



ESA-MOST Dragon Cooperation

中国科技部-欧洲空间局合作“龙计划”

## DRAGON 2 FINAL RESULTS AND DRAGON 3 KO SYMPOSIUM

“龙计划”二期总结研讨会暨三期启动会

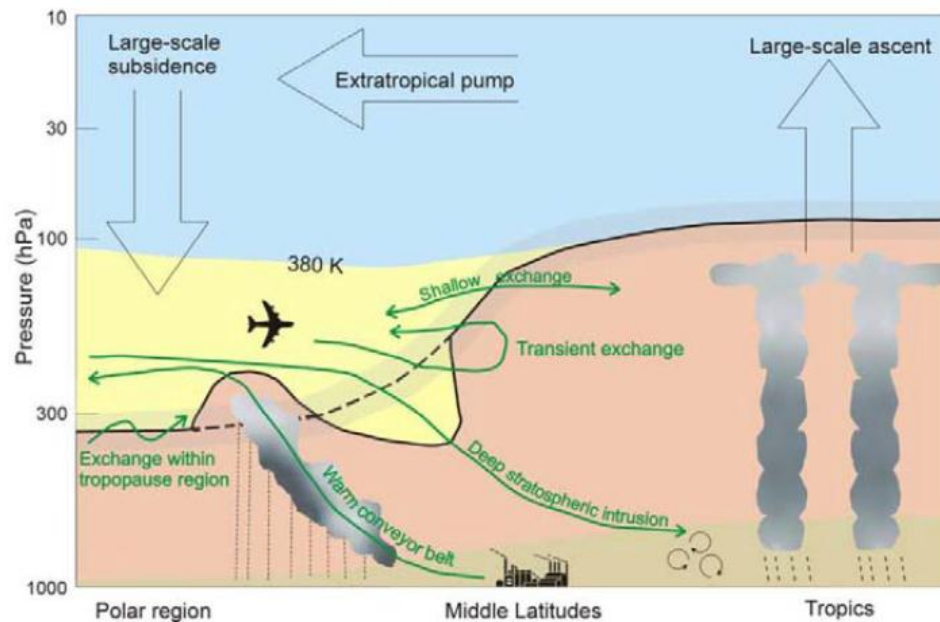
# Chemical Composition and Dynamics of the Upper Troposphere and the Lower Stratosphere (UTLS)

## Id. 10557

Viktoria Sofieva, Finnish Meteorological Institute

Chuanxi Liu, Institute of Atmospheric Physics, Beijing, China

# Main focus of the project: upper troposphere and the lower stratosphere



Dynamical, chemical and radiative coupling between the stratosphere and troposphere are among the important processes that must be understood for prediction of global trends, including climate change.

# Partners

## European:

(1) Finnish Meteorological Institute

Dr. V. Sofieva

Prof. E. Kyrölä

1(2) PhD students

3 doctors

**PIs**

**Co-PIs**

**Team  
members**

## Chinese:

(1) Institute of Atmospheric Physics (IAP), CAS

(2) National Satellite Meteorological Center  
(NSMC), CMA

Dr. C. Liu (IAP)

Dr. F. Huang(NSMC)

3 PhD students

4 doctors

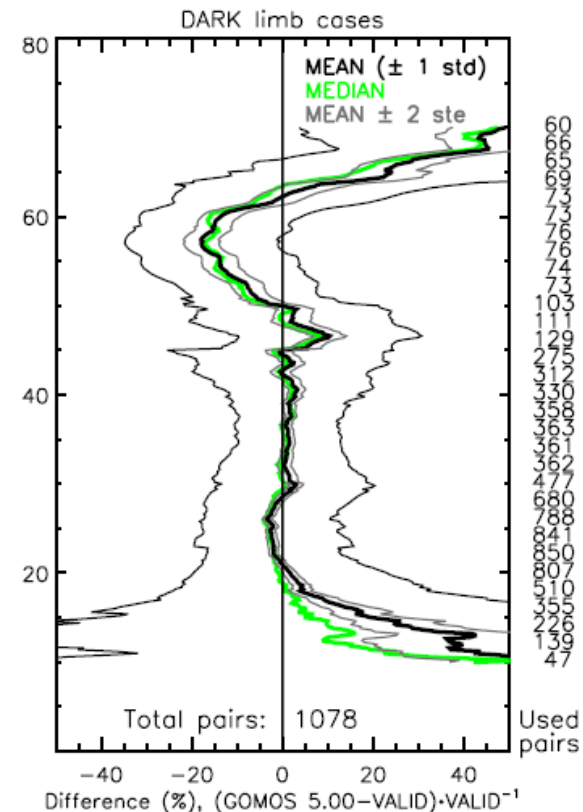
# Objectives

- Objective 1: Assessment of satellite data on chemical composition in UTLS
- Objective 2: Dynamical and chemical structures of the UTLS and its variability
- Objective 3: Multi-scale variability of stratospheric ozone
- Objective 4: Climatology of the stratospheric aerosol layer and its variability
- Objective 5: Updated ozone climatology and its relation to tropopause/multiple tropopauses

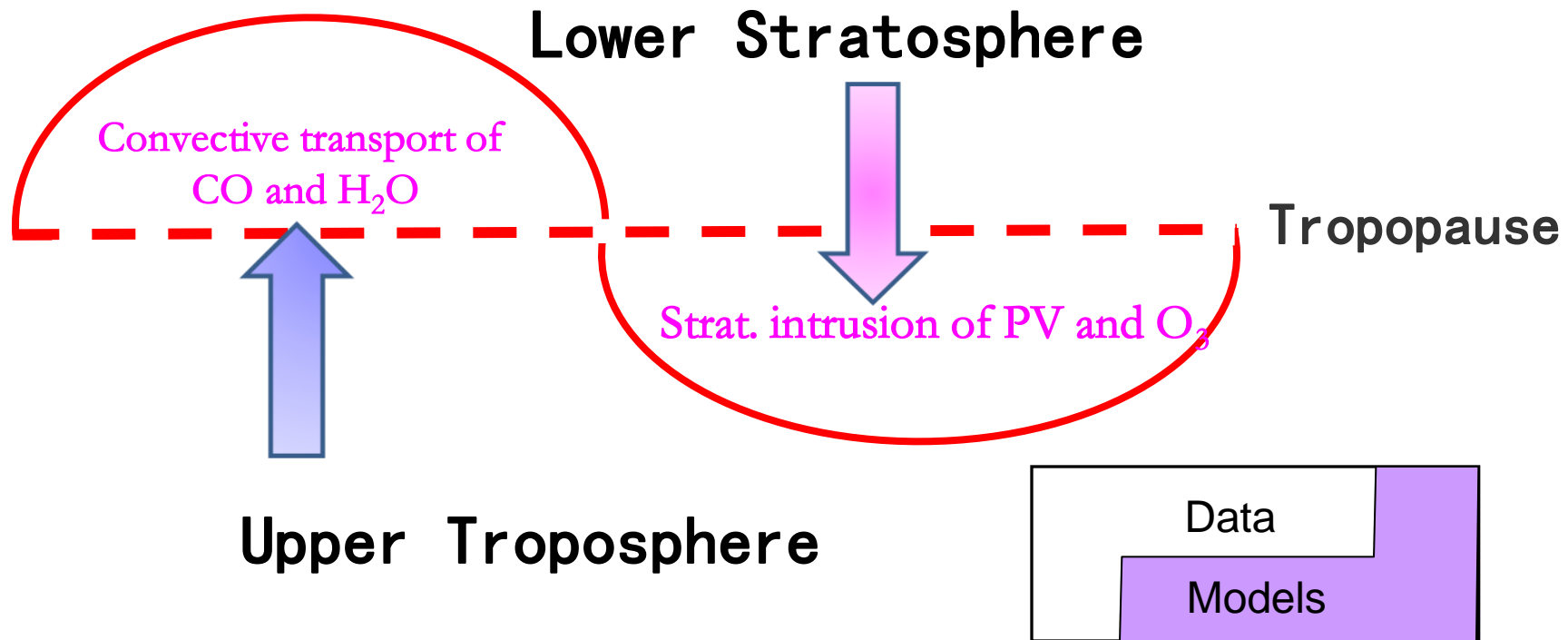


# Objective 1: Assessment of satellite data on chemical composition in UTLS

- UTLS is a "difficult" region for satellite retrievals
  - Nadir: low vertical resolution
  - Limb: low signal-to-noise ratio
- Validation of satellite data in UTLS
  - Envisat limb sensors (GOMOS, MIPAS, SCIAMACHY)
  - Third party missions (OSIRIS, ACE-FTS)
  - Chinese SBUS on board FY-3
  - Use of ozone sonde data
  - Expected outcome
    - statement on usefulness of existing data
    - data screening algorithm(s)
    - Potentially: improvement of retrievals

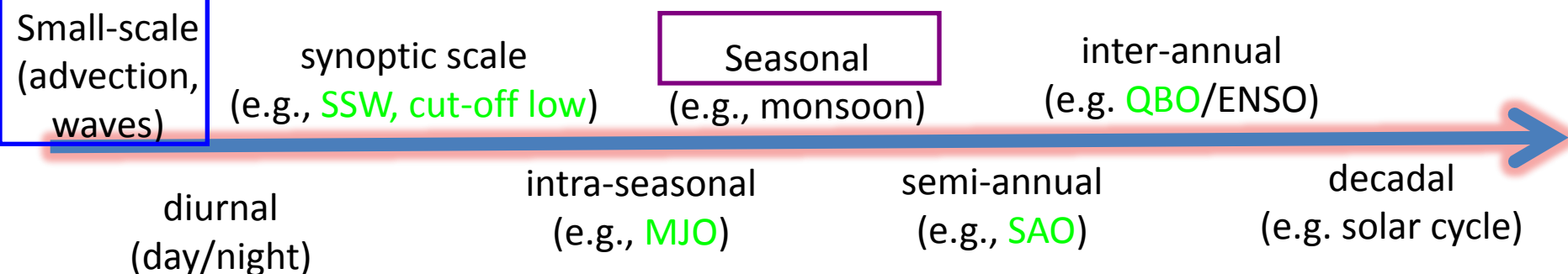


# Objective 2: Dynamical and chemical structures of the UTLS and its variability

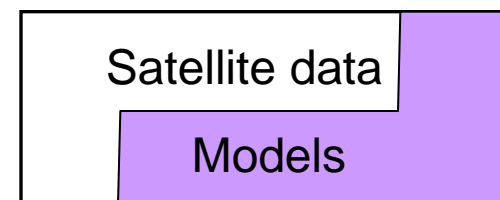


➤ Processes that raise/lower the tropopause height and consequently change the atmospheric compositions within the UTLS region especially over East Asia, such as MJO, COL, DC (deep convections), ASM (Asian Summer Monsoon)

# Objective 3: Multi-scale variability of stratospheric ozone



- Studied in DRAGON-2:
  - SSW, cut-off low, MJO, SAO, QBO
- Focus of DRAGON-3
  - Seasonal
    - Cold/warm polar vortex
    - Asian Summer Monsoon development
    - Winter-summer transition
  - Small scales

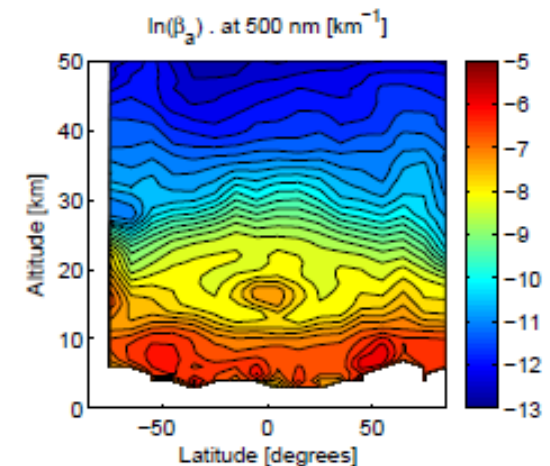


# Objective 4: Climatology of stratospheric aerosols layer and its variability

- Motivation:
  - aerosol layer plays an important role in the Earth radiation budget especially during periods of volcanic activity
  - aerosols influence chemical processes and can lead to pronounced ozone destruction
  - “background” stratospheric aerosol layer is variable rather than constant
- Main focuses:
  - updated multi-instrument aerosol climatology
  - Variations in both volcanic and non-volcanic periods
  - Relation to large-scale dynamical patterns (QBO, ENSO)



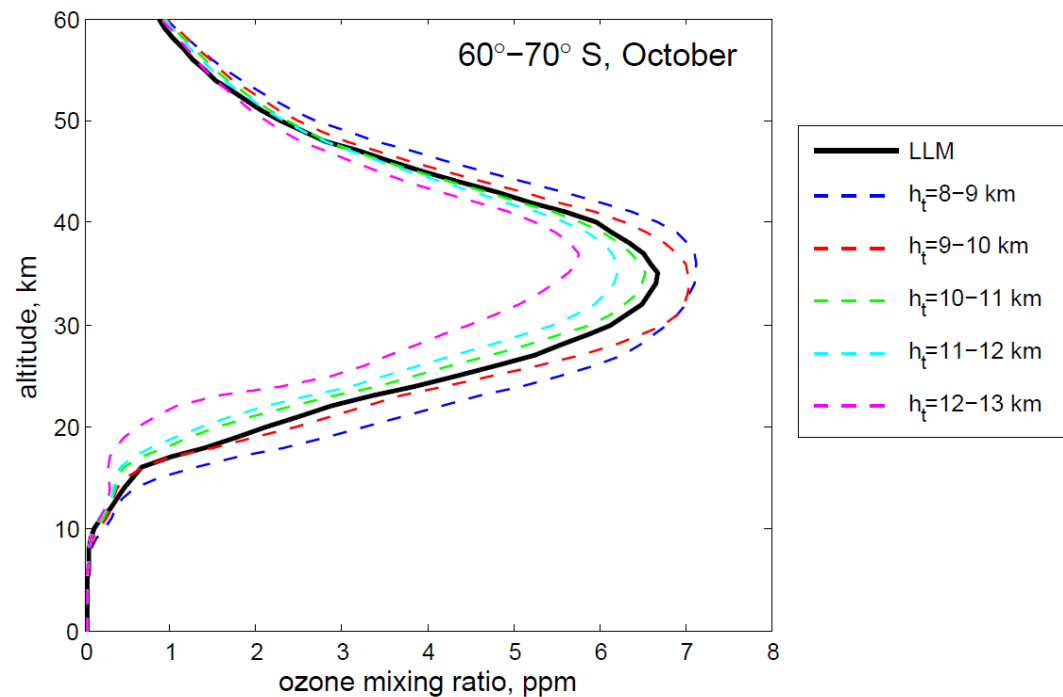
The Junge layer





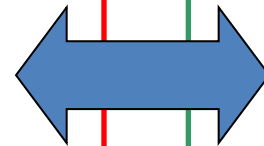
# Objective 5: updated ozone climatology and its relation to tropopause(s)

- Work has been already started
- Large uncertainty/variability in climatologic UTLS data
- New concept: joint ozone& tropopause height climatology
- Extensive use of satellite data (outcome of objective 1)



## Data

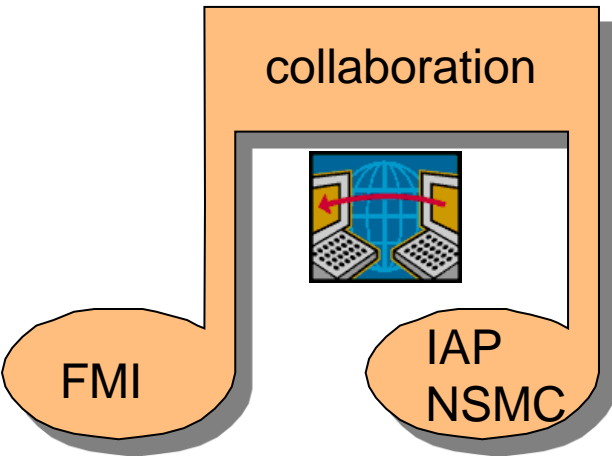
- ESA/Envisat data
  - GOMOS, MIPAS, SCIAMACHY
- Third-party missions
  - OSIRIS, ACE-FTS and MAESTRO, OMI
- Chinese FY-3 data
  - SBUS
- NASA data (MLS, HIRLDS)
- Ozone soundings data
- Historical satellite ozone data (SAGE-II)



## Models

- Chemistry-transport models
  - Mozart-3
  - CLaMS
  - FinROSE
- Chemistry-climate models
  - WACCM
  - ECHAM-5

# Expected results



Improved knowledge of UTLS processes

Very interesting works for young scientists

Interesting results?  
Presentations...  
Publications...

Scientific paper