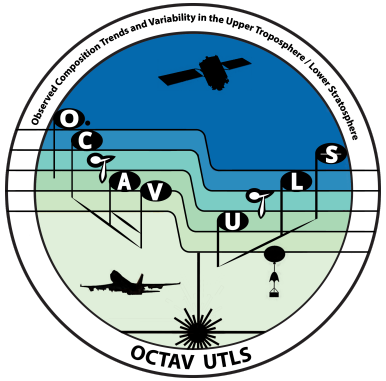


OCTAV-UTLS

(Observed Composition Trends And Variability in the Upper Troposphere and Lower Stratosphere)

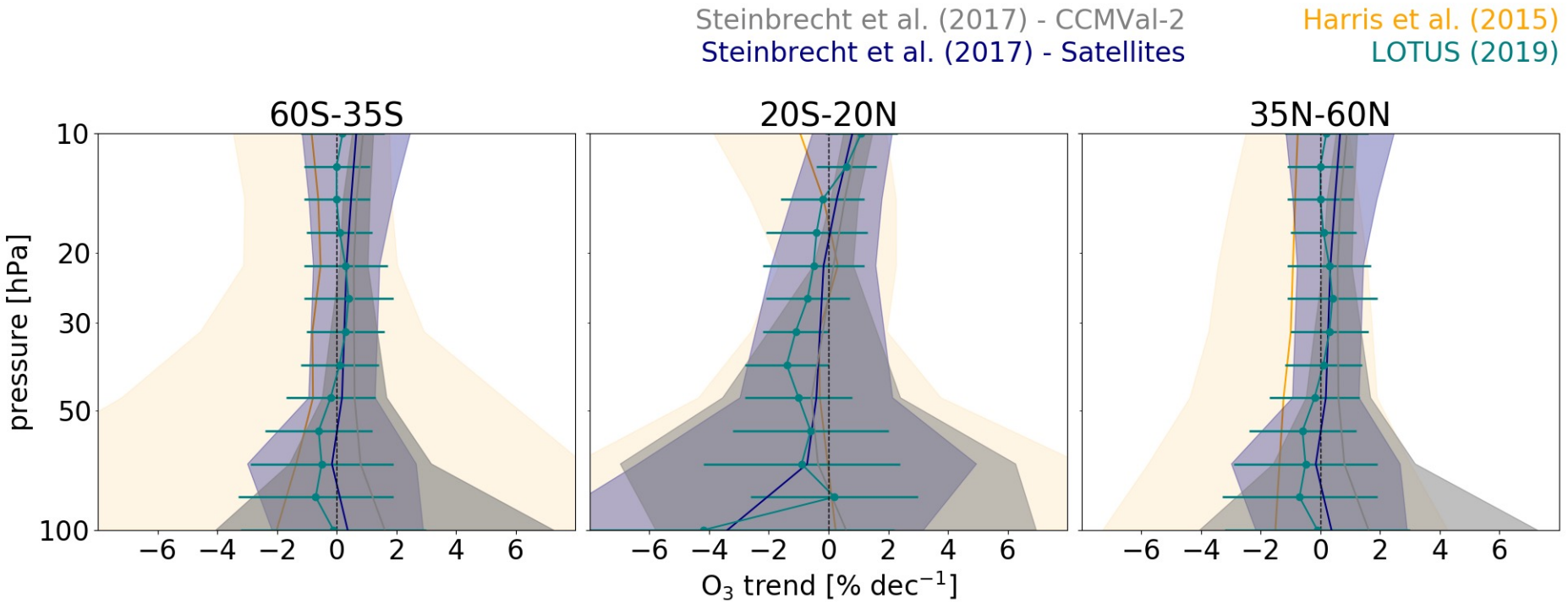
Activity leads:
Peter Hoor, Johannes Gutenberg University, Mainz, Germany
Luis Millán, Jet Propulsion Laboratory, California Institute of Technology, USA
Irina Petropavlovskikh, NOAA/CIRES, Boulder, CO, USA

HEGIFTOM meeting

March 2021

Motivation

Uncertainties in ozone trends increase substantially in the upper troposphere and lower stratosphere (UTLS).



Ozone trends post 2000 from different studies.

Motivation

Major obstacles to quantifying UTLS trends are the large dynamical variability of the tropopause region and upper tropospheric jets, and varying representativeness of measurements from platforms with diverse vertical/spatial sampling and resolutions

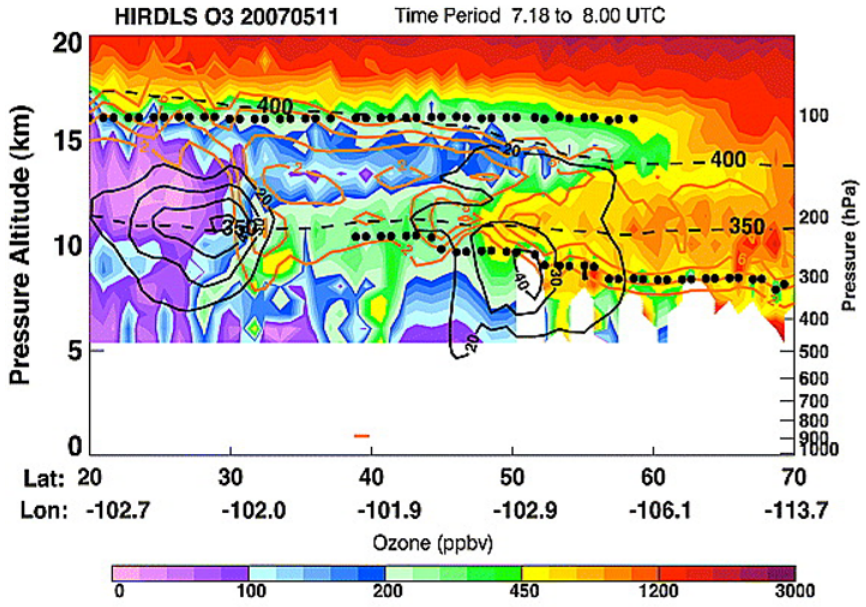


Figure adapted from Pan et al. [2009]

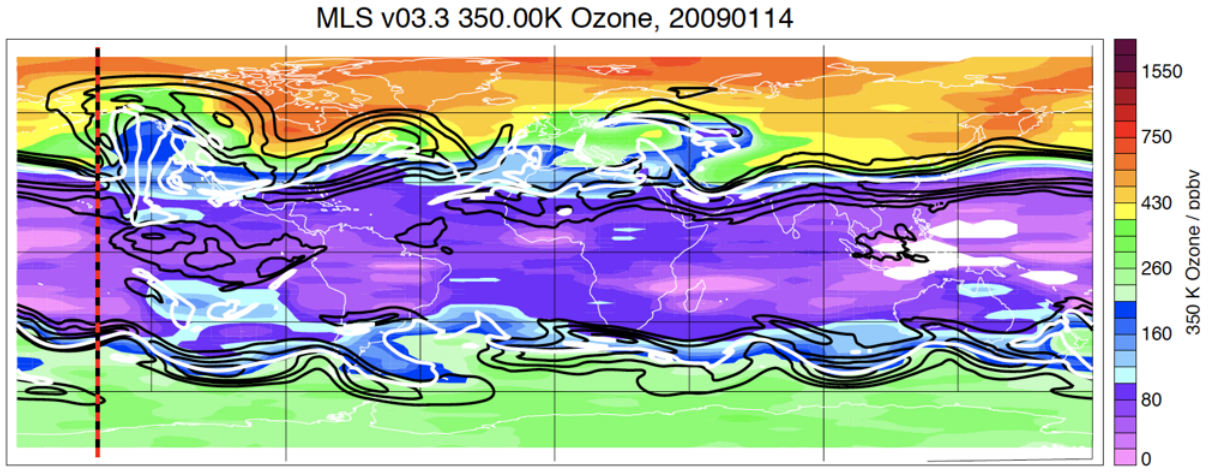


Figure adapted from Manney et al. [2011]

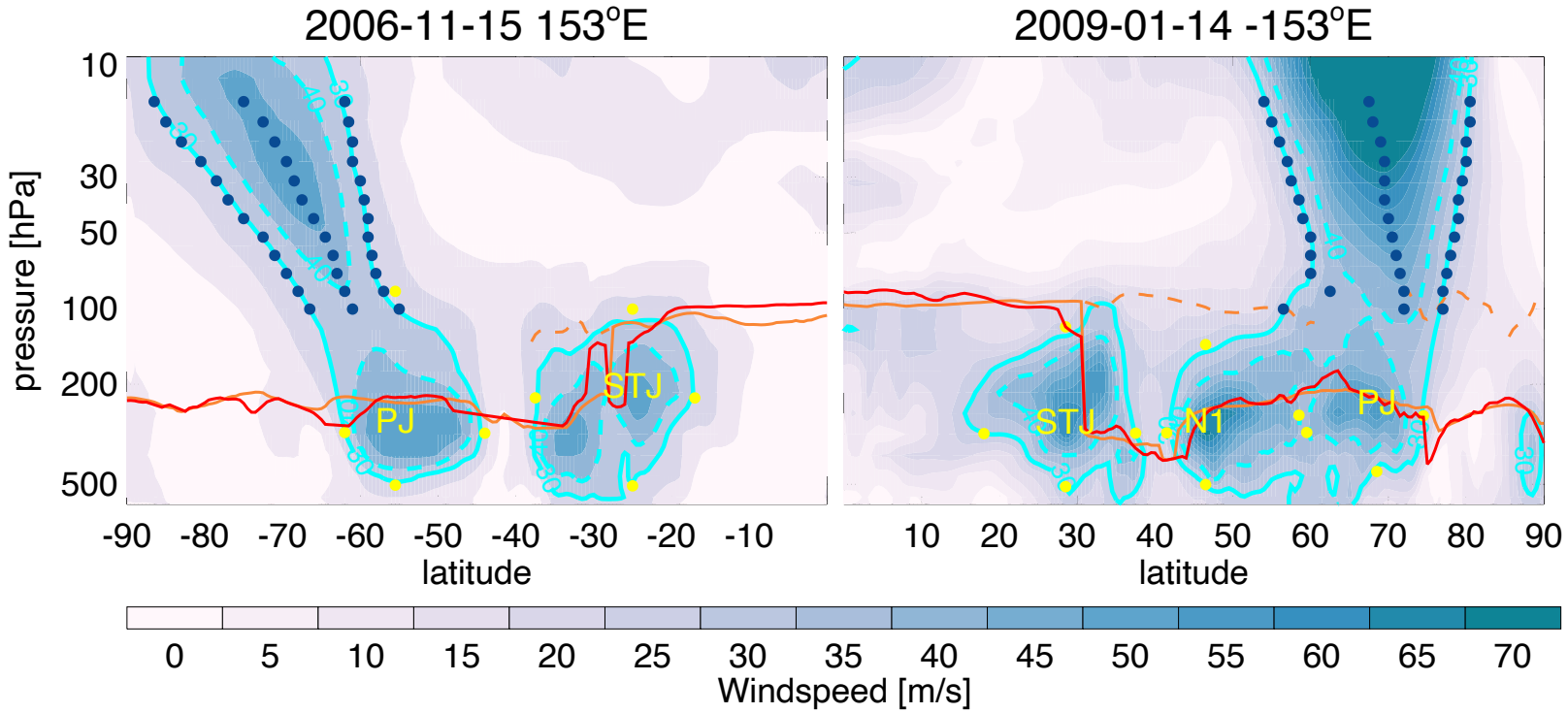
Motivation

The goal of OCTAV-UTLS project is to combine satellite, aircraft, balloon and ground-based observations using geophysical based coordinates to understand the processes driving the natural variability on the observed UTLS trends.

This is the first time that a comprehensive suite of datasets from different platforms will be consistently compared and combined in the UTLS using the same metrics (e.g., tropopause and jet relative coordinates) derived from reanalysis data.

Towards robust and consistent trends in the UTLS

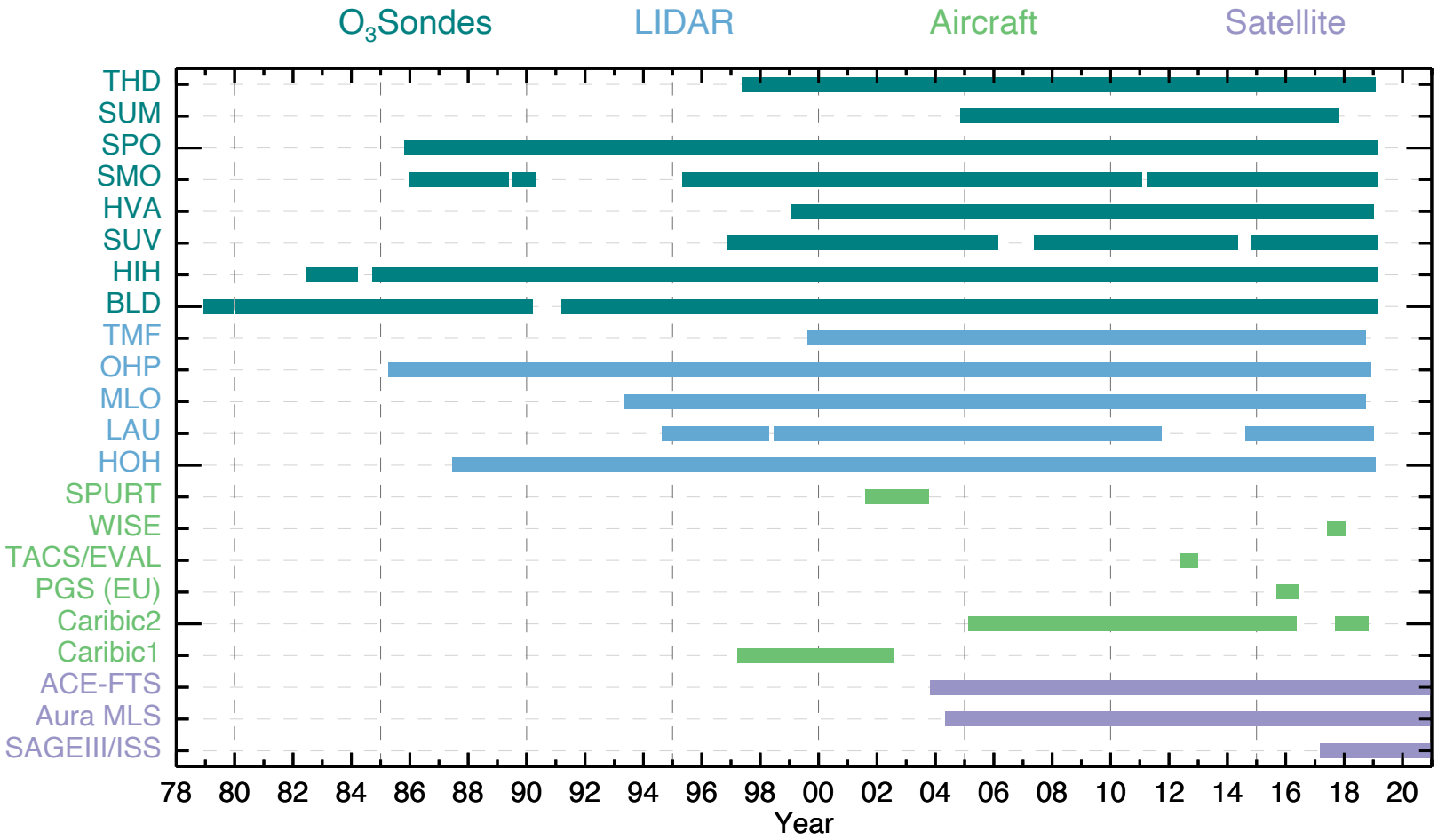
Methodology



Cross-sections of MERRA2 wind speed with jet, subvortex, WMO tropopause and dynamical tropopause classification information overlaid.

JETPAC provides equivalent latitude, tropopause characterization, and jet identification consistently for the vastly different UTLS datasets

Activity Overview

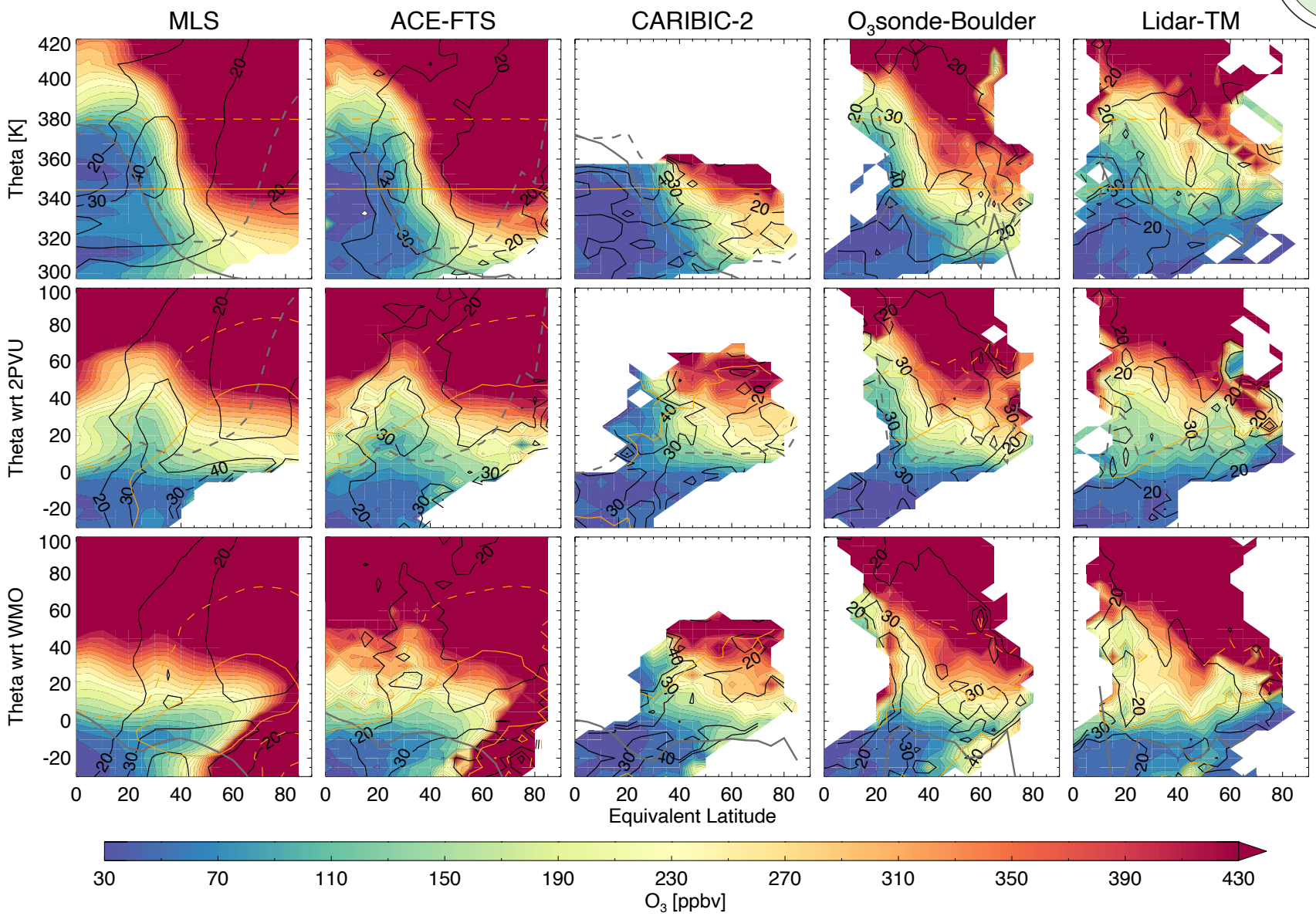


Available JETPAC files for different platforms

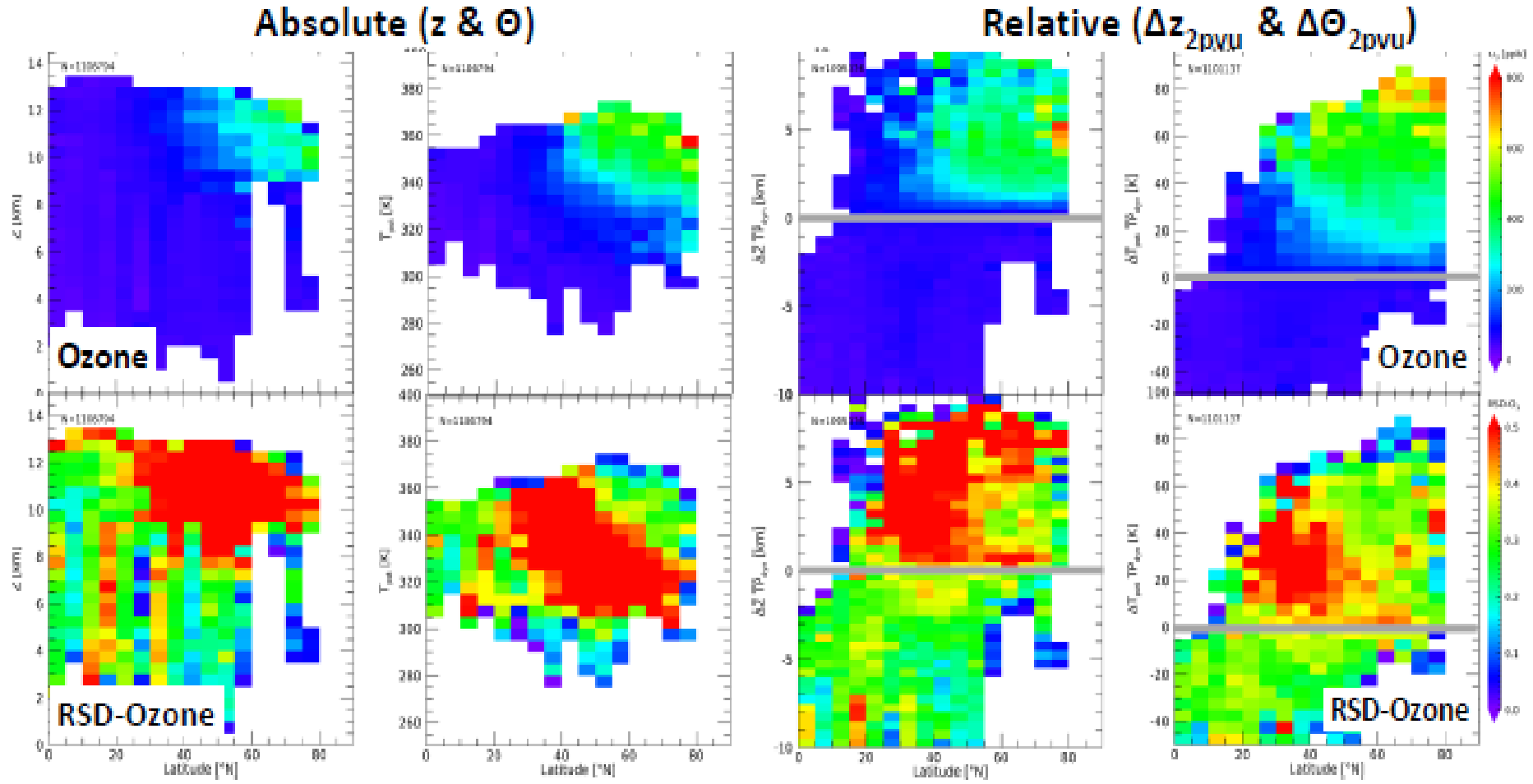
Progress

Comparison of cross-platform analysis using eq.lat and Theta relative to WMO-TP (Millán, Manney)

wind speed
2PV dynamical tropopause (—)
WMO tropopause (---)
345K (—) potential temperature
380K (---) potential temperature



Progress



Ozone distribution (top) and relative standard deviation in different coordinates derived from JETPAC using 2005-2016 IAGOS-CARIBIC aircraft measurements (Bönisch, Zahn, KIT)

Progress

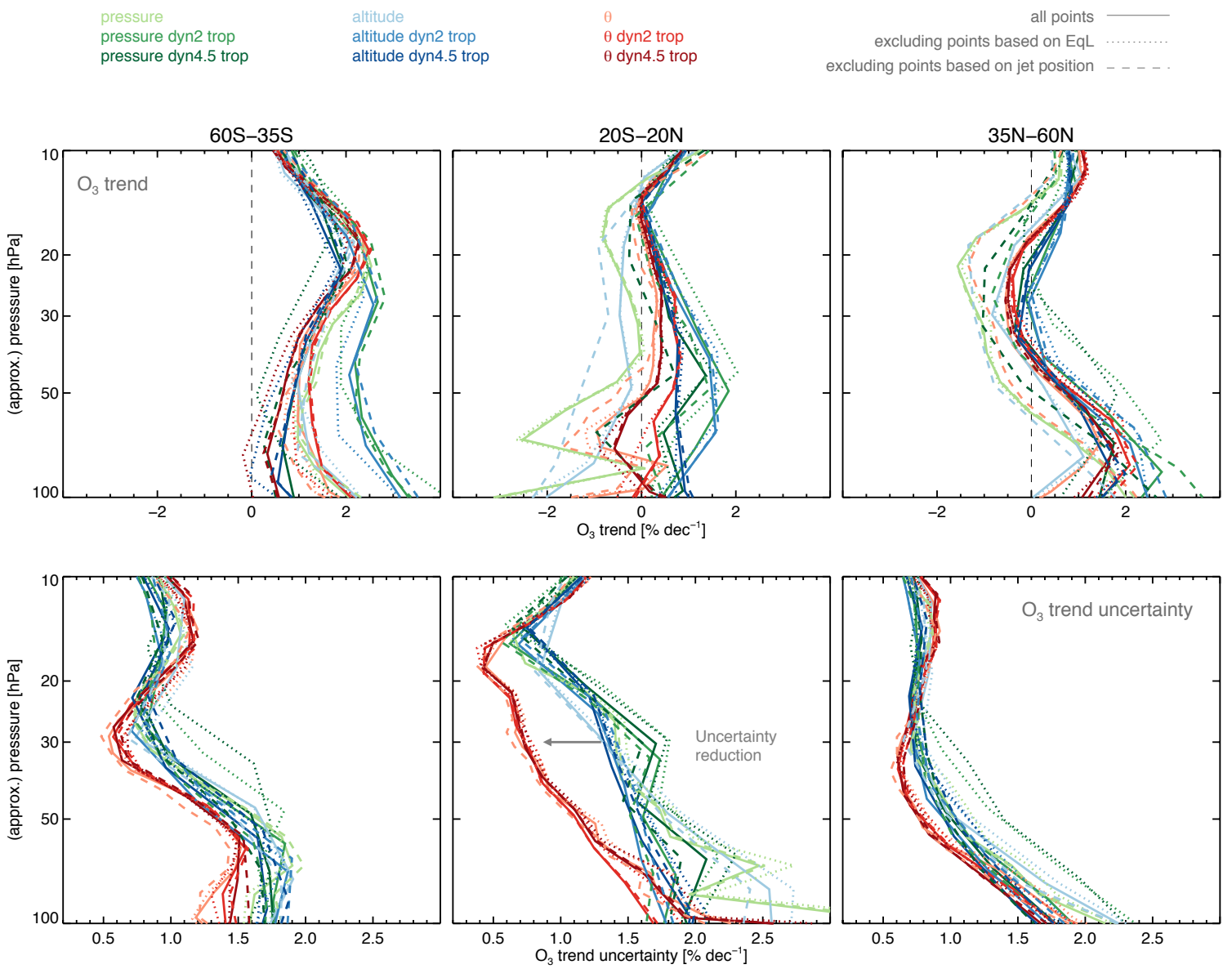
Preliminary MLS (2005-2019) O_3 trends using different coordinate systems (**pressure**, **potential temperature**, **altitude**).

Trends were estimated using monthly means

Monthly means were constructed using:

- All available points (solid lines).
- Excluding points whose equivalent latitude (EqL) was outside the latitude bins used (dotted lines).
- Excluding points that were within 5° of a jet core (dashed lines).

Climatological values were used to convert from potential temperature and altitude based coordinates back to pressure.



Collaborations

OCTAV-UTLS has strong links to several other SPARC activities including the

- LOTUS activity focusing on stratospheric ozone trends
- TUNER activity, focusing on technical issues concerning the compatibility of observations
- AMAC activity focusing on transport by the Asian monsoon into the UTLS
- SSiRC activity focusing on the distribution of stratospheric sulfur, where OCTAV can provide UTLS referenced coordinates for aerosol particle measurements

OCTAV-UTLS is linked to WMO GAW and NDACC programs, which guarantees consistent ground-based and sounding observations.

Future plans

OCTAV-UTLS submitted and won a 2-year International Space Science Institute (ISSI) team proposal.

ISSI facilities provide an ideal place for the face-to-face discussions and collaborative work needed to study all the possible meteorological coordinate combinations for different measurements.

The first ISSI meeting is currently planned for ~~April 2021~~ March 2022. The team will work on the first OCTAV-UTLS publication. This publication will explore which meteorological coordinate systems best reduce natural UTLS ozone variability

The 4th OCTAV-UTLS meeting will take place probably at KIT in Karlsruhe (Germany) in late 2021.

A hybrid style meeting with online and in-person attendance will be considered.