NORS Final Review Meeting

NORS

Demonstration Network Of ground-based Remote Sensing Observations
in support of the Copernicus Atmospheric Service

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Part ner	Participant organisation name / Short name in the proposal	Country
1	Belgian Institute for Space Aeronomy	BE
2	Eidgenoessische Materialpruefungs- und Forschungsanstalt	CH
3	Instituto Nacional de Tecnica Aeroespacial	ES
4	Universitaet Bern	CH
5	Karlsruher Institut fuer Technologie	DE
6	Centre National de La Recherche Scientifique	FR
7	Universitaet Bremen	DE
8	Université de Liège	BE
9	Max Planck Gesellschaft zur Foerderung der Wissenschaften	DE
10	Ruprecht-Karls-Universitaet Heidelberg	DE
11	Science and Technology B.V.	NL

NORS : Network of Remote Sensing Ground-based Observations in support of the Copernicus Atmospheric Monitoring Service:

EU FP7 project Nov. 1, 2011 – November, 30 2014

Objectives

➢ to perform the required research and developments for optimizing the NDACC data for the purpose of supporting quality assessments of the Copernicus atmospheric monitoring service (CAMS)   (research part)

➢ To develop and implement a Web-based Validation Server of the CAMS products using the NORS data products   (operational part)

⇒ ***nors-server.aeronomie.be***

NORS data products =

NDACC LIDAR, microwave radiometer, FTIR and (MAX)DOAS data

(total columns, tropo- and stratospheric columns, profiles) for O_3, CH_4, CO, HCHO, NO_2 and aerosol extinction (= subset of NDACC data)
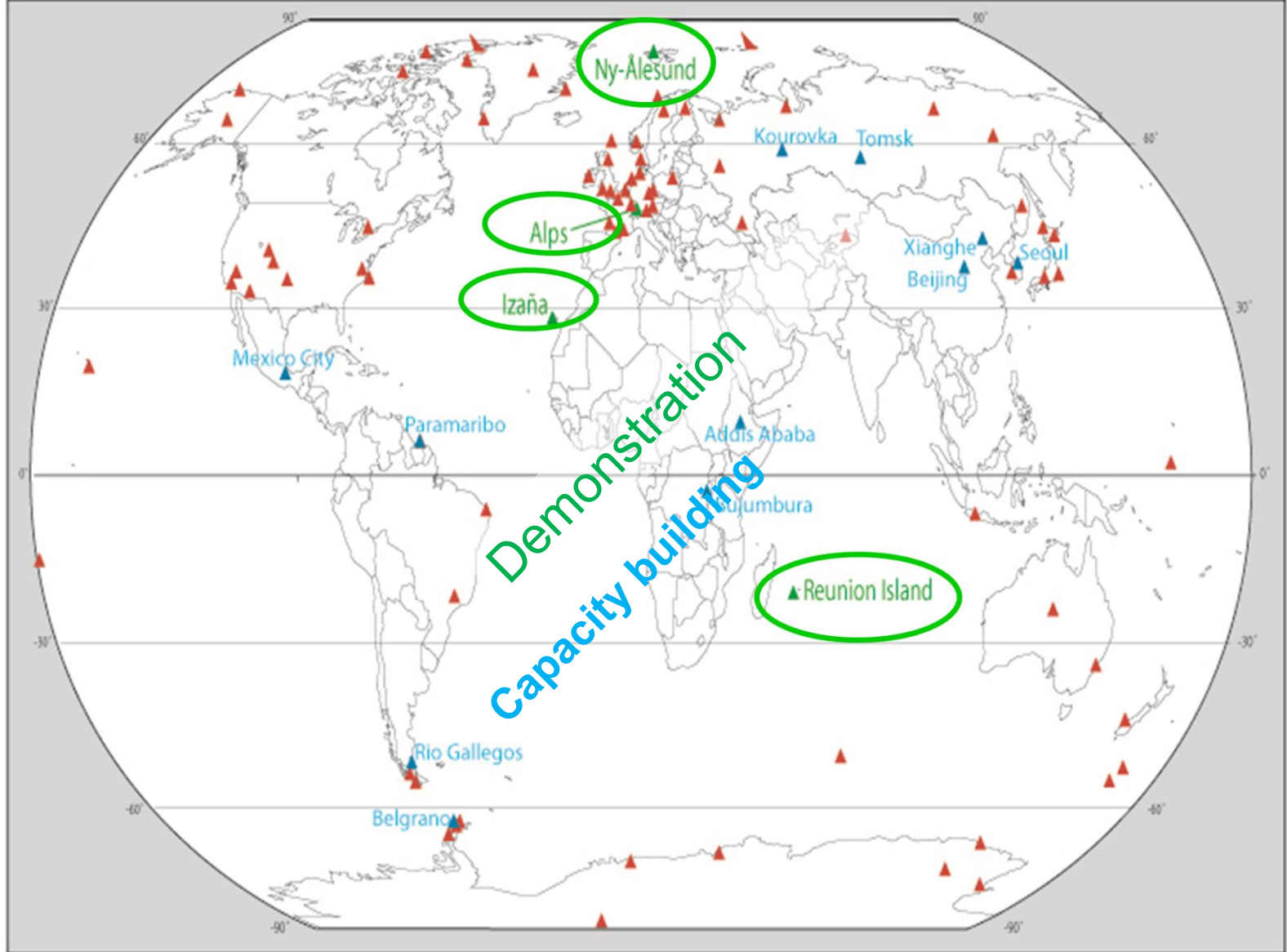
Legend:
- ▲ Operational NDACC stations
- ▲ NDACC stations selected as pilot stations in NORS
- ▲ Stations to be developed in NORS to potentially become NDACC stations

Research part

focuses on :

➢ harmonisation of data products within and across techniques

➢ Better characterisation of data products (data user guide, uncertainties, airmass location, data representativeness, information content…)

➢ Combined use of various O_3 data products for constructing an O_3 profile data set covering full altitude range

➢ Integration of in-situ data and remote-sensing data (using) models, among others for validation of tropospheric remote sensing data

Operational part

focuses on :

➢ Rapid delivery of data (within one month; some is daily)

➢ NORS Validation Server

  ✓ Generic, advanced and consistent comparison algorithms

  ✓ Traceability

  ✓ Automated validation reports of target MACC products using NORS / NDACC data

  ✓ Contribution to MACC validation of NRT global atmospheric composition service

  ✓ Contribution to MACC validation of regional AQ service

Review at PM2 & μ progress in last year

- Rapid data delivery realized for about 80% -> percentage to be increased

⇒ Increase from 8 to 15 stations

  that are contributing validation reports

  for 7 species (the initial 6 plus H2O)

  In addition, FTIR.NO2 and FTIR.HCHO are also provided

- 21 more deliverables have been submitted since PM2 – at least in draft form; the final versions of the draft deliverables will be submitted before the end of November

- All initial objectives and more have been achieved

  ✓ Number of products and stations is more than strictly commited to

Sustainability is the most difficult point !

Final Workshop

- 2 days international (beyond Europe!) workshop
- 111 registered participants (a few only part-time)
  among which
  31 members of the NDACC Steering Committee &
  1 member of CEOS
  plus 2 ESA representatives and EU representatives
  and a WMO representative

- 46 oral presentations
- 7 posters

- Among the presentations, 20 are directly resulting from NORS

A report about the final workshop will be published in the NDACC Newsletter and as a NORS deliverable

Final review: organisation

Summaries by WP leaders of results achieved in NORS,

➢ with emphasis on last year's achievements
➢ with reference to talks durings the workshop
   for scientific and technical details

backup

NORS data products & techniques

- <u>Target NORS data products</u>
  - ❑ tropospheric and stratospheric ozone columns and vertical profiles up to 70 km altitude
  - ❑ tropospheric and stratospheric NO_2 columns and profiles
  - ❑ lower tropospheric profiles of NO_2, HCHO, aerosol extinction
  - ❑ tropospheric and stratospheric columns of CO
  - ❑ tropospheric and stratospheric columns of CH_4

- <u>4 NDACC observation techniques + in-situ surface monitoring:</u>
  Lidar, MicroWave, FTIR, UV-VIS DOAS
  + in-situ surface monitoring

Research (1)

- Development of a methodology for integrating ground-based data sources to provide consistent ozone vertical distribution time series as well as tropospheric and stratospheric ozone columns (WP6)

  $\Rightarrow$ to provide full vertical information that is representative of, e.g., alpine station

- Validation and integration of tropospheric composition measurements (in-situ surface and remote-sensing measurements) (WP5)

  $\Rightarrow$ for comparison to satellite data

- (MAX)DOAS technique:
  - Advances in cloud detection and filtering techniques
  - Advances in tropospheric NO2 and aerosol measurements
  - …

    $\Rightarrow$ for delivering new/improved data products from the network

Research (2)

- Consistency checks between DOAS and FTIR data for NO2 (presented in 1st year) and HCHO

  $\Rightarrow$ complementarity between techniques

- Consistency checks between CO from NDACC (MIR) and TCCON (NIR) observations

  $\Rightarrow$ use of both networks for validation of satellite and MACC data

- Advances in uncertainty budget evaluations and reporting

  $\Rightarrow$ E.g., in FTIR community: Workshop in January 2013 to discuss common (to network) uncertainty evaluations tools (S/W codes integrated in data processing codes)

- Consistency checks between NORS products and satellite data used in MACC

  $\Rightarrow$ Better understanding of quality of MACC assimlilation analyses

Research (3)

- **Documentation**
  - ➢ Data User guide
  - ➢ Uncertainty budgets
  - ➢ Data representativeness

These documents will be made available also on NDAC database or Website

Operational part (1)

1. <u>NORS Data delivery</u>

- ***Rapid delivery*** – within < 1 month after data acquisition) of the NORS (NDACC) data to the RD directory on the NDACC DHF

- Requirement: ***GEOMS HDF format*** according to templates (including uncertainties preferably)
    - ❖ Format has shown some deficiences → some solved; others to be resolved by end of project.

- Consolidated data and reanalysis data are submitted to usual station directories on NDACC DHF

Operational part (2)

2. <u>Large effort on development of generic, advanced and consistent intercomparison tools</u> for NORS versus MACC-II products (mainly done at BIRA)

   e.g., Accounting for vertical averaging (AVK)

   e.g., accounting for data representativeness

   e.g., accounting for diurnal variation of strato- NO2

   e.g., consistent interpolation and regridding methods

   e.g., consistent reporting

   e.g., uncertainties included

   …..

   ➢ Described in ***"Description of algorithms for the NORS Validation server"*** *(to be published)*

   ➢ Available as python routines

Operational Part (3)

3. <u>Large effort by S&T on development Nors Validation Server (NVS)</u>

⇒ Actual status

     Prototype validation server

     http://nors.stcorp.nl

     available for testing and verification

⇒ Final status:

     implemented at BIRA

     linked to the MACC-II Webpages

⇒ completely **automatic reports generation**

    + on-demand comparisons (other data, other models, other validation parameters, ….) and reports for VIP users

⇒ Gives direct feedback to data providers and users

Operational Part (4)

Automatic means what ?

As soon as MWR, LIDAR, FTIR or UV/VIS DOAS data are archived
in NDACC station directories or RD directory,
in GEOMS HDF,

$\Rightarrow$ they will show up on the Validation Server
and intercomparison reports will be available on NVS