Belgian Science Policy (BELSPO) / Federal Scientific Institutes (FSIs)

I. Update on Cal/Val Activities

Jean-Christopher Lambert

Belgian Institute for Space Aeronomy (IASB-BIRA)

Agency Report VII

WGCV Plenary # 39

Berlin, May 6 - 8, 2015

Working Group on Calibration and Validation

Agency Report VII
BELSPO / FSIs

Contributing Institutes

- Federal Scientific Institutes (FSIs) under BELSPO Authority
  - Belgian Institute for Space Aeronomy, IASB-BIRA
  - Belgian User Support and Operation Center, B-USOC
  - Royal Institute of Natural Sciences of Belgium, IRSN
  - Royal Meteorological Institute of Belgium, RMIB
  - Royal Observatory of Belgium, ROB
- Regional Partners
  - Centre spatial de Liège, CSL
  - Free University of Brussels, ULB
  - Université de Liège, ULg
  - Vlaamse Instelling voor Technologisch Onderzoek, VITO

Agency Report VII
BELSPO / FSIs

Outline of the updates

- EO missions
- Validation data
- Validation methods
- Validation systems

- Background information (not presented at meeting)

BELSPO / FSIs
Update on EO missions

Atmosphere:

- Phase F: ESA GOME, GOMOS, MIPAS, SCIAMACHY
- Phase E: EUMETSAT MetOp and MSG (CM-SAF, O3M-SAF); CSA ACE-FTS; NASA/KNMI Aura OMI
- Next year: Sentinel-5 precursor TROPOMI, PICASSO/CubeSat
- Future: EU Sentinel-4 UVN and 3MI, EU Sentinel-5 UVN and IASI-NG
- Phase B: Altius/PROBA

Land, Oceans and Snow/Ice:

- PROBA-1 (L 2001) transferred to ESA
- PROBA V (L 2013): 100m workshop in Brussels, Nov. 2014
- EU Sentinel-3 (L 2015/Q4)
- CONAE-CSL cooperation on SAOCOM-1A/1B (L 2016/2017): polarimetric SAR/ScanSAR + InSAR/DInSAR processor

Solar:

- ISS Columbus SOLAR/SOLSPEC (L 2008)
- PROBA-2 (L 2009)

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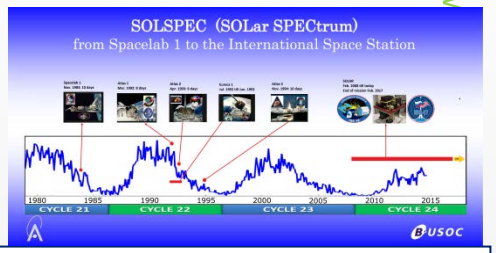
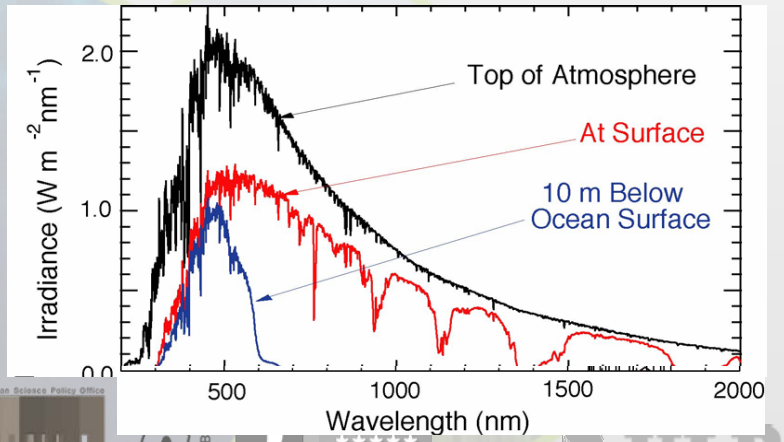
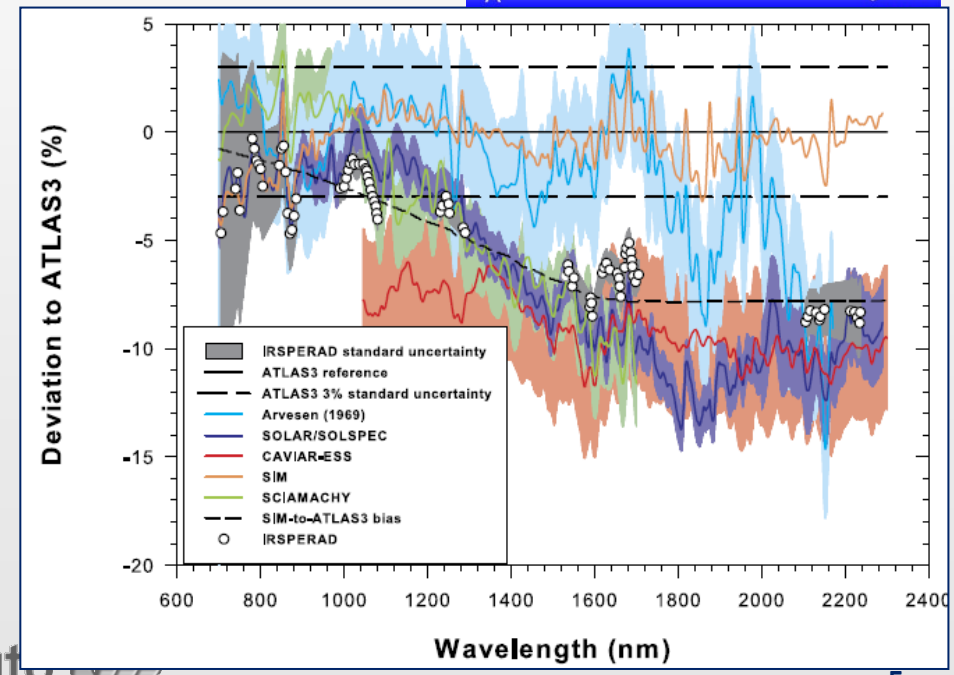
Update on EO missions

ISS Columbus SOLAR/SOLSPEC Workshop, Uccle, March 2015

- 30 participants from Belgium, France, NL, UK and USA: BELSPO, ESA, B-USOC, IASB-BIRA, RMIB, ROB, LASP, LATMOS, PMOD/WRC
- Highlights:
  - 166 nm to 2900 nm since 2008, degradation controlled
  - Usefulness in ozone and climate research, WRC
  - Legacy instruments back to 1980s
  - IRSPERAD campaign, Izaña, 2011
  - NIR under discussion
  - Data preservation and distribution







Courtesy D. Gillotay and D. Bolsée

BELSPO / FSIs
Update on validation data

Atmosphere: [various websites]

- AERONET, EEA/EMEP, NDACC, TCCON, WMO/GAW stations
- International effort on harmonization, reprocessing, error characterization (iCAL, GAIA-CLIM WP2, QA4ECV WP4, CINDI-II)
- Balloon-based AirCore campaign for TCCON/OCO-2 calibration
- UAV- and car-based DOAS instruments, AROMAT campaigns

Marine: http://www.mumm.ac.be/datacentre

- Belgian Maritime Data Centre (BMDC), SeaDataNet member
- Physical, chemical and meteorological parameters over North Sea
- Ship- and shore-based

Solar: http://uvindex.aeronomie.be

- Solar UV-Visible Irradiance Monitoring Network (7 RT stations in Belgium + Belgian Antarctic Base), with centralised calibration centre (Uccle)
- Spectral irradiance 280-600 nm, broadband, clouds, sunshine duration…

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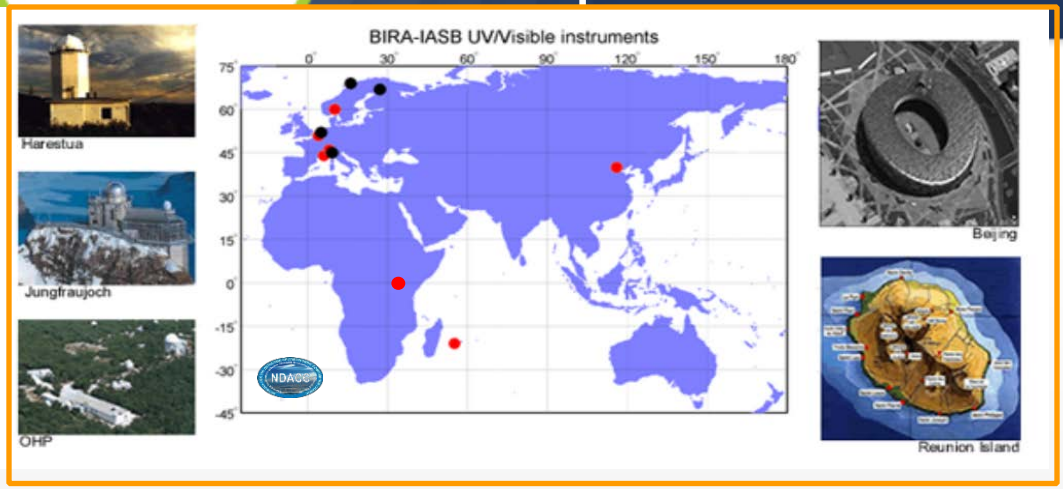
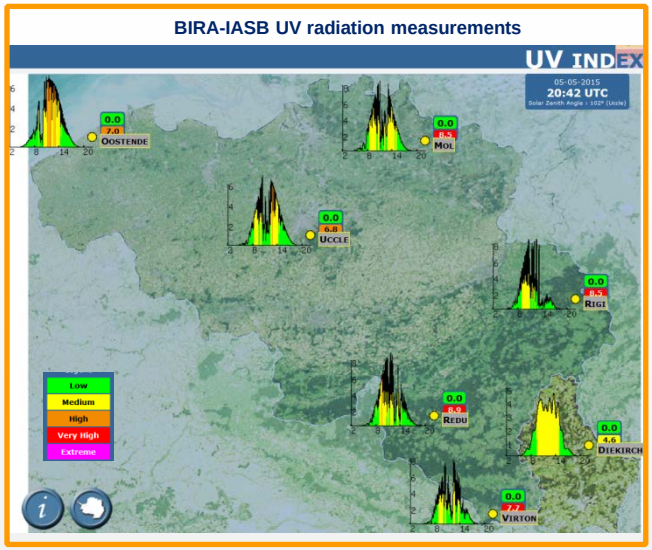
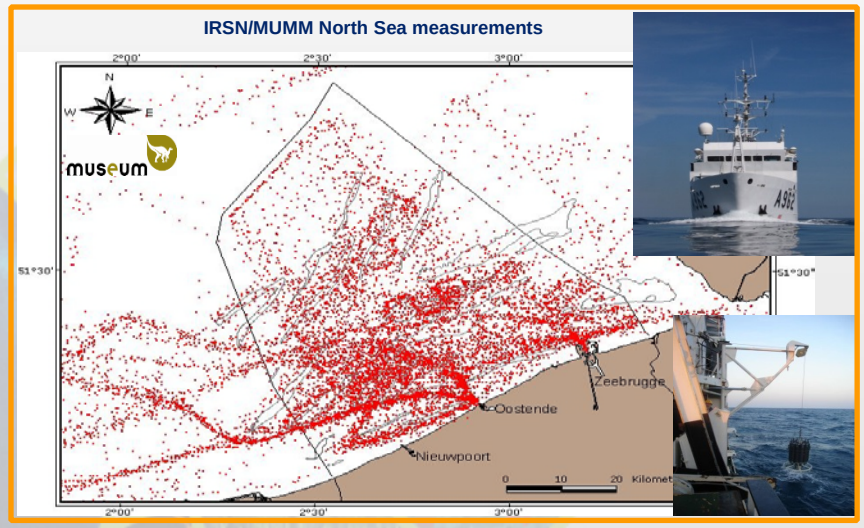
Update on validation data



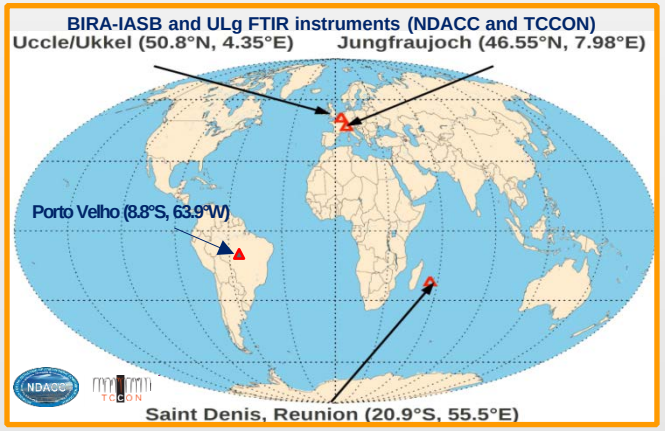
Contact M. Van Roozendael and F. Hendrick, BIRA-IASB
+ Brewer/O3Sondes in Uccle, H. De Backer, RMIB



Contact D. Gillotay, BIRA-IASB



Contact S. Scory, IRSN/MUMM

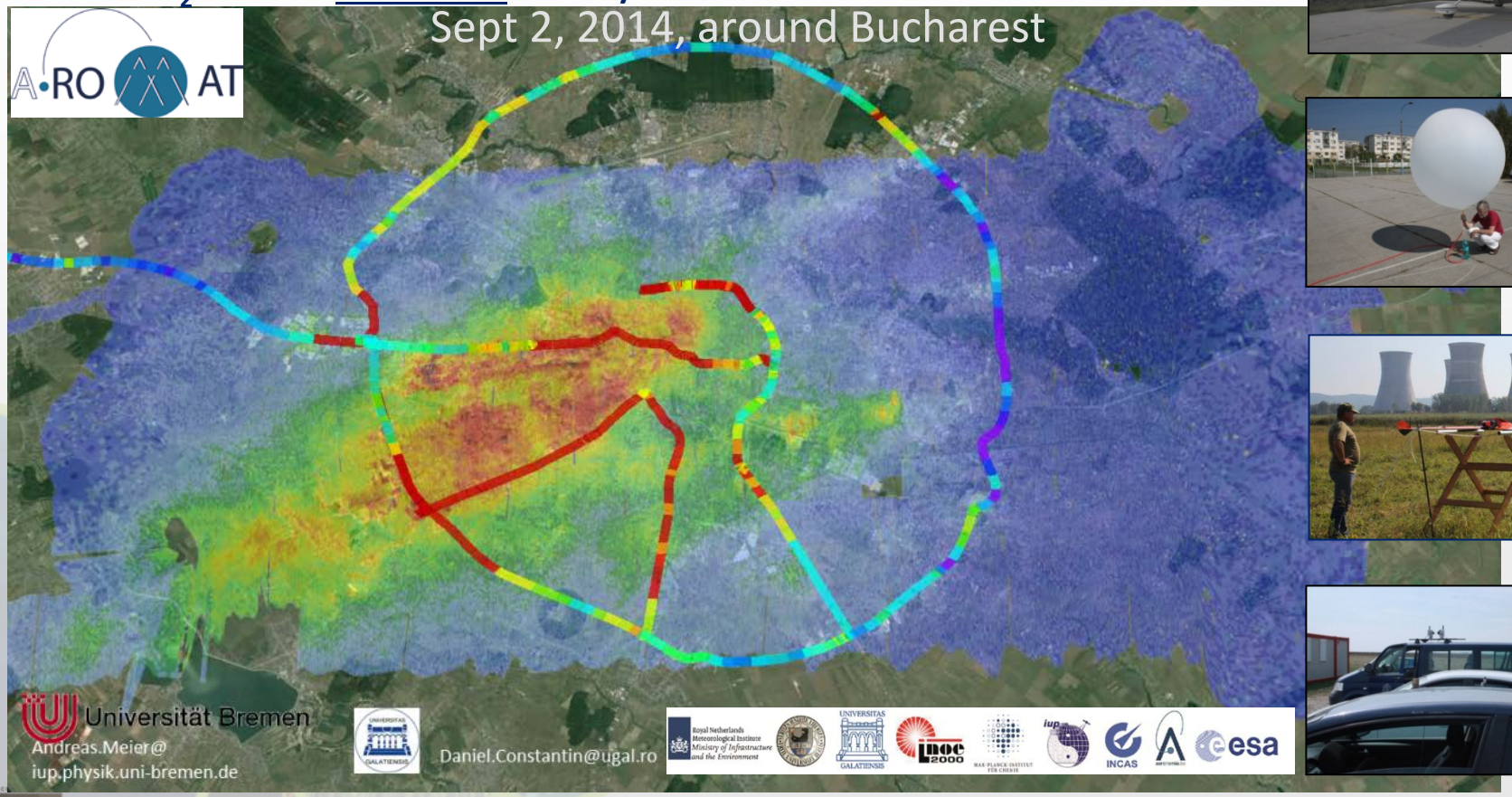


Contact M. De Mazière, BIRA-IASB

Working Group on Calibration and Validation

Update on validation data AROMAT Campaigns

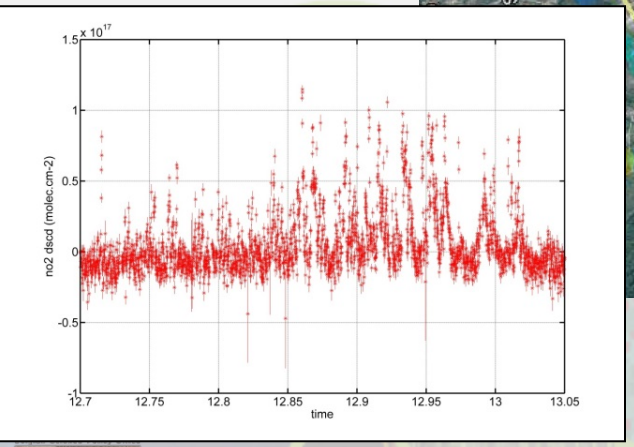
AirMAP: IUP-Bremen pushbroom imager, resolution 100m, on Uni. Berlin Cessna (*Schönhardt et al., 2014)*
Mobile DOAS systems: compact uv-vis spectrometers on cars (MPIC, **IASB-BIRA**, Uni. Galati) *Ref: Wagner et al., 2010; Merlaud, 2013; Constantin et al., 2013*
+ KNMI **NO_2 sonde** + **IASB-BIRA SWING/UAV** + on site instrumentation

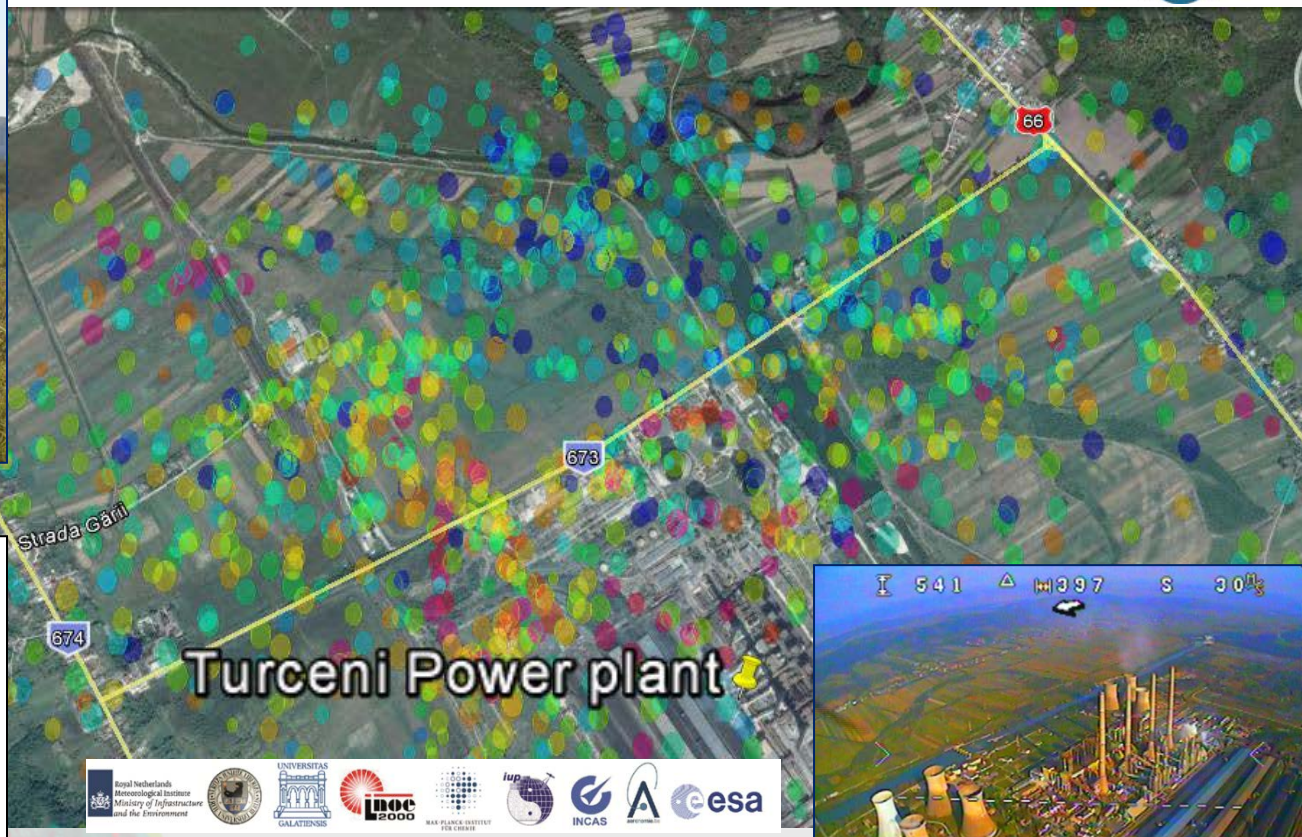


Working Group on Calibration and Validation

Update on validation data AROMAT Campaigns

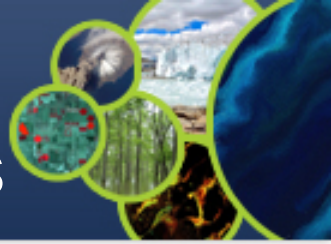
IASB-BIRA_SWING/UAV *Ref: Merlaud et al., 2013*





Next campaigns: AROMAT-2 Aug./Sep. 2015 + Bucharest 2017

BELSPO / FSIs
Update on AC&C validation systems



Multi-TASTE: Unification of satellite validation systems:

- CP => Phase E => Phase F: Multi-TASTE, O3M-SAF
- Long-term/Climate Data Records: SI2N, ESA CCI, CM-SAF
- Generic framework, specific methods and tools, linkage with Copernicus Climate Change Service: QA4EO, EU FP7 QA4ECV

➢ Versatile validation system for atmospheric composition satellites

Error budget of data comparisons:

- OSSSMOSE: OSSE based validation simulator, with 3D metrology
- Error budget closure including now smoothing and sampling differences

NORS: Validation support for MACC atmospheric services (CAMS)

- Joint GAW/NDACC/NORS workshop Nov. 2014, Brussels (100+ participants)
- FP7 project ended; MACC-III funding for implementation of routine activity
- No funding for data acquisition and analysis (“in situ“ component)

Gap analysis of validation capabilities:

- EU H2020 GAIA-CLIM

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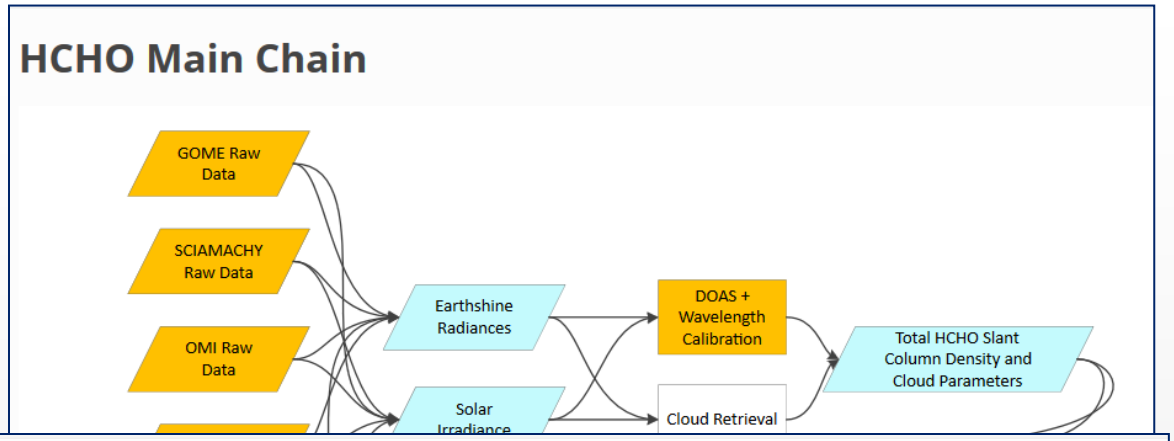
AC&C Validation Systems
QA4ECV Traceability Chains

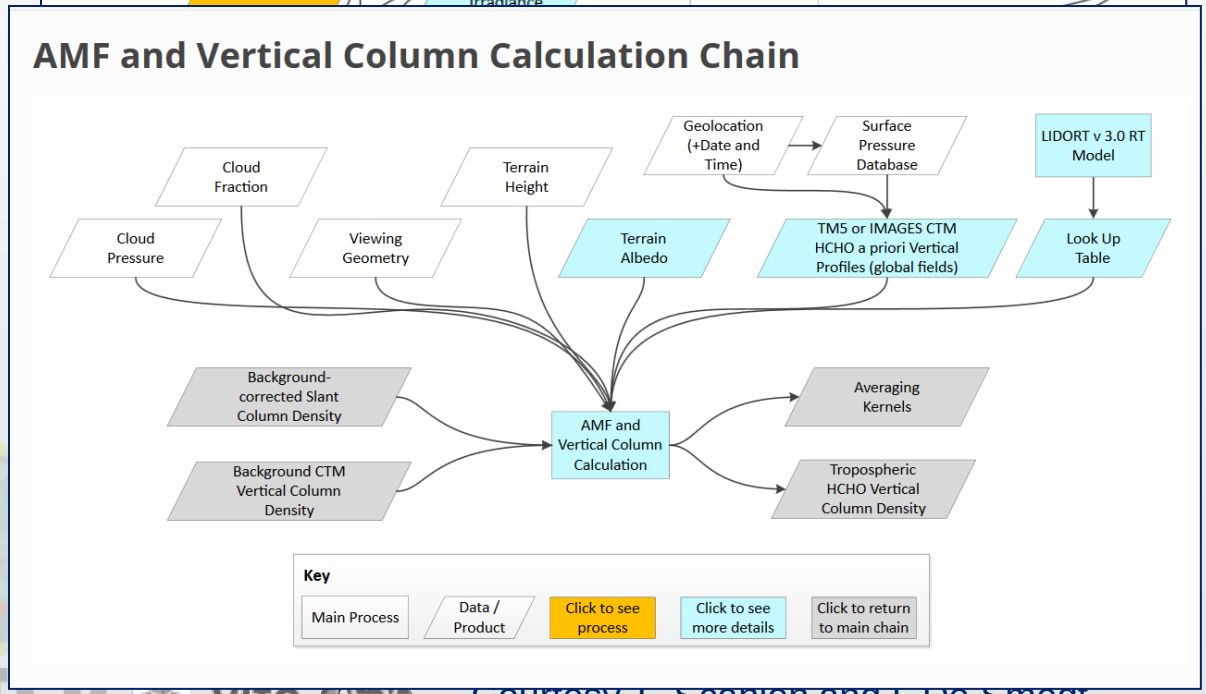
Traceability of data generation process

Illustration: Traceability of generation process for nadir formaldehyde column data

Current step: Audit of traceability chains

Next step: Audit of QI associated with data generation steps and error propagation





Courtesy T. Scanlon and I. De Smedt

AC&C Validation Systems
QA4ECV Traceability Chains

Atmos. Meas. Tech. Discuss., 7, 11481–11546, 2014
www.atmos-meas-tech-discuss.net/7/11481/2014/
doi:10.5194/amtd-7-11481-2014

Atmospheric Measurement Techniques Discussions
Open Access

Round-robin evaluation of nadir ozone profile retrievals: methodology and application to MetOp-A GOME-2

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[5]LATMOS, UVSQ, UPMC, CNRS, Paris, France
[6]Finnish Meteorological Institute (FMI-ARC), Sodankylä, Finland
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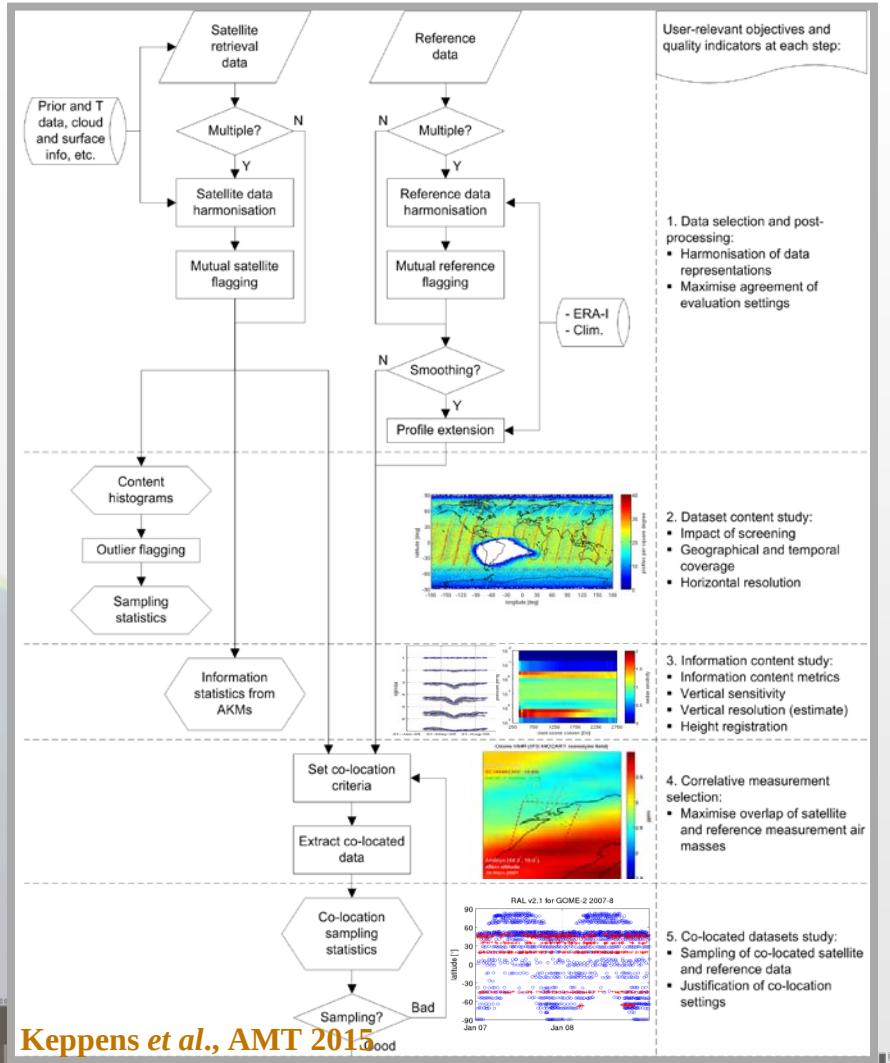
Working Group on Calibration and Validation

Discussed at ACC-10

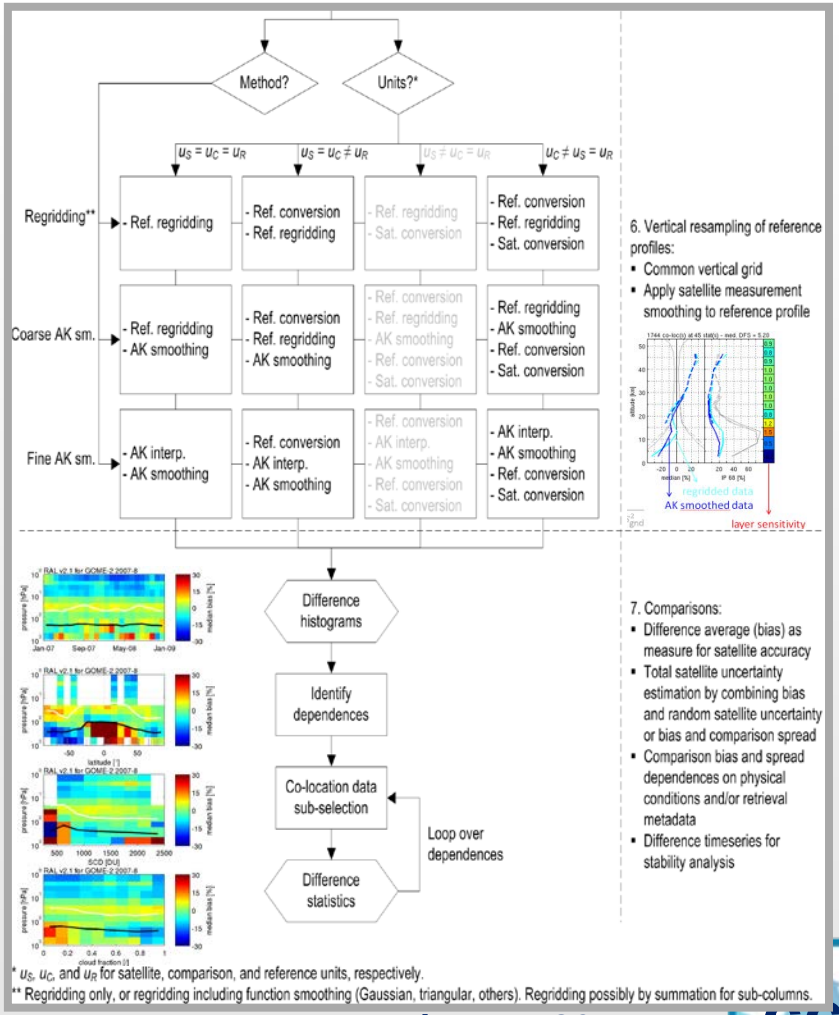
Proposed at ACC-11 for nadir O_3 profile initiative

AC&C Validation Systems
QA4ECV Traceability Chains

QA4CV traceability chain of geophysical validation process applied to CCI Ozone



Keppens *et al.*, AMT 2015



Keppens et al., AMT 2015

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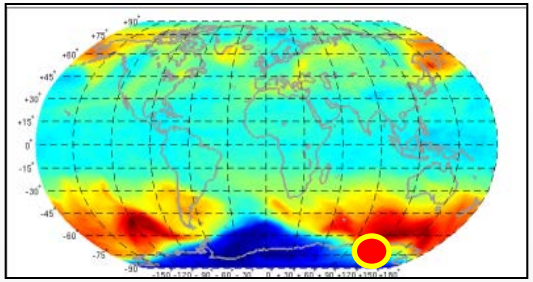
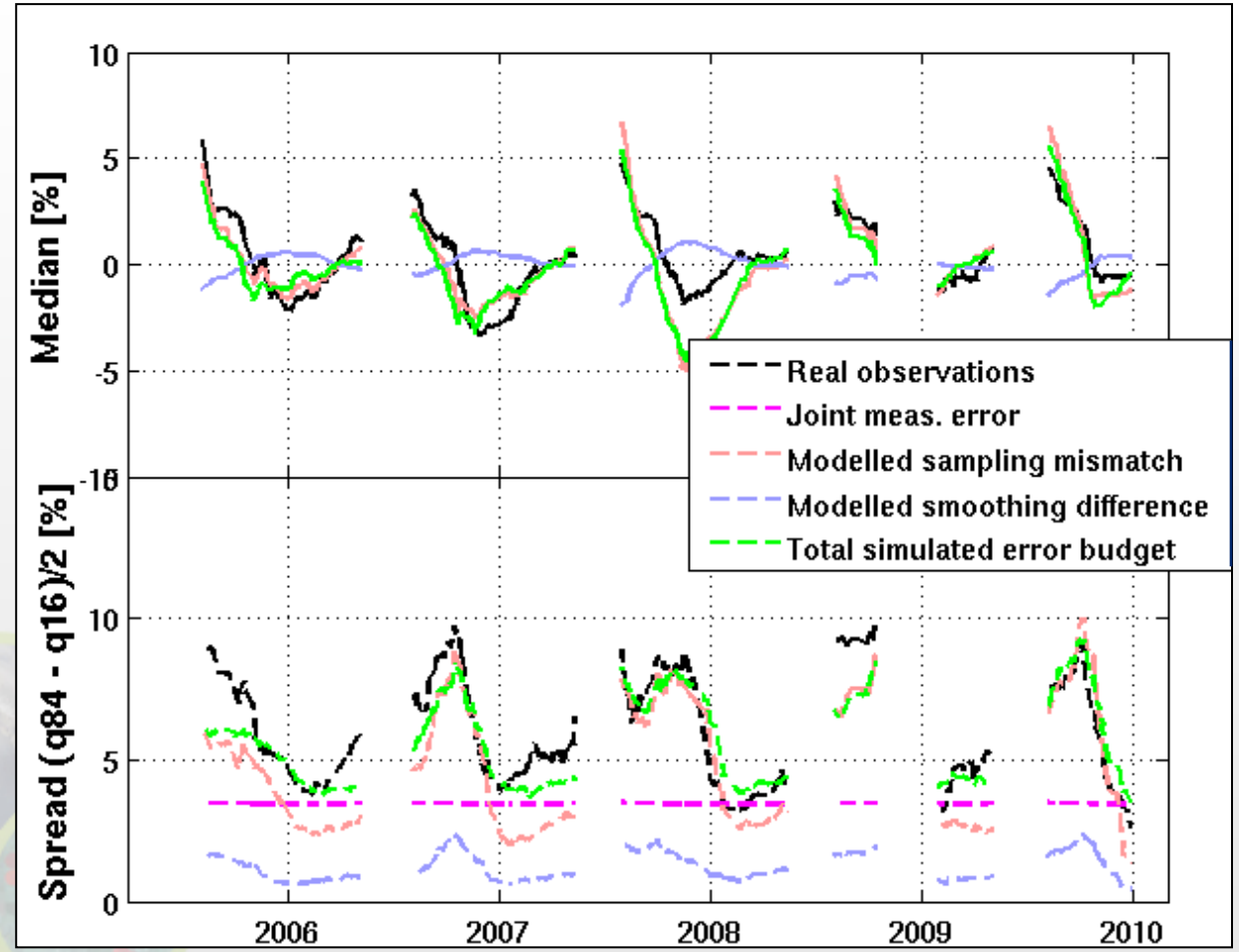
AC&C Validation Systems
OSSSMOSE Metrology Simulator

Error budget closure of ozone column validation



BELSPO/PRODEX A3C: OSSSMOSE application to GOME GODFIT v3 vs. CNRS SAOZ v3 in Dumont d'Urville (ANT)



Verhoelst et al., AMTD 2015

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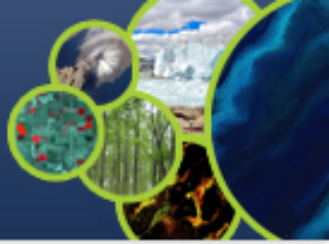
BELSPO/FSIs Cal/Val Practices
Harmonization at Federal Level



A Portal to Atmospheric and Marine Information Resources (PAMIR)

- Federal project funded by BELSPO: IASB-BIRA, IRSN, RMIB
- PI: Anne De Rudder, IASB-BIRA
- Progress towards compliance of geo-located atmospheric and marine data from FSIs with INSPIRE Implementing Rules (EU Directive)

WGCV related:

- Topics: QA4EO principles, generic framework, generic validation report template, medatada editor, catalogue
- Federal forum for exchange/harmonization of validation protocols, best practices, access to Cal/Val data etc.

Working Group on Calibration and V

With ocean and atmosphere, let INSPIRE gain altitude and depth.

Belgian Science Policy (BELSPO) / Federal Scientific Institutes (FSIs)

II. Background Information

Jean-Christopher Lambert

Belgian Institute for Space Aeronomy (IASB-BIRA)

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WGCV Plenary # 39

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