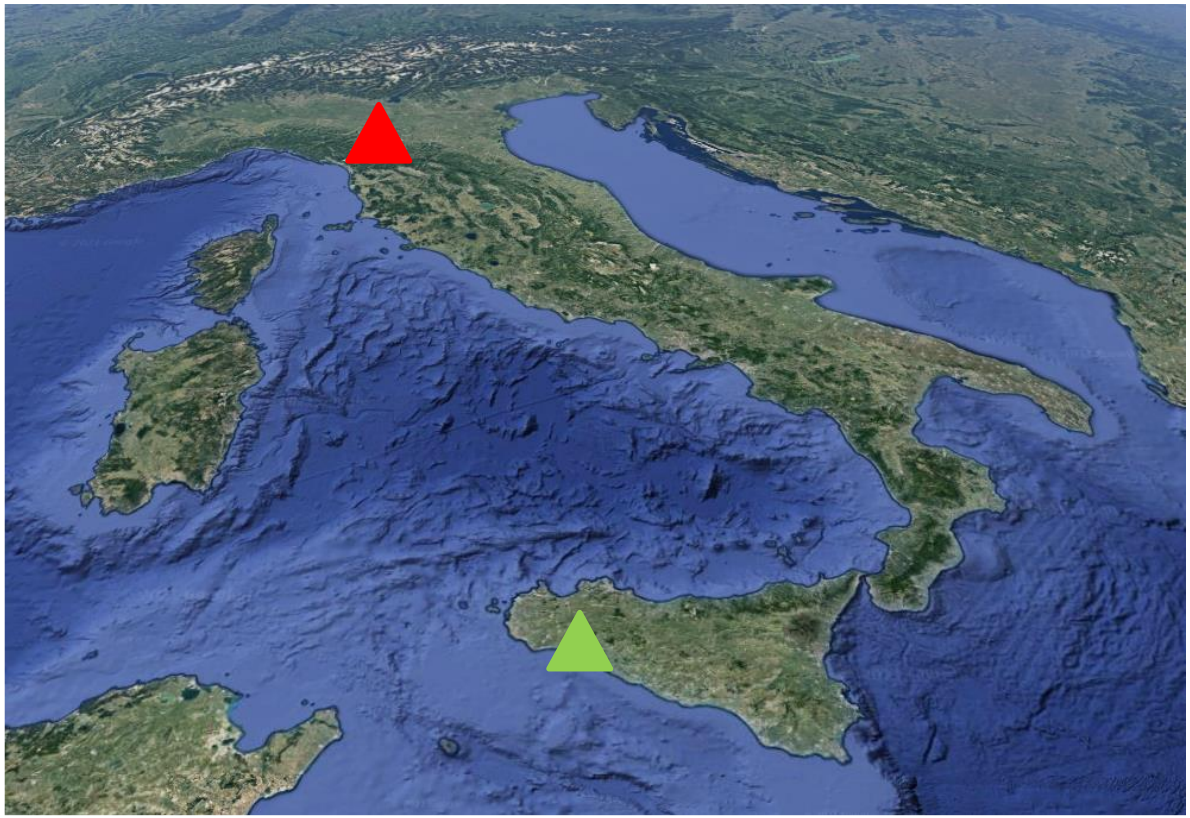
NOx observations at Mt. Cimone and Capo Granitola

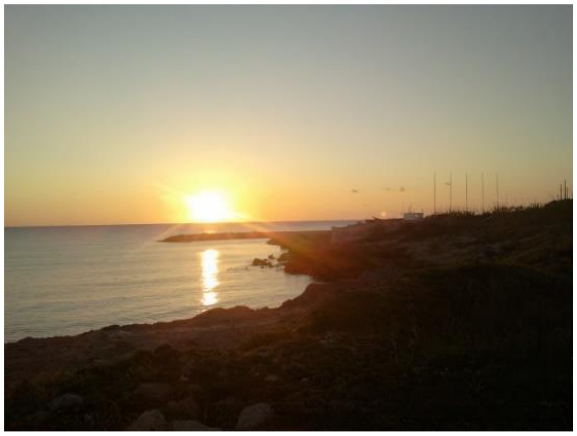
CNR–ISAC, Bologna and Turin

ACTRIS NOx/VOC QA Workshop, 17–19 April 2023

Monte Cimone (CMN)
44.0 N, 10.7 E, 2165 m a.s.l.

- Highest peak of the Northern Apennines
- Completely free horizon 360°
- Usually above PBL, except summer
- WMO/GAW Global Station
- CNR Observatory hosted by Italian Air Force





Capo Granitola (CGR)
37.66 N, 12.65 E

- South-western coast of Sicily
- Affected by sea-land breeze
- Remotely-controlled
- WMO/GAW Regional Station
- Hosted by CNR-IAS institute

Experimental set-up @ CMN

- Unmanned observatory (visits every 2/3 weeks)

Sampling head: composed by Teflon and Pyrex (glass) with residence time of about 3s from the tube entrance to instrument inlet

Analyzer: Thermo Tei42i-TL equipped with a Photolytic Converter (Air Quality Design Inc.) to convert NO_2 to NO. Inlet particle filter (Teflon); no dryer.

Calibration unit: Thermo 146i (dilution and GPT).

NO standard (5 ppm) from NPL (since June 2017). Before commercial standard by RISAM gas.

Zero air source: Thermo 1160 dry air generator (activated charcoal and Purafill)

Since September 2017, new led array BLC (efficency nearly 98-99% -> 72% for 2022)

Experimental set-up @ CGR

- Hosted at the CNR-IAS campus. Local staff helps with the maintenance (very basic actions)

Sampling head: composed by Teflon tube with active flow control and residence time of about 2s from the tube entrance to instrument inlet

Analyzer: Thermo Tei42i-TL equipped with a Photolytic Converter (Air Quality Design Inc.) to convert NO_2 to NO. Inlet particle filter (Teflon); no dryer.

Calibration unit: Thermo 146i (dilution and GPT).

NO standard (5 ppm) from NPL (since June 2017). Before commercial standard by SIAD (commercial).

Zero air source: Thermo 1160 dry air generator (activated charcoal and Purafill)

Since September 2017, new led array BLC (efficency nearly 98-99% -> 95% for 2021)

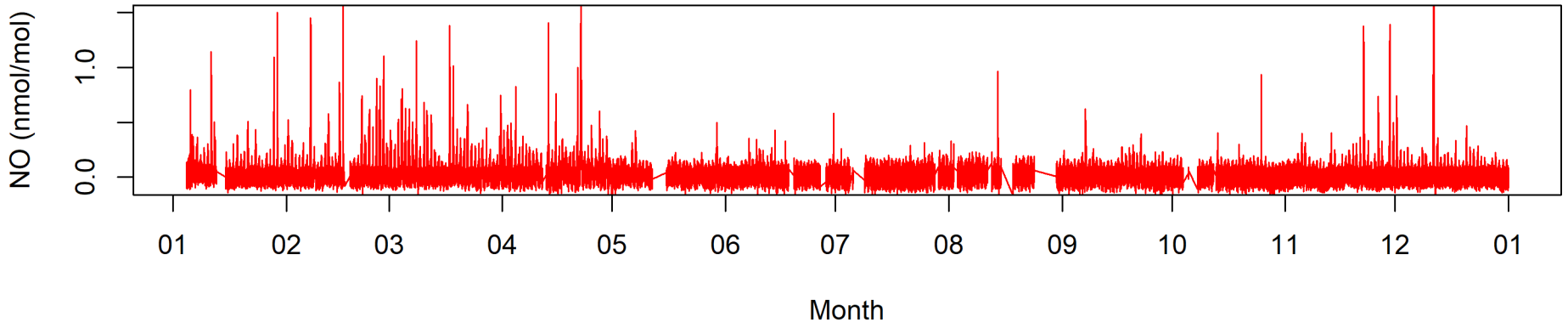
Unofrtunately, due to instrumental problems, no available data for 2022

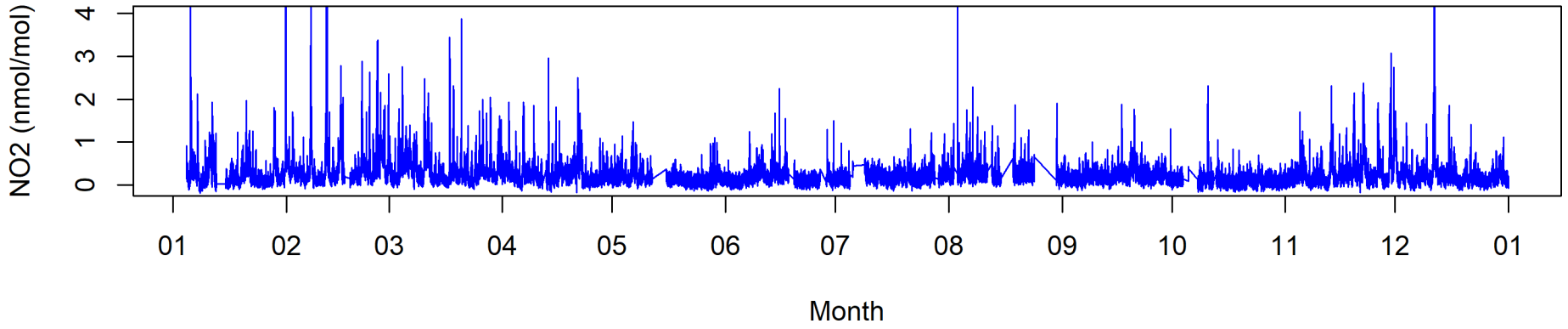
Data description @ CMN, CGR

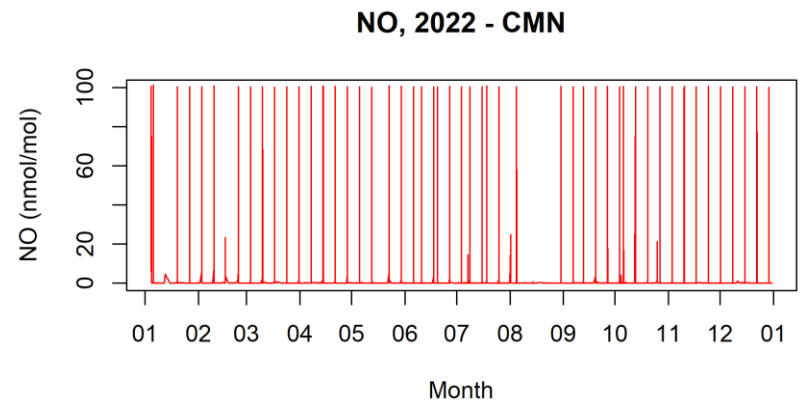
- NRT data delivery capacity
- Automatic procedures run for calibrations, correction of observed data and flags attribution, following the GAW guidelines:
  - Correction for water vapour interferences
  - Correction for ozone interferences
  - Night-time bias correction, based on:
    - O_3 level > 20 ppb
    - absence of sunlight
    - no local sources of NO
- Automatic procedures for file creation, following the EBAS/ACTRIS CDM

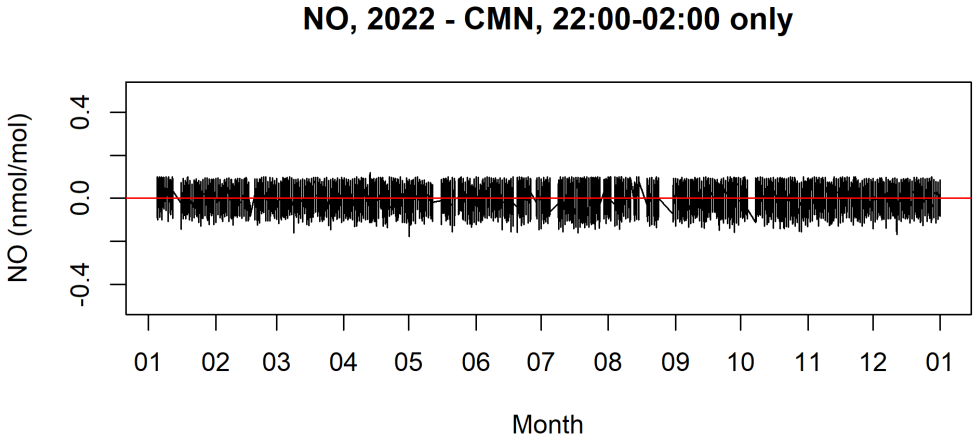
Mt. Cimone/Po Valley RI will participate to the first NO/NO2 ACTRIS intercomparison campaign in Jülich, 19–30 June 2023

CMN, NO and NO_2 in 2022

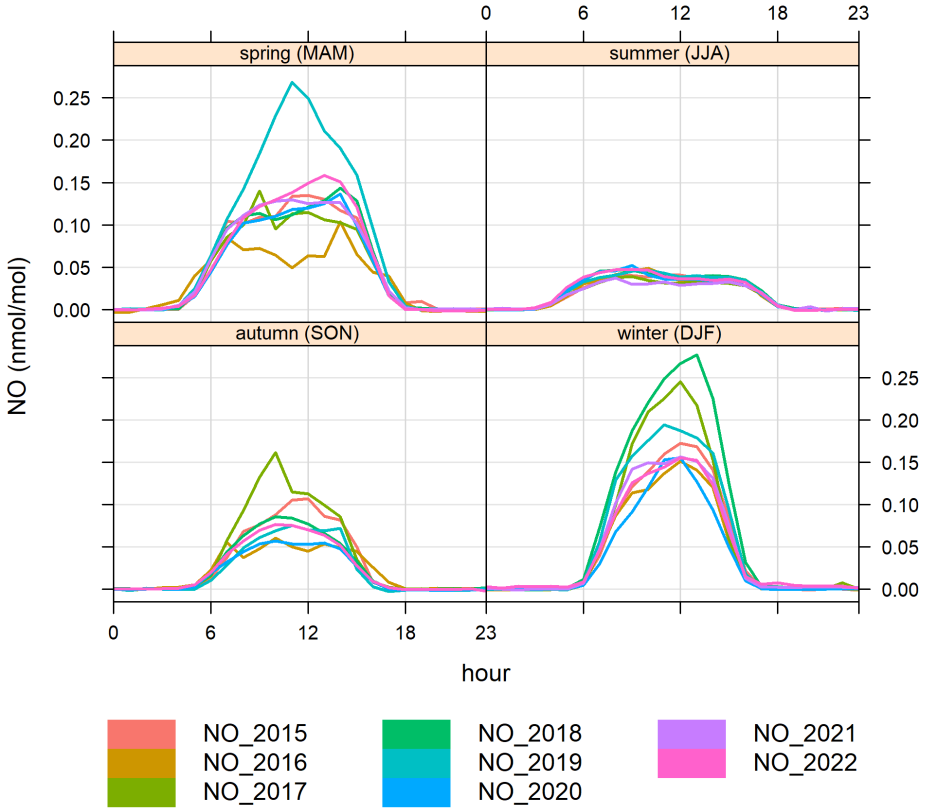


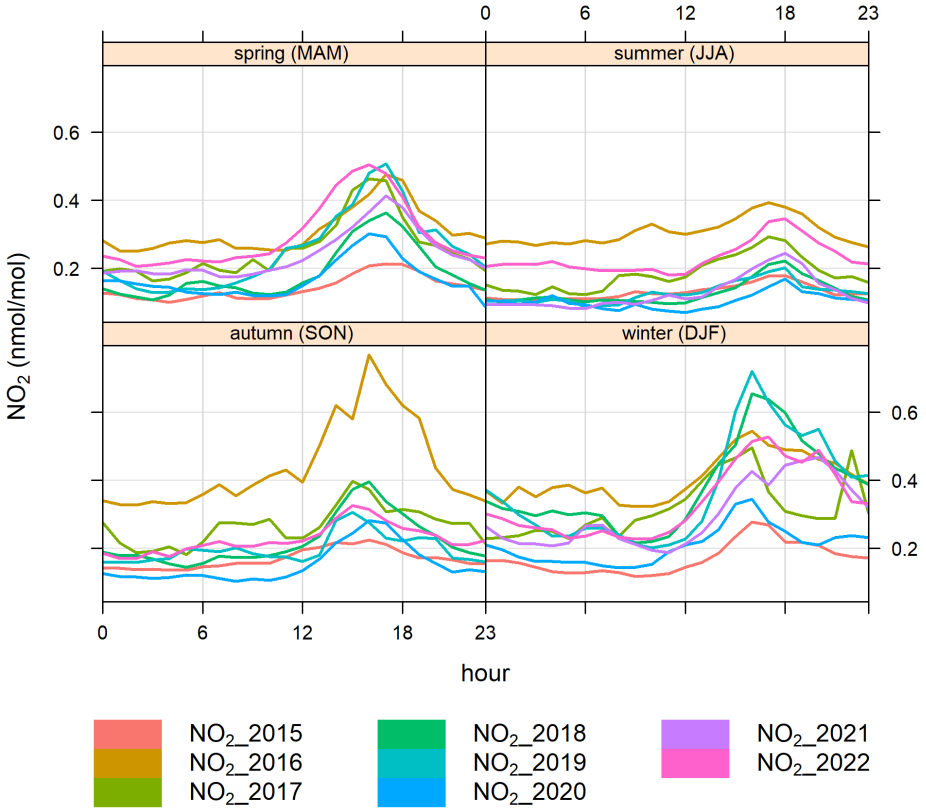






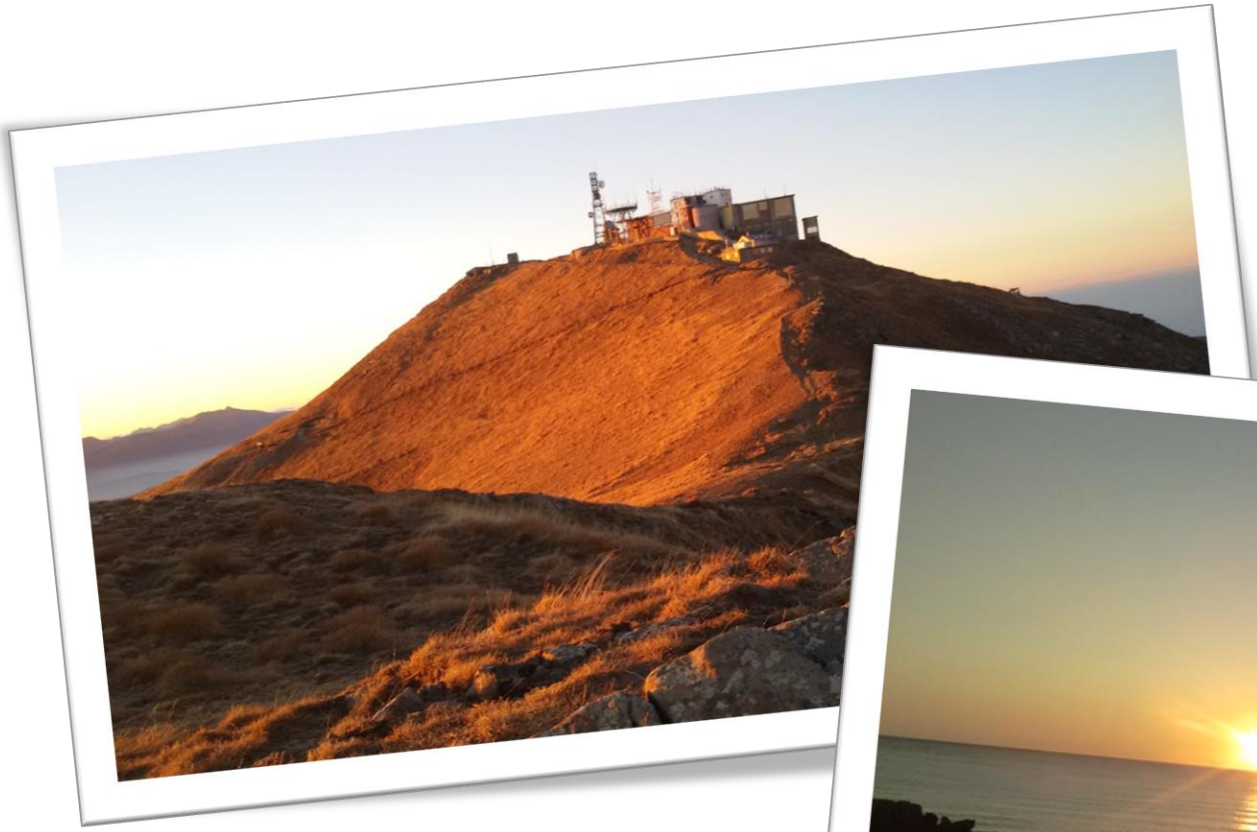
CMN, NO and NO_2 diurnal variability in 2022

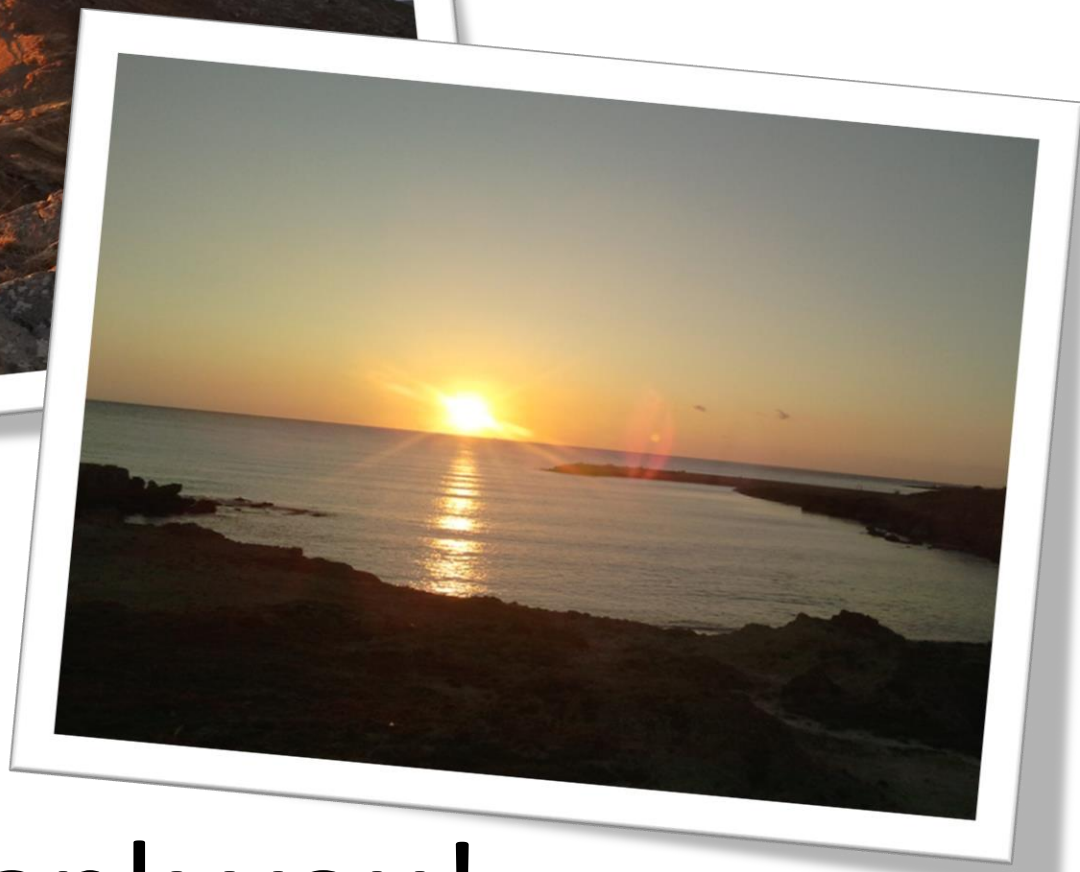




- Diurnal and seasonal variability consistent with previous years
- Peak of NO during mid-day due to photolysis of NO_2 to NO
- NO_2 increase from late morning to evening, due both to photochemistry and PBL dynamics
- Pronounced NO interannual variability, especially in MAM and DJF

Cristofanelli et al., 2021 (Atmos. Environ.)





Thank you!