Variability of Total Column CO_2, CH_4 and CO in the Eastern Mediterranean and Middle East (EMME) Region: Insights from the TCCON Nicosia and AirCore

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[2]: Institute of Environmental Physics, IUP, University of Bremen, Germany
[3]: LSCE/IPSL, CEA-CNRS-UVSQ, Université Paris Saclay, Gif-sur-Yvette, France
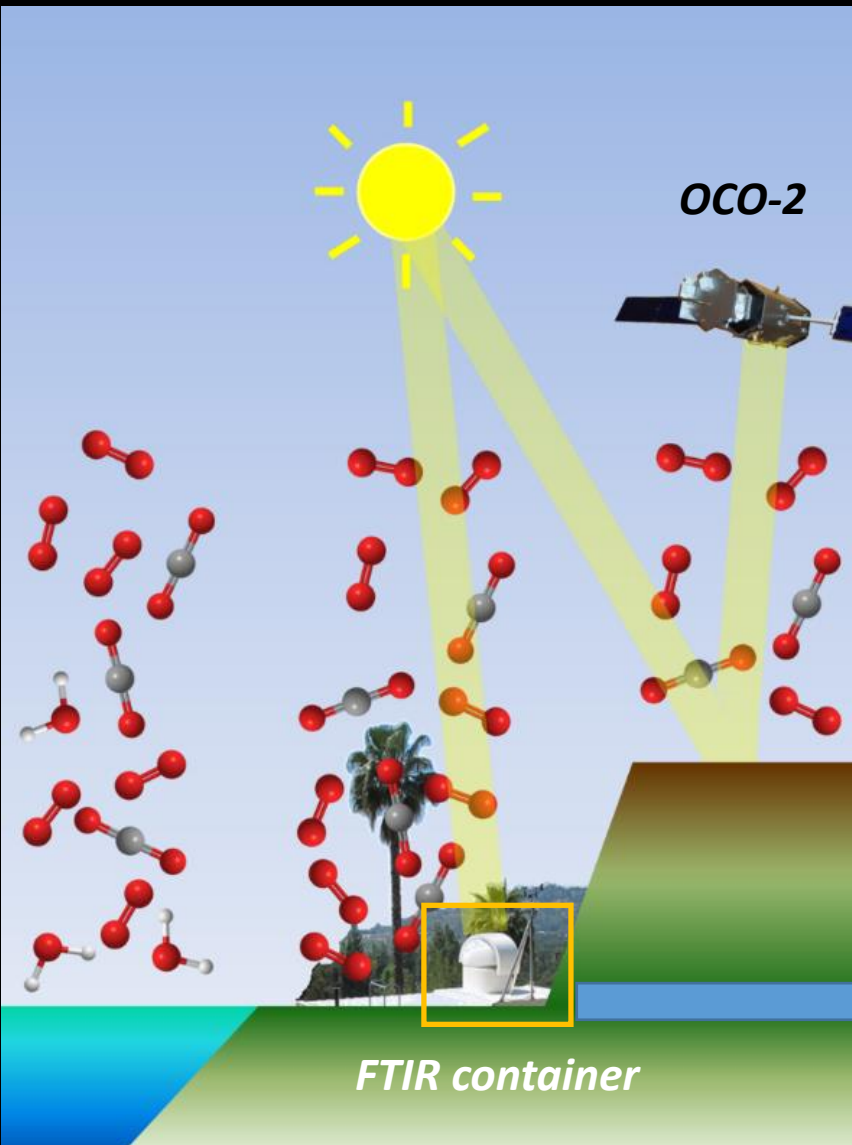[4]:Now at Department of Chemistry, Biochemistry and Pharmaceutical Sciences, University of Bern, Switzerland

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Supplementary Material

The Total Carbon Column Observing Network

How does it work?
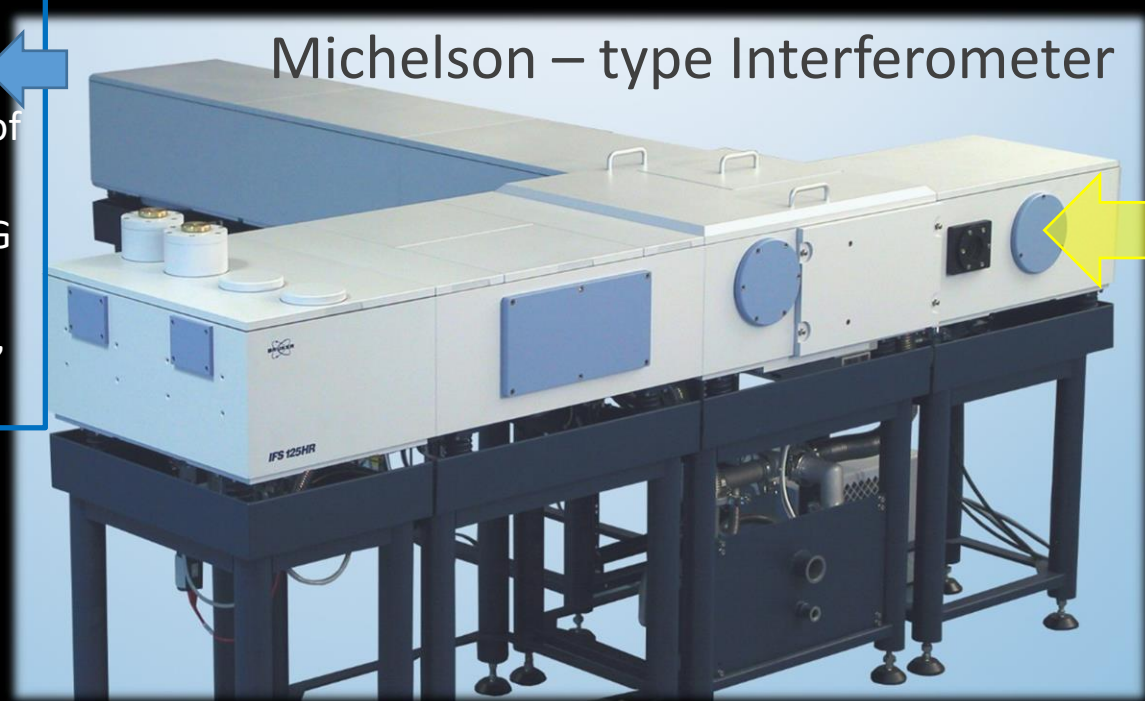
Ground-based Fourier Transform Spectrometers

OCO-2

Column-averaged dry-air mole fractions (**DMFs**) of main Greenhouse gases, X_G for gas G

CO_2, CH_4, N_2O, HF, CO, H_2O, HDO
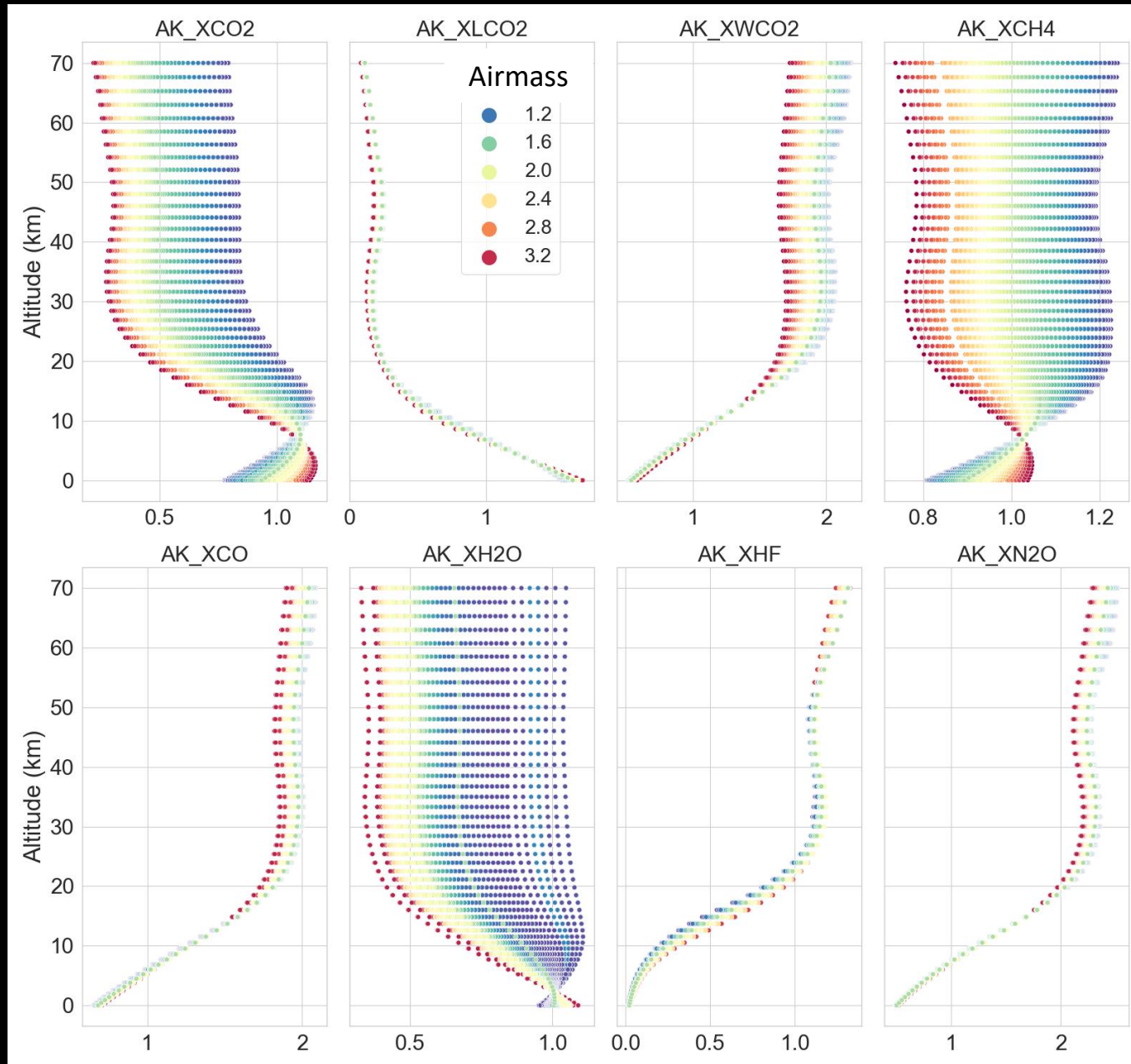
FTIR container

Michelson – type Interferometer

Bruker IFS 125HR

Averaging Kernels (AK)

- Represent the sensitivity of the instrument per altitude and airmass (related to Solar Zenith Angle).

> **AK > 1.0** high sensitivity
>
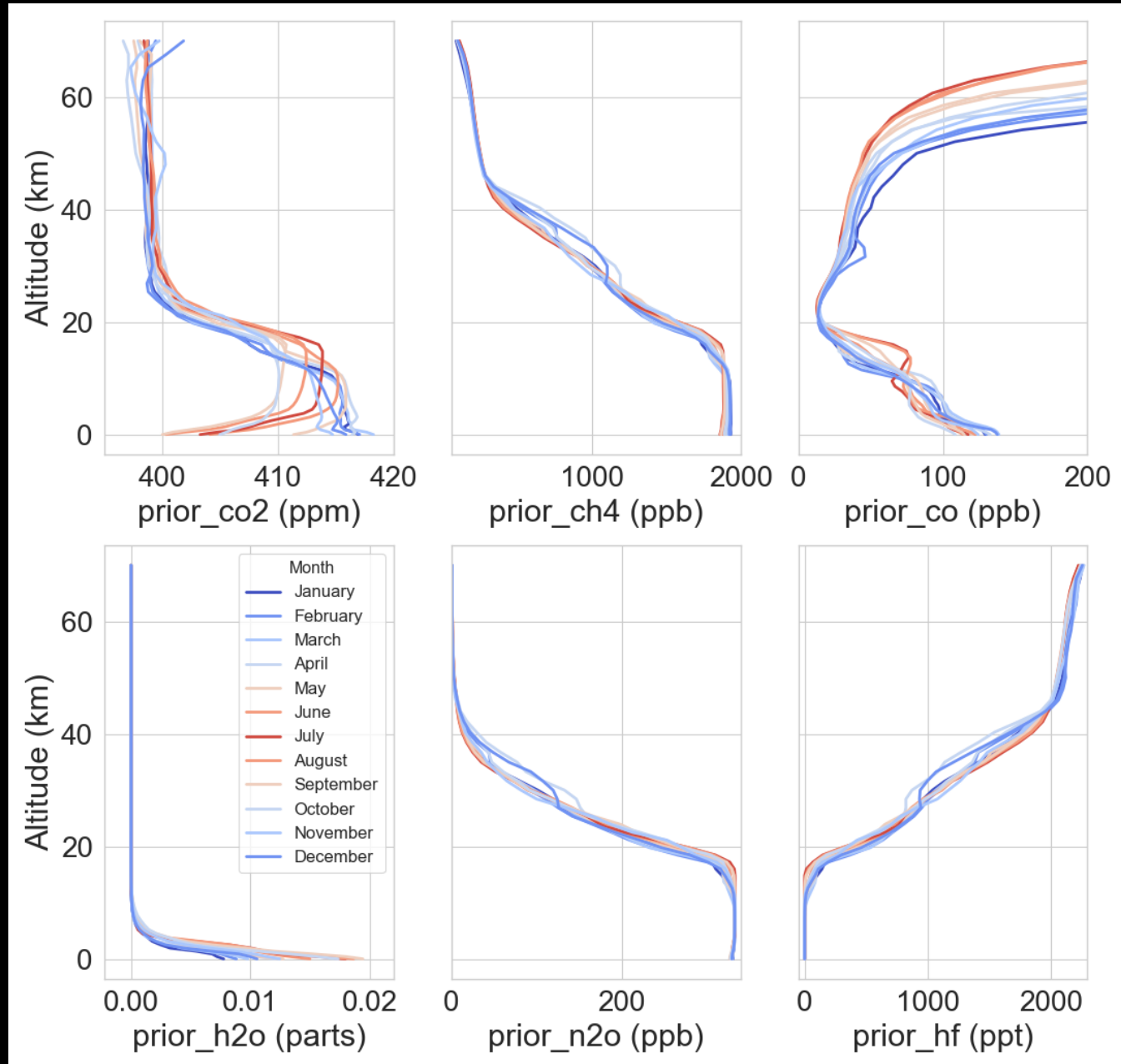> **AK < 1.0** reduced sensitivity

- A set of AK are calculated per measurement, per gas window.
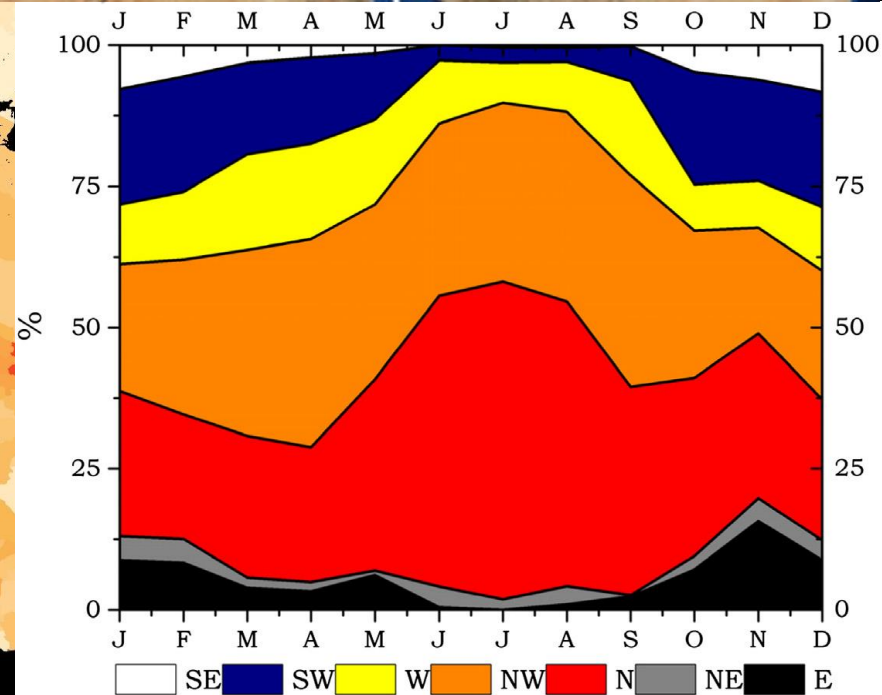
Additional Information – Theoretical Background
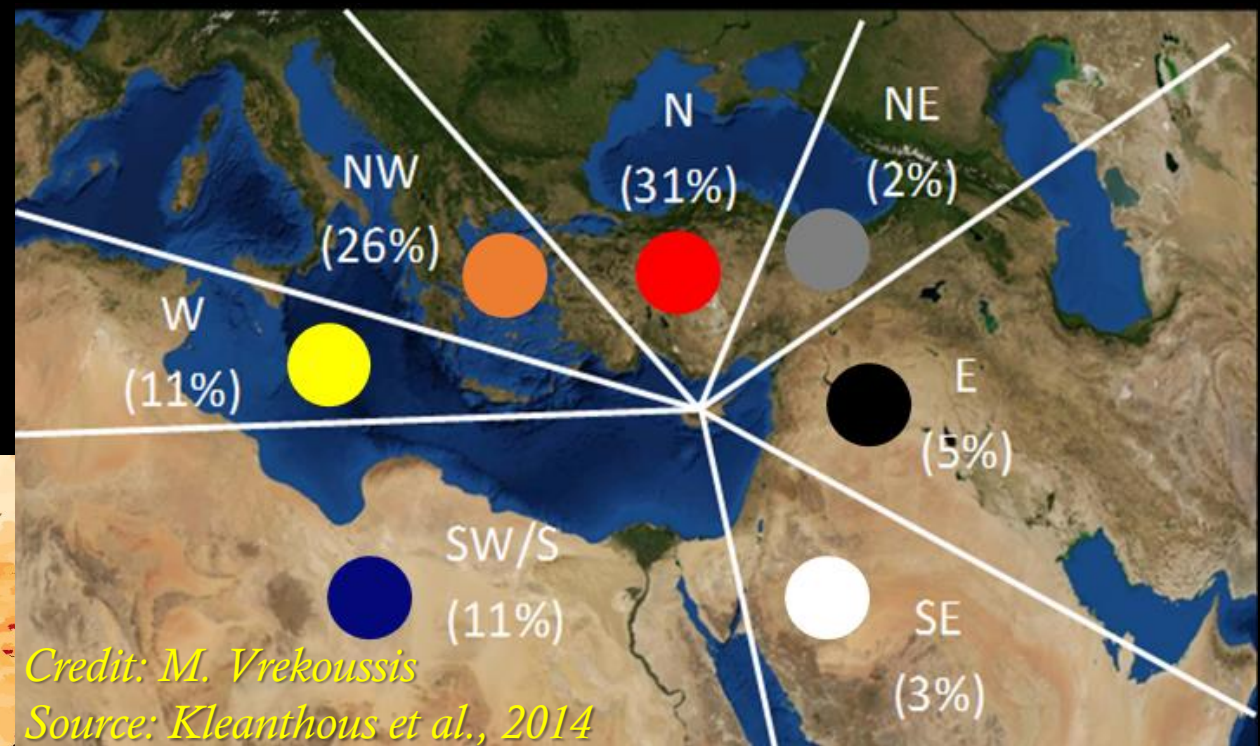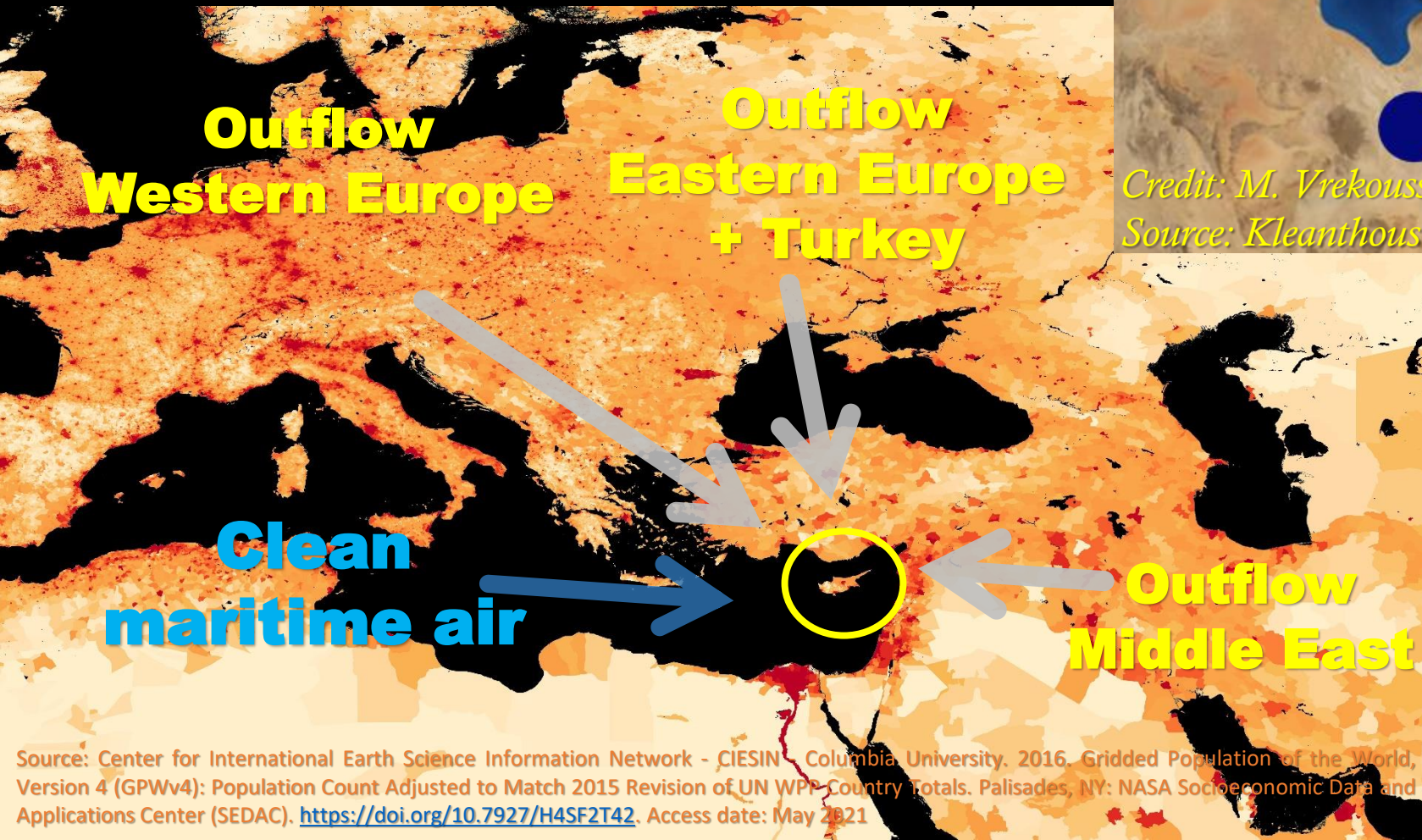

Priors

- A modelled vertical gas profile (our initial "guess").

- Unique per site, with a 3-hourly resolution.

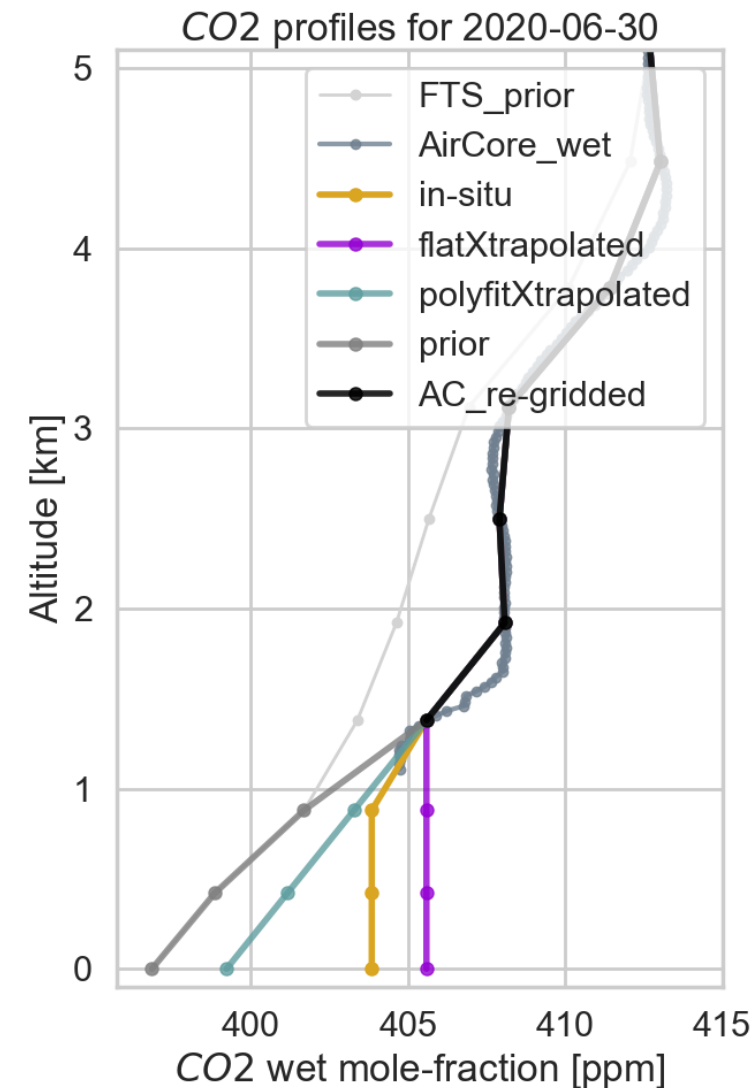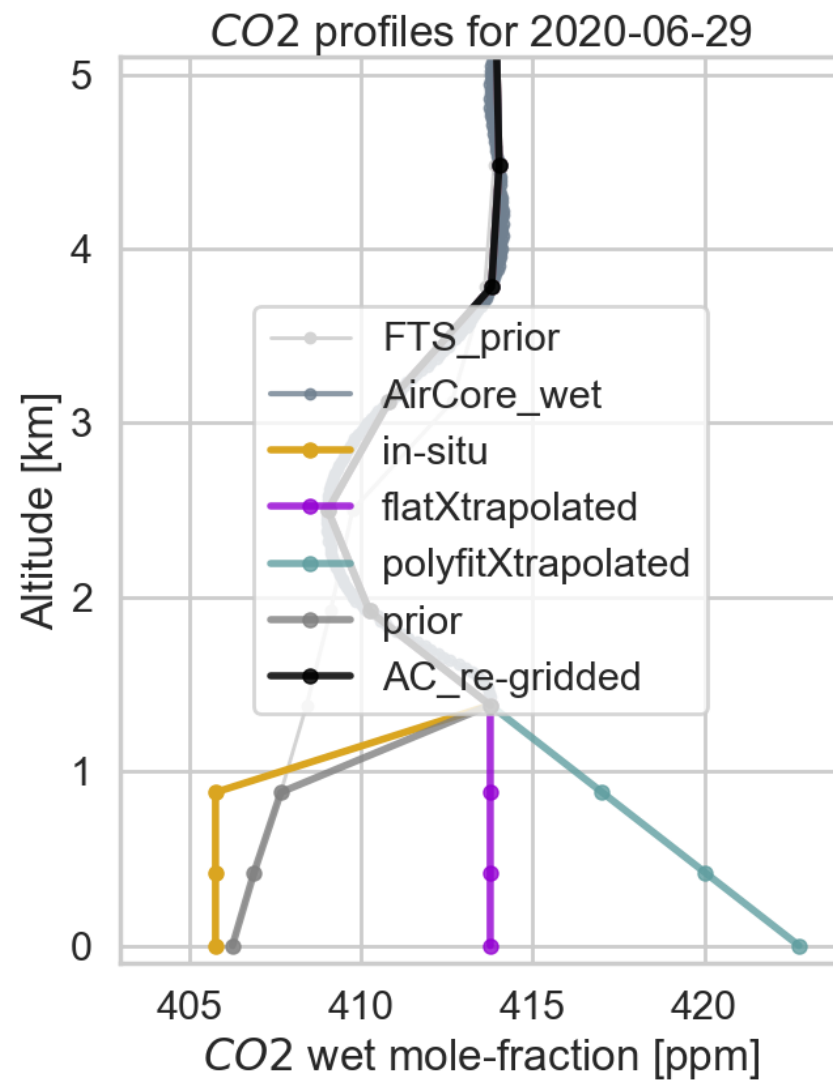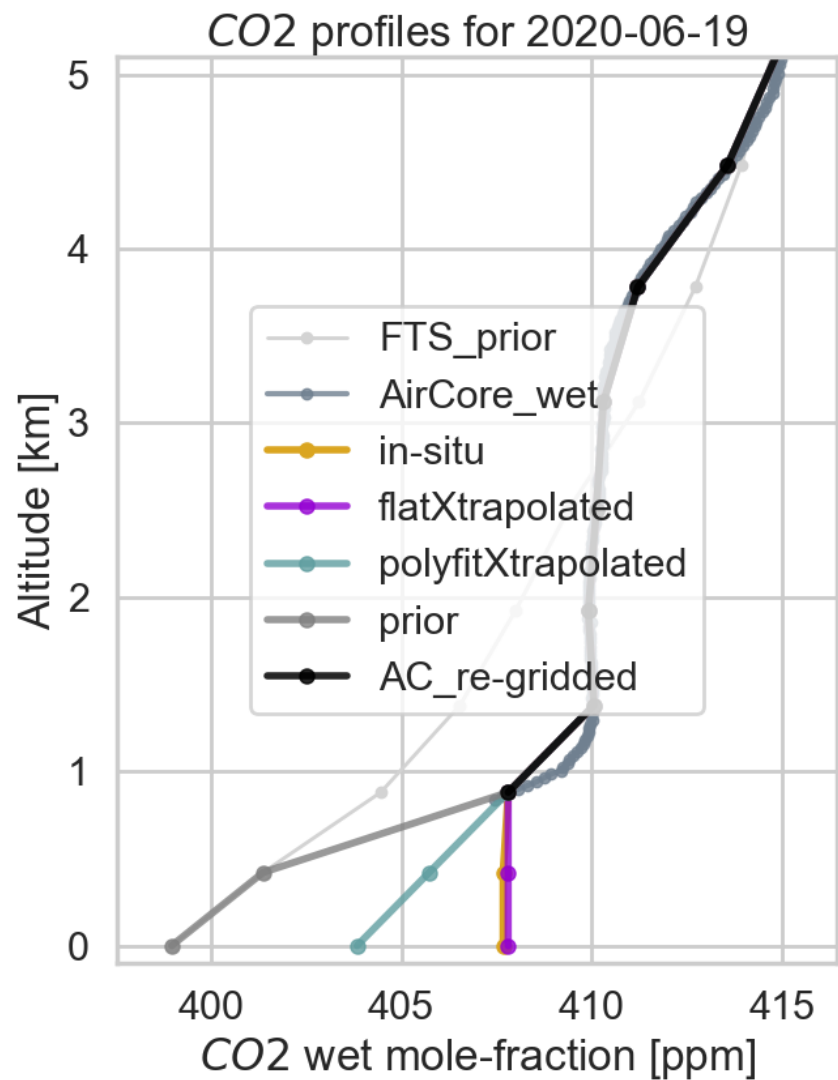- Uses meteorological reanalysis product from GEOS FP-IT.

Goddard Earth Observing System Forward Product for Instrument Teams (GEOS FP-IT) reanalysis product, Lucchesi, 2015

Regional Boundary Layer Air Masses in Cyprus & Seasonal Variability

NW (26%)

N (31%)

NE (2%)

W (11%)

E (5%)

SW/S (11%)

SE (3%)

Credit: M. Vrekoussis
Source: Kleanthous et al., 2014

Outflow Western Europe

Outflow Eastern Europe + Turkey

Clean maritime air

Outflow Middle East

SE   SW   W   NW   N   NE   E

$CO2$ profiles for 2020-06-19

$CO2$ profiles for 2020-06-29

$CO2$ profiles for 2020-06-30

The complete profiles…