# OCTAV-UTLS (Observed Composition Trends and Variability in the UTLS) SPARC Activity. Jet-relevant data analyses of NOAA ozonesonde records.


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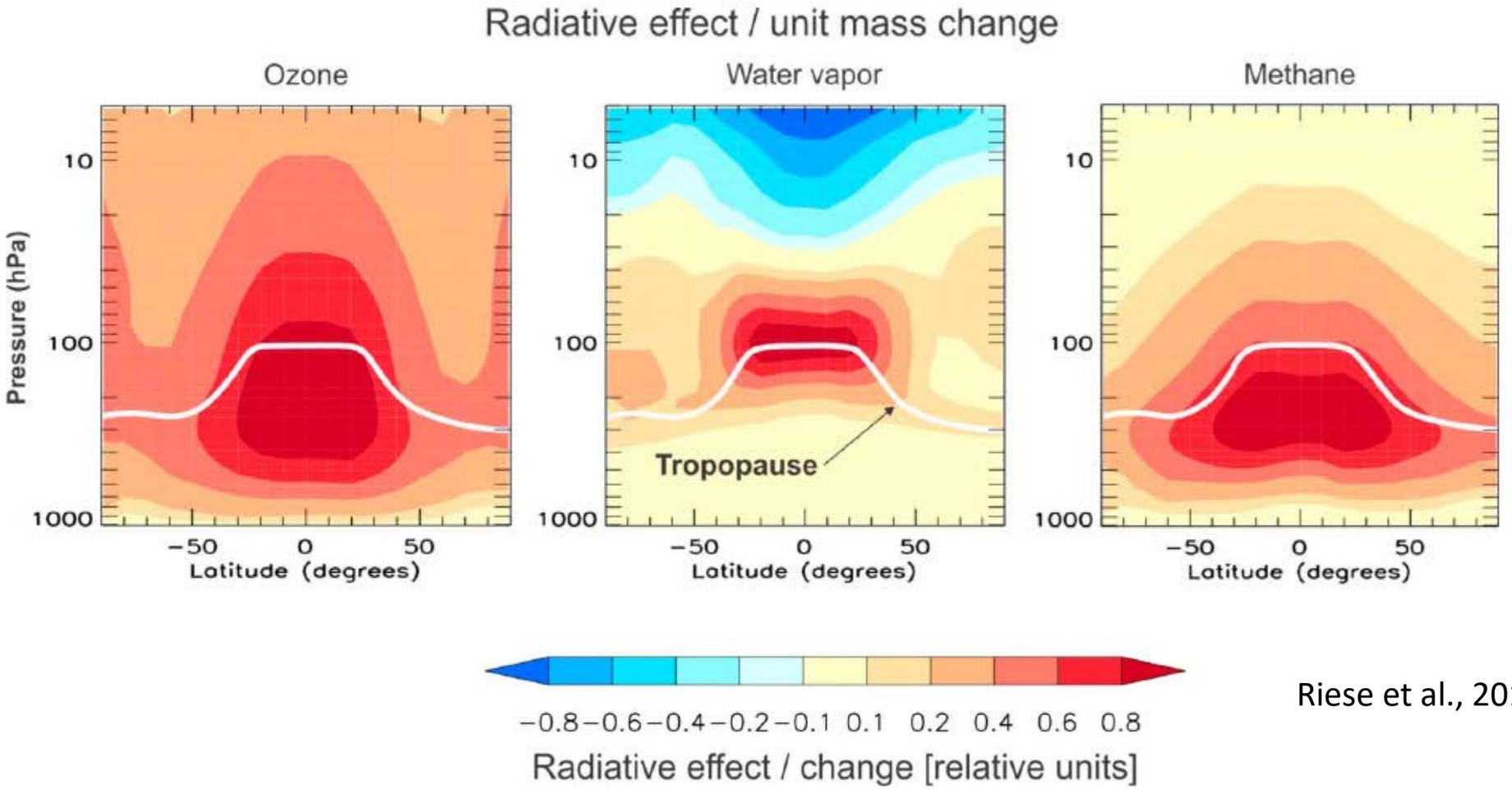
# OCTAV **UTLS**: Motivation

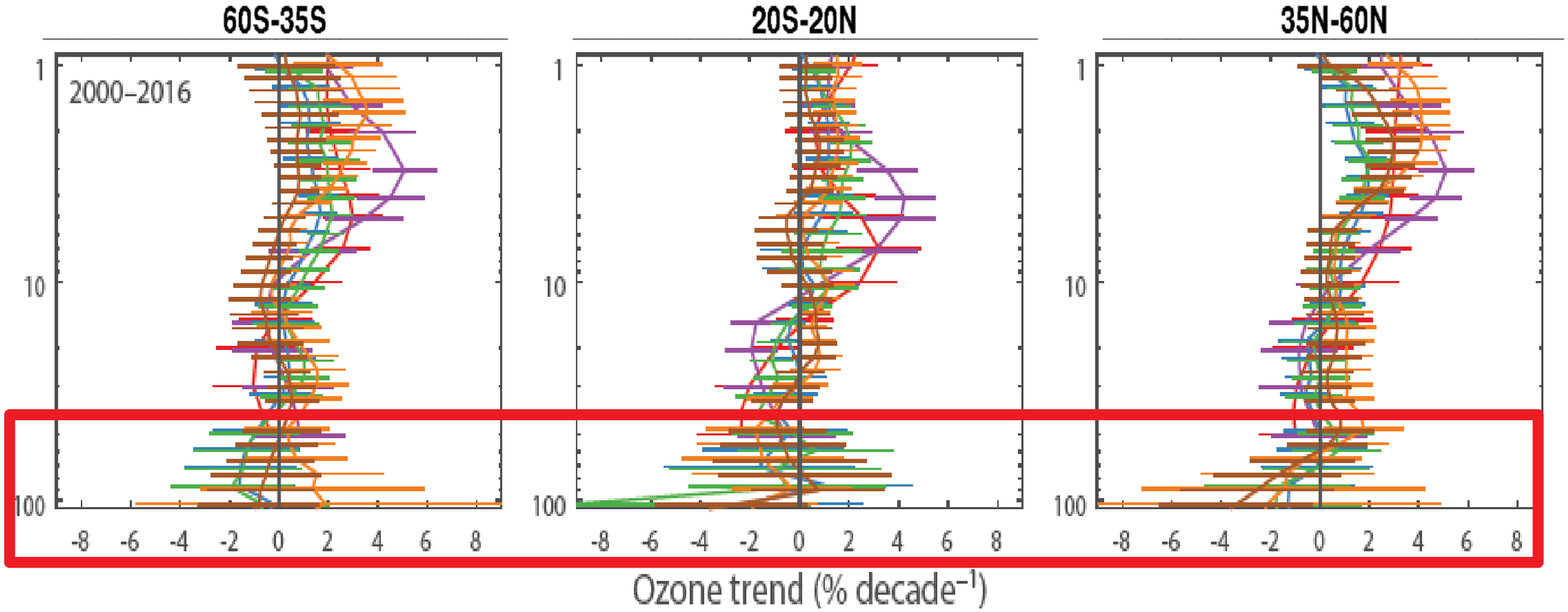



Riese et al., 2012

strong sensitivity of surface temperature to changes of radiatively active trace gases in the UTLS

# OCTAV **UTLS**: Motivation

UNEP/WMO Ozone assessment, 2018, SPARC/WMO LOTUS Report, 2019




**UTLS: Large range of uncertainty**

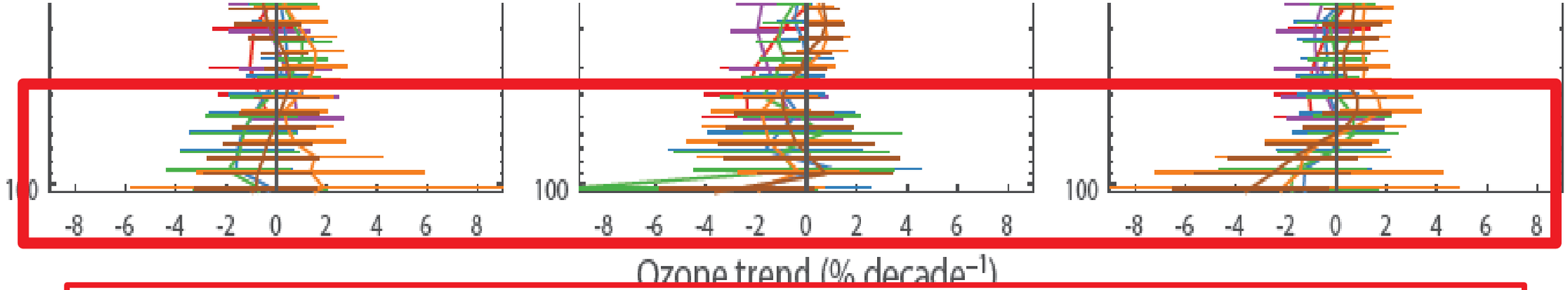
**Sign and magnitude of trends**

# OCTAV **UTLS**: Motivation

**What are main causes of the variability/uncertainties of the chemical composition in the UTLS?**

**- Limitations by the observations (coverage, resolution, measurement uncertainty)**

**- Dynamical variability**




**Can we better account for the dynamically induced variability to reduce the variability of the composition?**

# OCTAV – UTLS
# Observing Composition Trends and Variability in the UTLS

**Objective: Develop unified consistent geophysically-based metrics to account for dynamical induced variability**

**Previous Research: Strat/trop exchange is enhanced in the vicinity of the Jets ENSO+QBO+BDC influence jet location and tropopause**

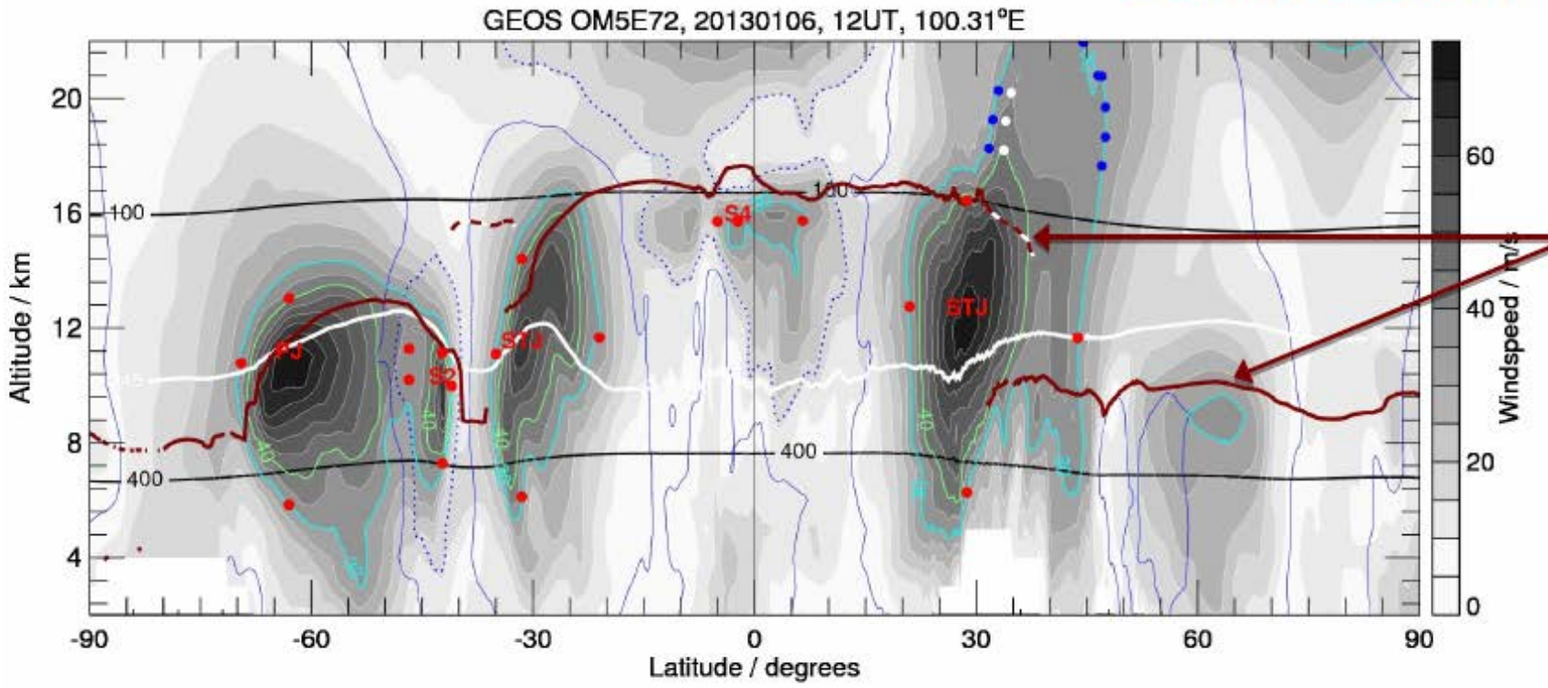
**Method: Apply the same metrics (e.g. tropopause and jet relative coordinates) to multiple data sets from different platforms**

**What are the best coordinates to account for the variability induced by dynamics?**

# OCTAV UTLS: Methods


## JEt and Tropopause Products for Analysis and Characterization

Jet cores: windspeed maxima >40m/s
Jet region edges: 30m/s windspeed




Detailed tropopause information

**G. Manney**
**L. Millan**

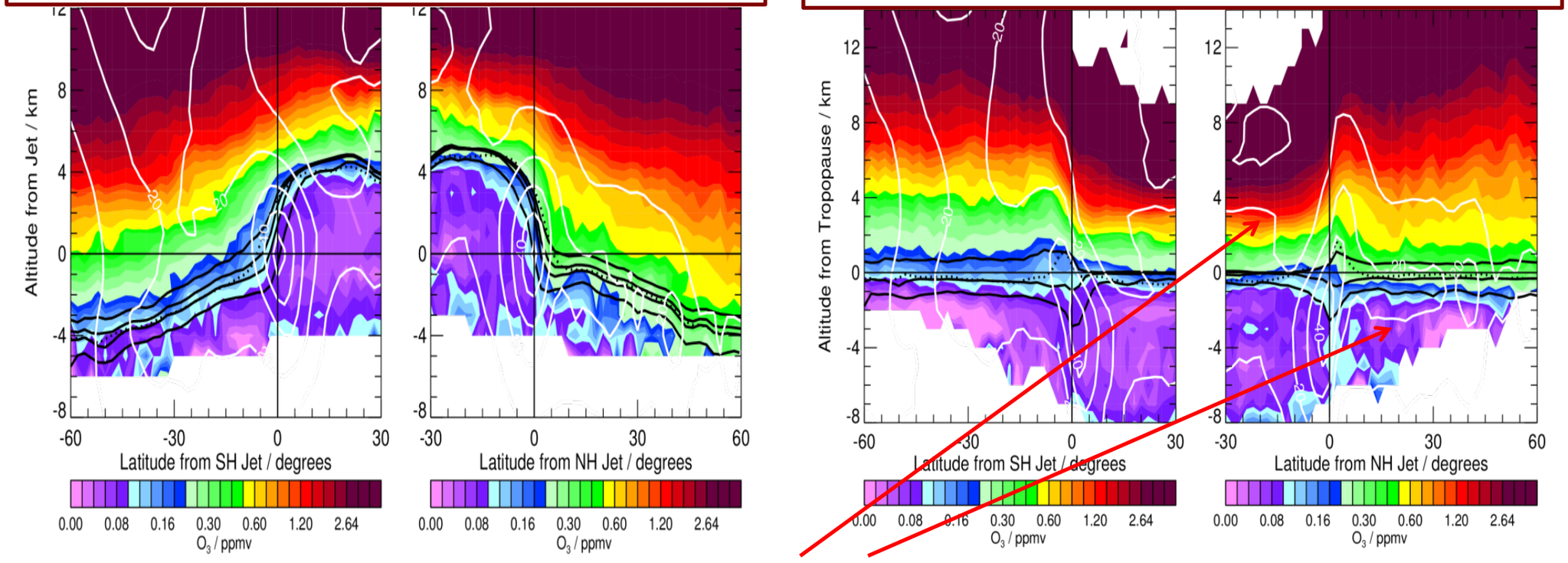
**+ DIFFERENT GEOPHYSICAL COORDINATE SYSTEMS**

# OCTAV UTLS: Methods

## Combined tropopause referenced and jet-relative coordinates (STJ, PJ)

STJ latitude / STJ altitude, all longitudes

STJ latitude / TP altitude

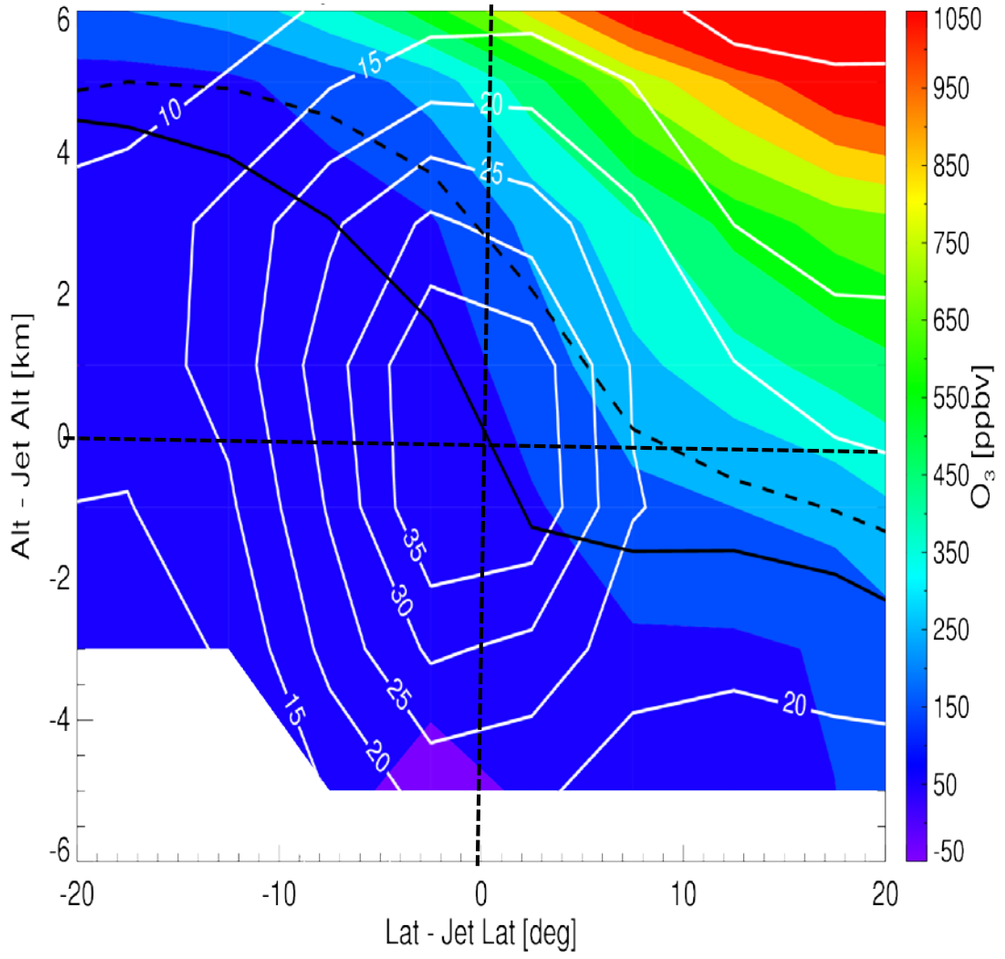



Clear separation between different regions and ozone gradients

**JETPAC (Manney et al., 2011, 2014, 2017)**

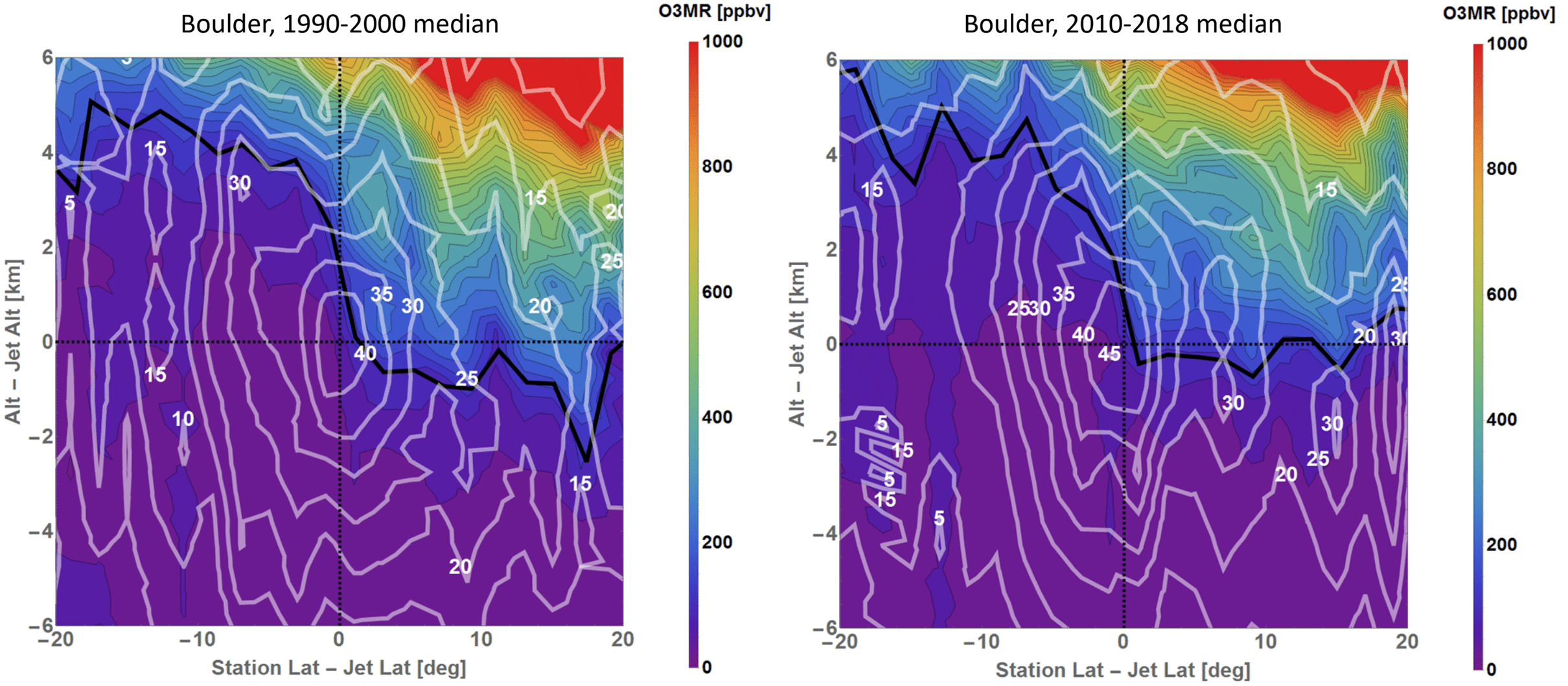
# OCTAV UTLS: overcoming sampling limitations

MLS satellite (MAM 2010-2018)



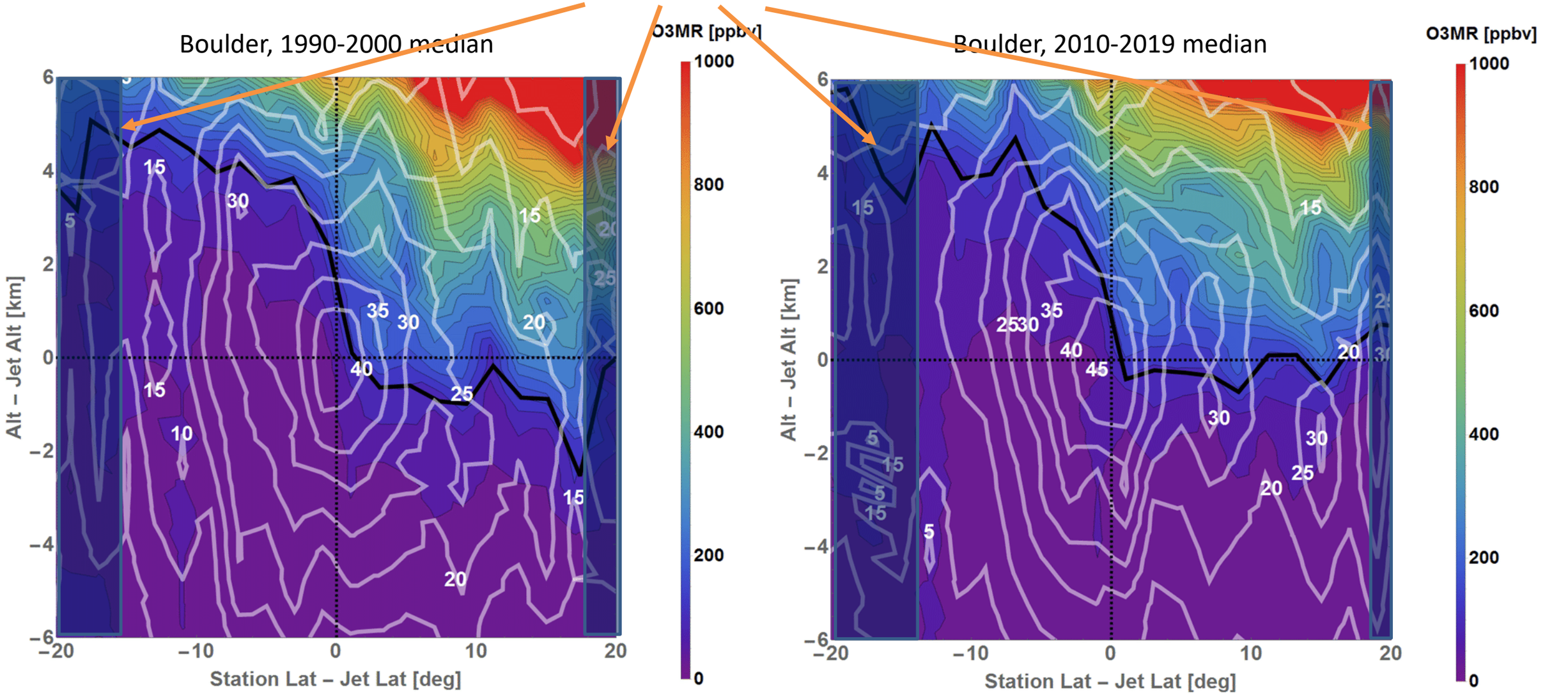

Boulder, ozonesonde (MAM 2010-2018)

# OCTAV-UTLS method: long-term changes

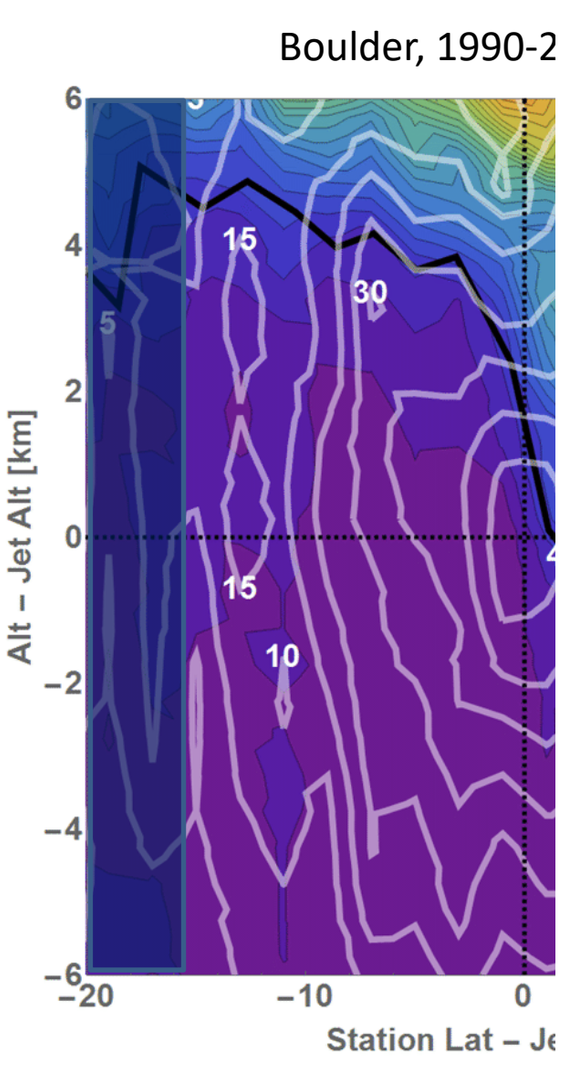


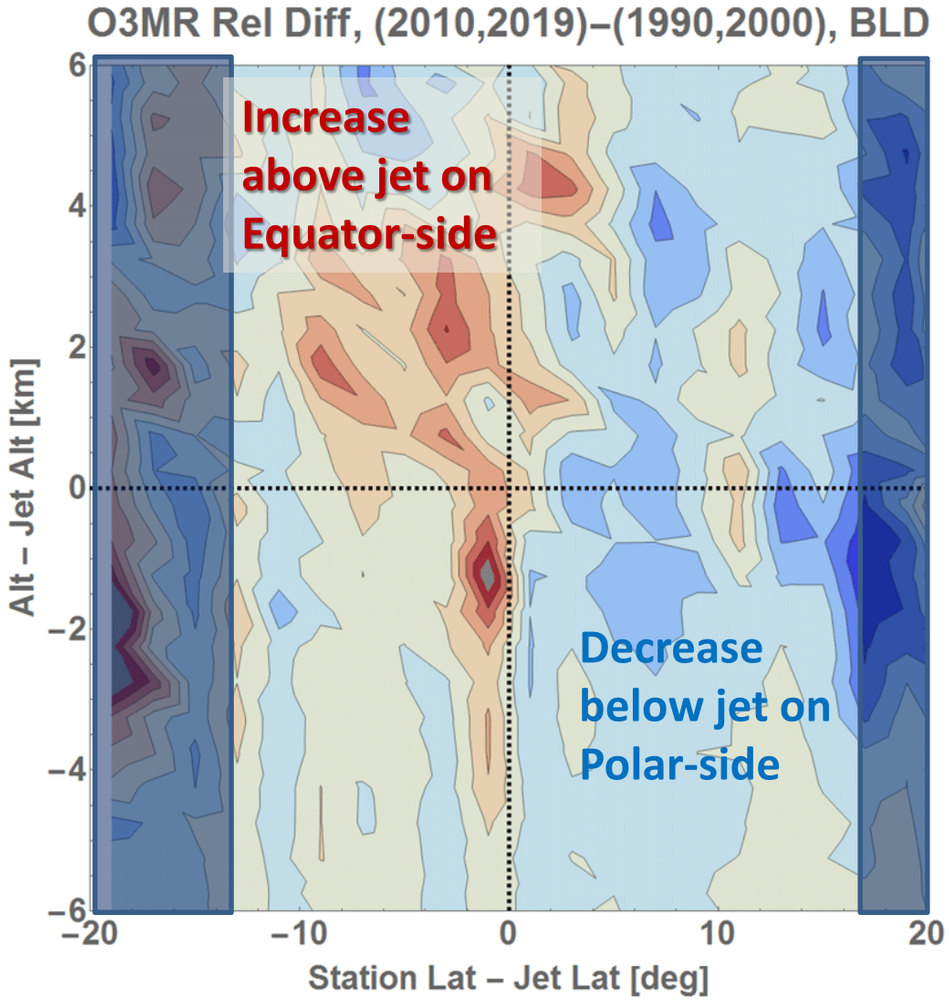
# OCTAV-UTLS method: long-term changes

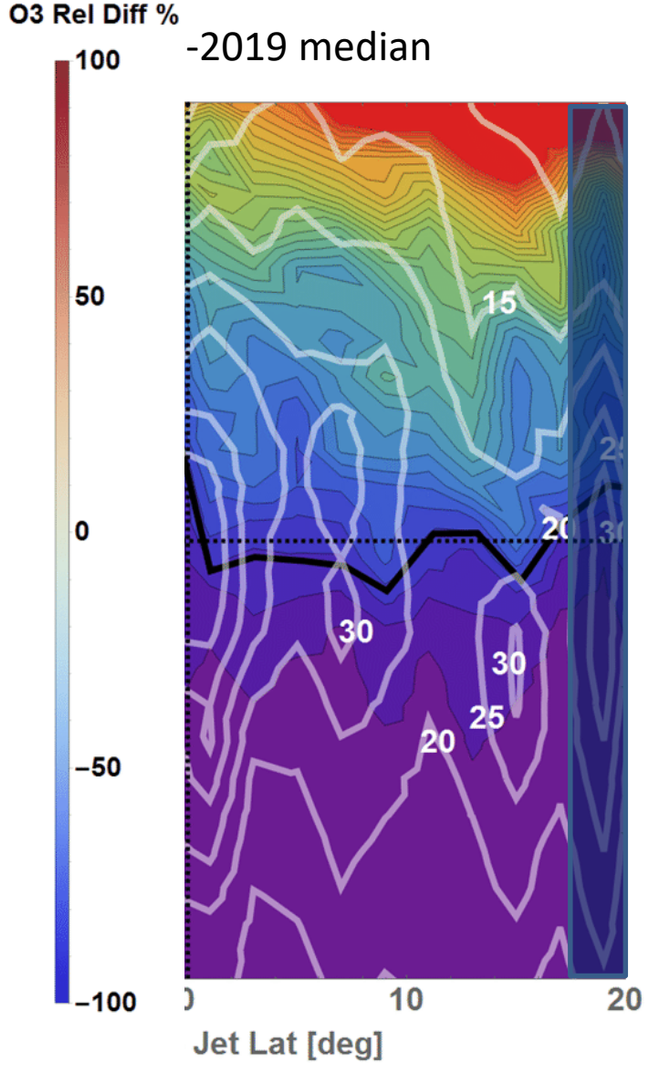
**Low sampling, less than 10 %**

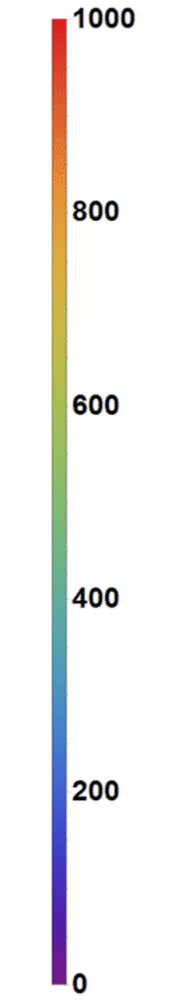


# OCTAV-UTLS method: long-term changes



# OCTAV Science questions

- **Can we identify long-term composition changes in the UTLS from existing UTLS datasets?** **It requires further statistical analyses for significance and sampling impacts**
- How well can we **quantify trends in the UTLS composition** derived from different observation techniques with **limited temporal and spatial sampling**? **New coordinates.**
- Can we **estimate/quantify the impact of major natural modes of interannual variability** (e.g., QBO, NAM, ENSO, NAO) on UTLS composition? **Future investigation**
- How do trends in UTLS composition affect the **radiative balance in the UTLS** and what are the critical impacts of that for weather and climate, including changes in wave activity and stratospheric influences?
- What **future measurement strategies** are needed to improve our understanding of the UTLS trends and variability?

# Future work

- Determine the best coordinates for trend analyses
- Compare ground-based and satellite data in jet-relevant coordinates
- Compare different geographical locations (i.e. impacts from QBO, ENSO and BDC transport)
- Do trend analyses in UTLS.