

Demonstration Network Of ground-based Remote Sensing observations in support of the GMES Atmospheric Service

Context

- European Initiative
Global Monitoring for Environment and Security (GMES)
⇒ 6 thematic areas
 - atmosphere
 - land
 - ocean
 - security
 - emergencies
 - climate



Supported by ESA and EU since early 2000

Context

- A number of ESA and EU projects have been funded in preparation of the operational **GMES Atmosphere Service (GAS)**:

In particular **MACC**:

Monitoring Atmospheric Composition and Climate, is the current pre-operational atmospheric service of the European GMES programme.

MACC combines state-of-the-art atmospheric modelling with Earth observation data to provide information services covering European Air Quality, Global Atmospheric Composition, Climate, and UV and Solar Energy.

Overall Objective:

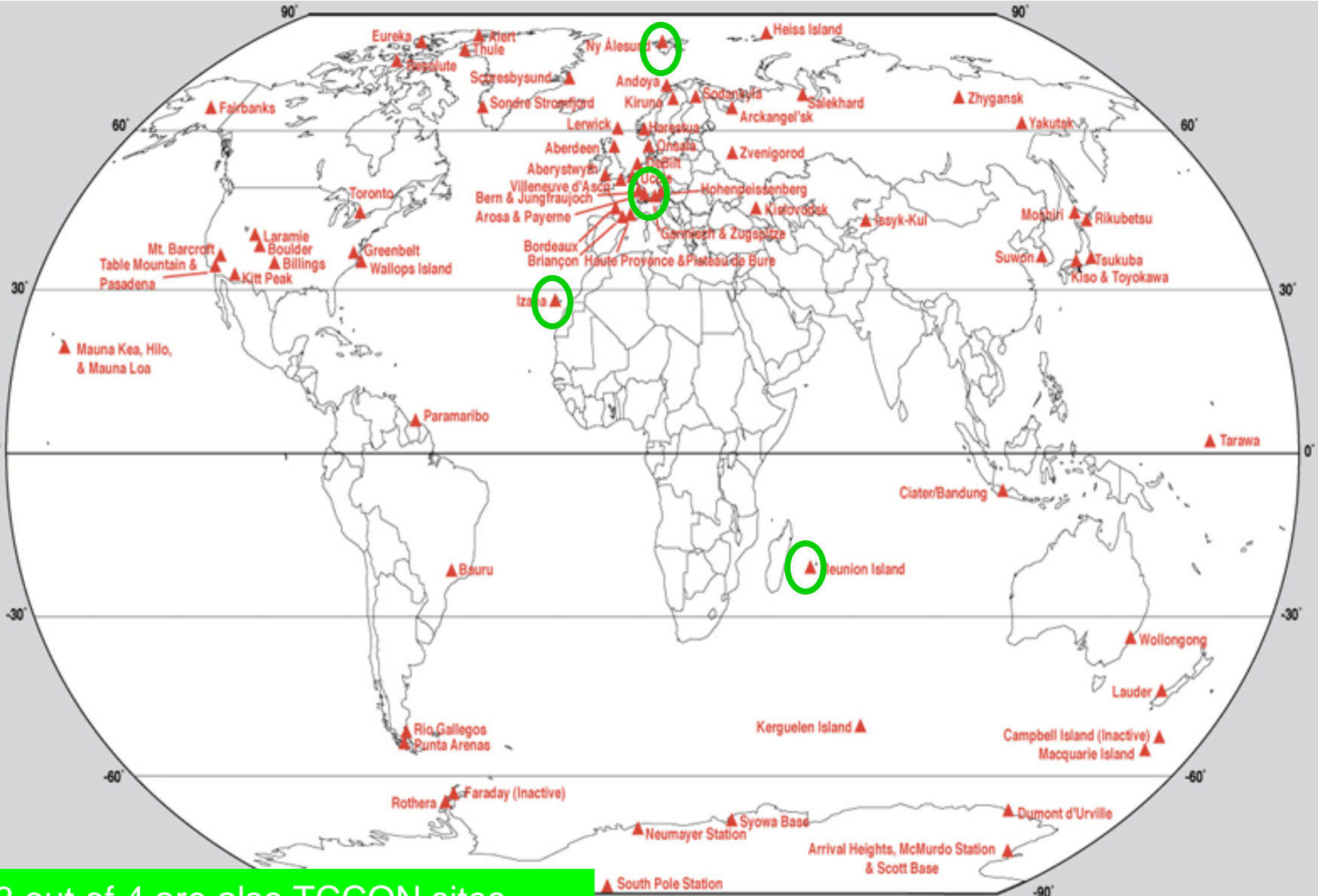
Perform the required research and developments to optimize the NDACC data and data products for the purpose of supporting the quality assessments of the future GAS.

NORS

- NORS is a demonstration project:
- target NORS data products
 - tropospheric and stratospheric ozone columns and vertical profiles up to 70 km altitude;
 - tropospheric and stratospheric NO₂ columns and profiles;
 - lower tropospheric profiles of NO₂, HCHO, aerosol extinction;
 - tropospheric and stratospheric columns of CO
 - tropospheric and stratospheric columns of CH₄
- 4 NDACC techniques:
LIDAR, MW, FTIR, UV-VIS DOAS
- 4 NDACC pilot stations

FTIR products := CH₄, O₃, CO profiles and columns

NORS pilot stations



3 out of 4 are also TCCON sites

NORS objectives

- Rapid data delivery to NDACC with a **delay of maximum 1 month**;
- Promote NORS data as validation data within GAS: provide an extensive **characterisation** of targeted NDACC data and user documentation
- to investigate the **integration** of ground-based data products from various sources (ground-based in-situ surface and remote-sensing data, and satellite data)
- to provide ground-based measurement time series **back to 2003** in support of the re-analysis products of GAS.
- to develop and implement a **web-based application for validation of MACCII products** using the **NORS data products**.

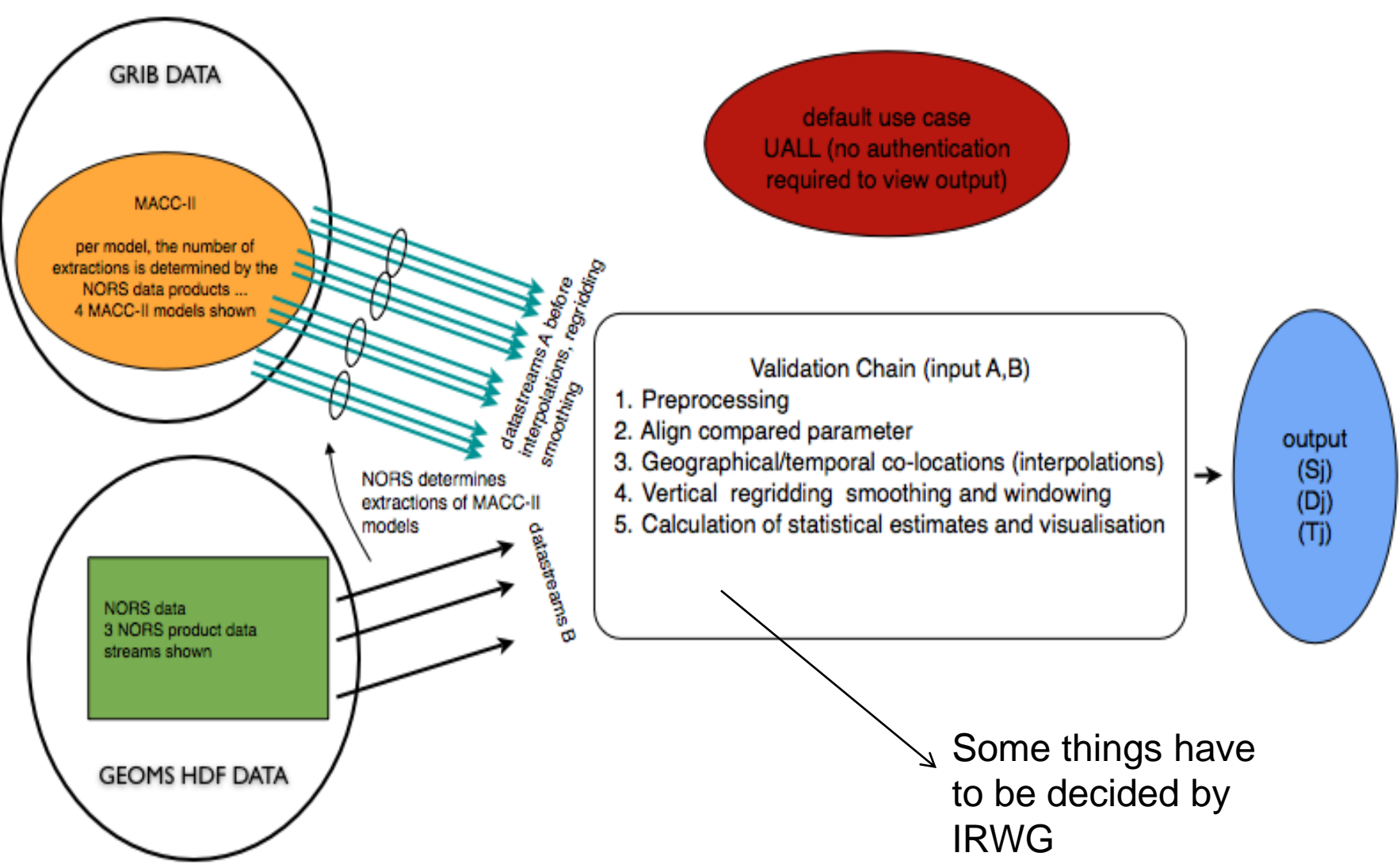


Status

- Start Nov. 1, 2011
- Duration: 33 months
- KO meeting, Brussels, Dec. 14, 2011
- Milestone May 1 2012
 - NORS website nors.aeronomie.be
 - NORS data uses GEOMS data format
 - Rapid data delivery systems are set up
 - User requirements are formulated for the NORS validation server



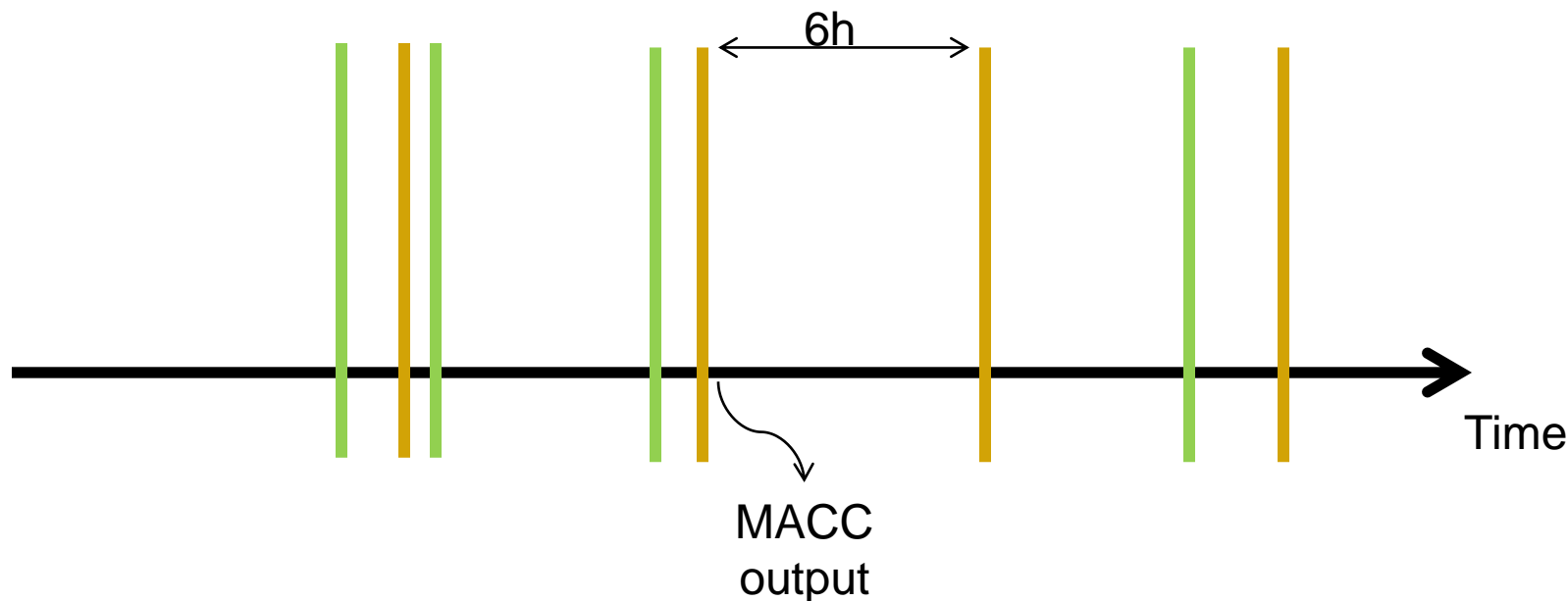
Overview validation server



Some things have to be decided by IRWG

Description of the validation server

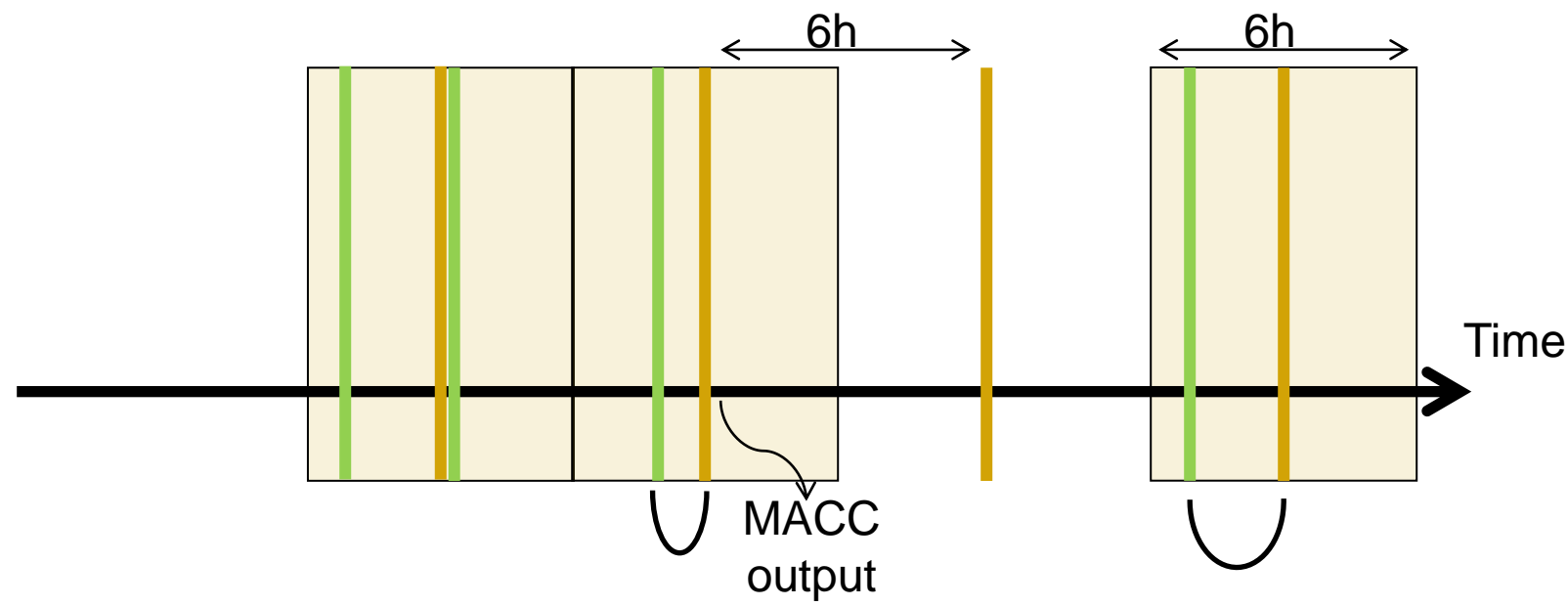
- NORS target species: e.g. O₃ total column at LA.REUNION
- MACC-II model: extract O₃ data at LA.REUNION... generated every 6hours
- How to compare the data?



1. **temporal co-location**
measurements <-> model data

Temporal co-location

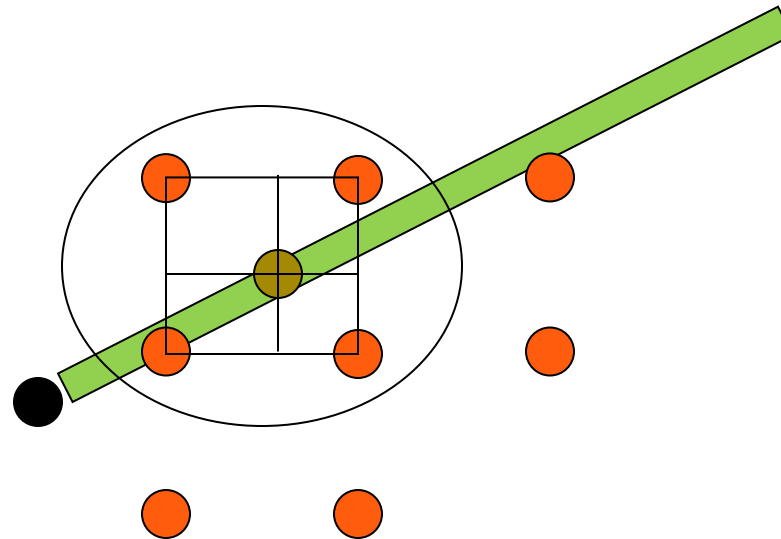
- Choose a 'characteristic time window' for every NORS product.



- Window should not be bigger than 6h
1 measurement -> 1 MACC output
- FTIR products choose windows = 6h

Spatial co-location

- For every measurement, calculate the location of the **effective airmass**
- Interpolate the four surrounding MACC-II model data to this effective airmass location:



for every measurement -> a unique corresponding (interpolated) MACC data point.

Comparison of columns

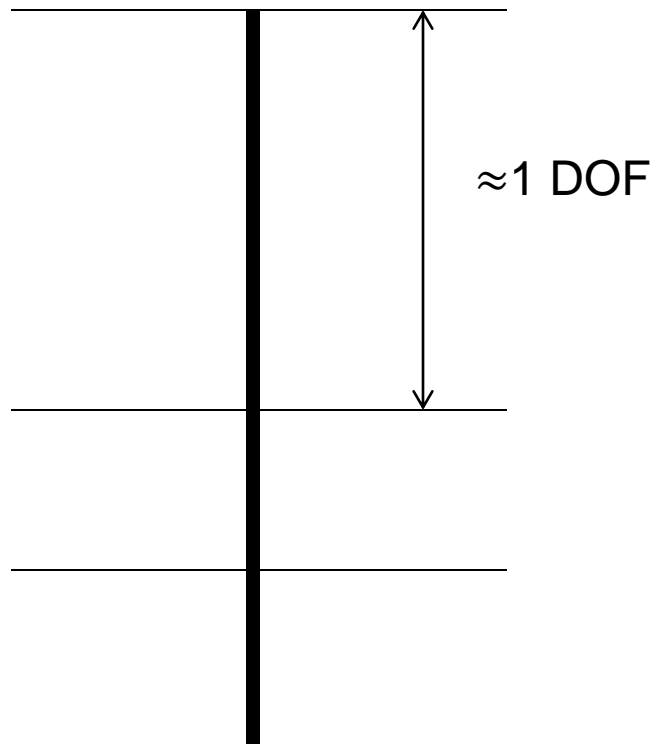
- The MACC-II data is smoothed with the averaging kernel of the NORS measurement
- Then statistics can be calculated (mean bias, modified normalized mean bias, ...)

Vertical grid



Comparison of profiles

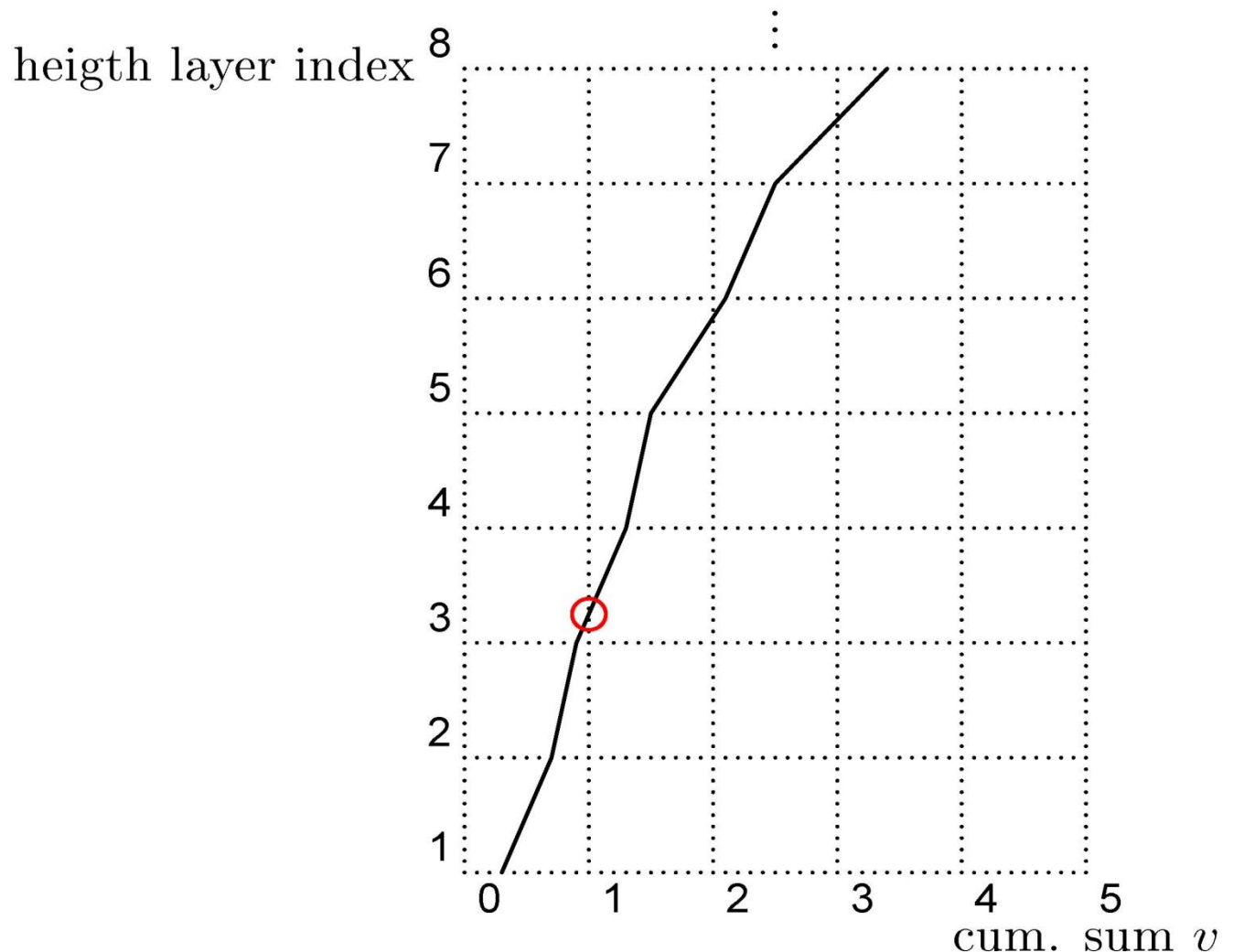
- The MACC-II data is smoothed with the averaging kernel of the NORS measurement
- To compare profiles, it is better to regrid to a vertical grid on which the retrieved profile has about 1 DOF between two boundaries



- This grid will depend on the instrument (and location). Every instrument should provide its **'preferred' vertical grid.**

Determine the unit DOF grid

- Subgrid of grid in GEOMS data
- v =diagonal vector of (averaged) averaging kernel



Summarizing for FTIR

- characteristic time = time between MACC-II data
- Calculation of effective airmass location -> cf. GECA tools
- Definition of the 'preferred vertical grid'.

