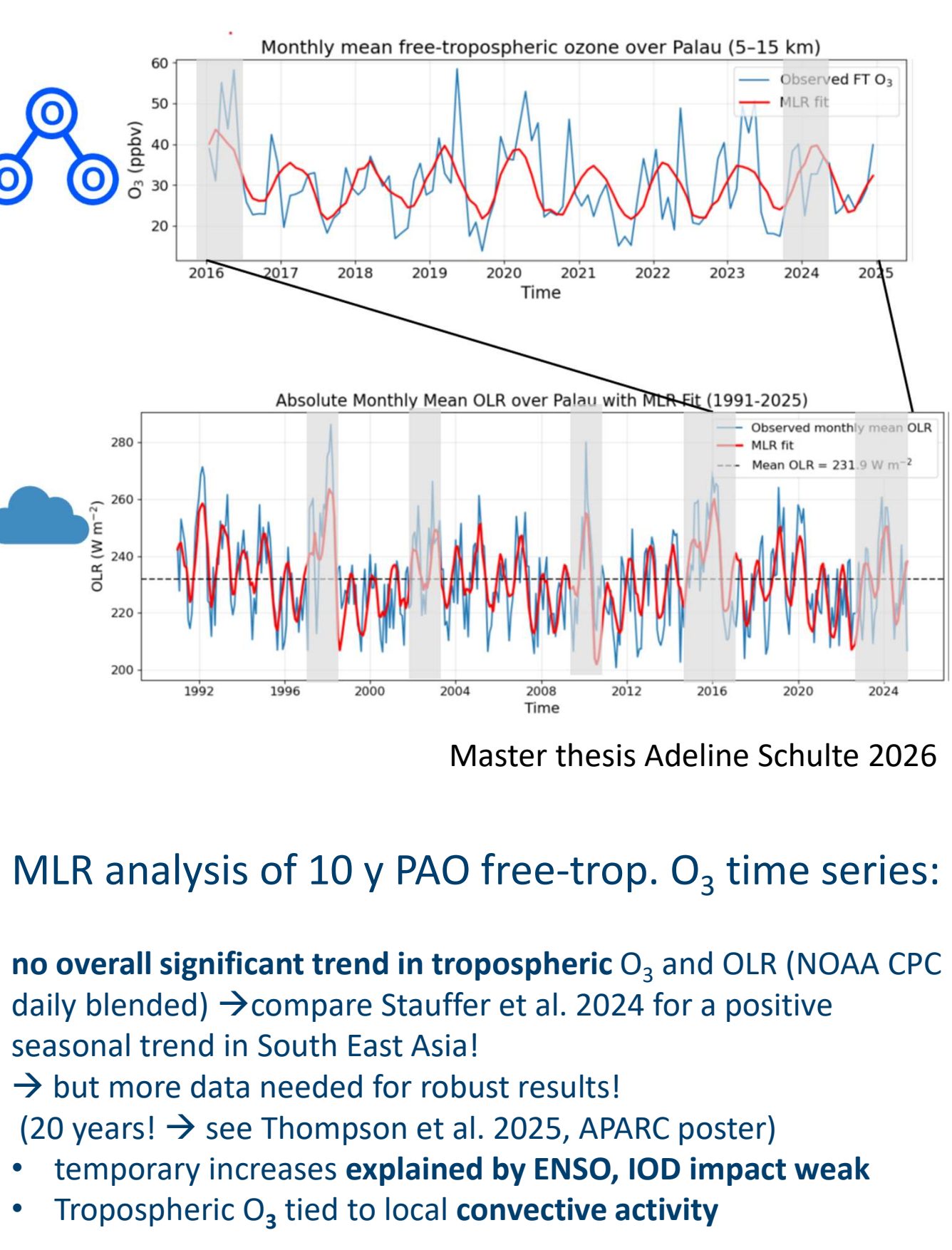
## Distinct seasonal transport and local convective signatures in the O<sub>3</sub>RH structure



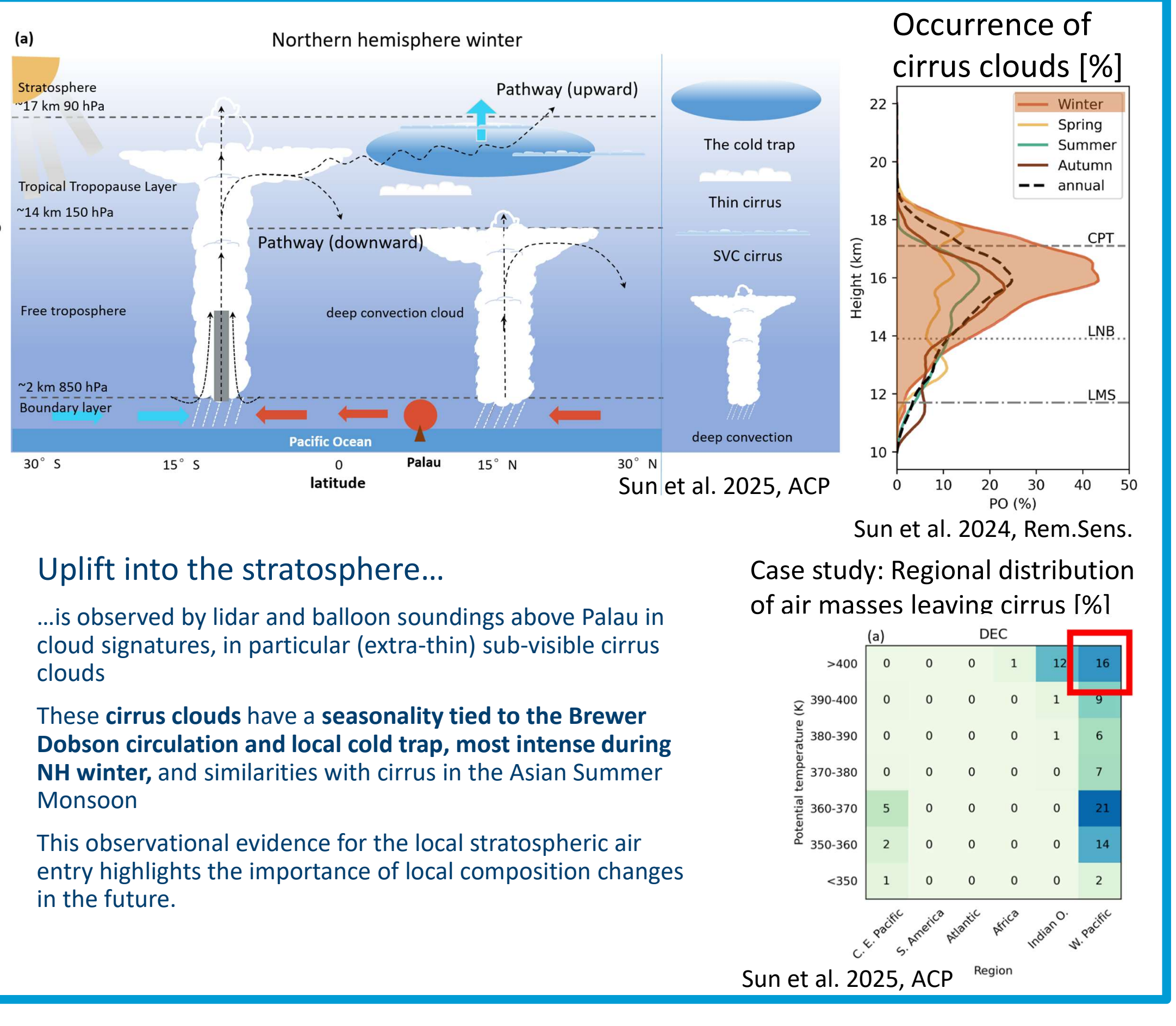
## Strong seasonality with modulations mainly by ENSO



## Multilinear Regression (MLR) Analysis



## Observed uplift via TWP cold trap



## Main references

