



Atmospheric Composition Sub-Group Report

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Outline

- ✓ Review of atmospheric composition missions
- ✓ ACSG-8 Meeting Feb. 2010
- ✓ Highlights: campaigns, XS harmonisation, GEOmon
- ✓ QA4EO and ACSG
- ✓ GMES Atmospheric Service (GAS) quality strategy
- ✓ Various



Spectral range:

	UV		UV/VIS/NIR
	IR		VIS/IR
	MW		multi-sensor

Review of AC missions: current

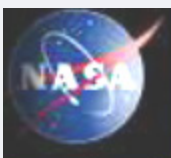
- ✓ ERS-2 GOME (03/1995), NOAA-16/17/18 SBUV/2, Odin OSIRIS & SMR (02/2001), SCISAT-1 ACE FTS & MAESTRO (08/2003) performing well
- ✓ ESA Envisat (03/2002): MIPAS and SCIAMACHY performing well; GOMOS anomalies under investigation; mission extended till 2013
- ✓ NASA EOS-Aura (07/2004): nominal operation of OMI, MLS, TES; HIRDLS instrument failure in March 2008; platform fuel through 2015
- ✓ A-Train (Aqua, Calipso, CloudSat, Parosol, Aura): nominal operation
- ✓ EUMETSAT MetOp-A (10/2006): GOME-2 and IASI in nominal operation
- ✓ CMA/NSMC FY-3A (05/2008): SBUS/TOU O₃ P/C (SBUV/TOMS type)
- ✓ JAXA/NIES TANSO/GOSAT (01/2009): global CO₂ and CH₄
- ✓ JAXA/U. Kyoto JEM/SMILES (superconduct. SMWR): operational 11/2009

Review of AC missions: future

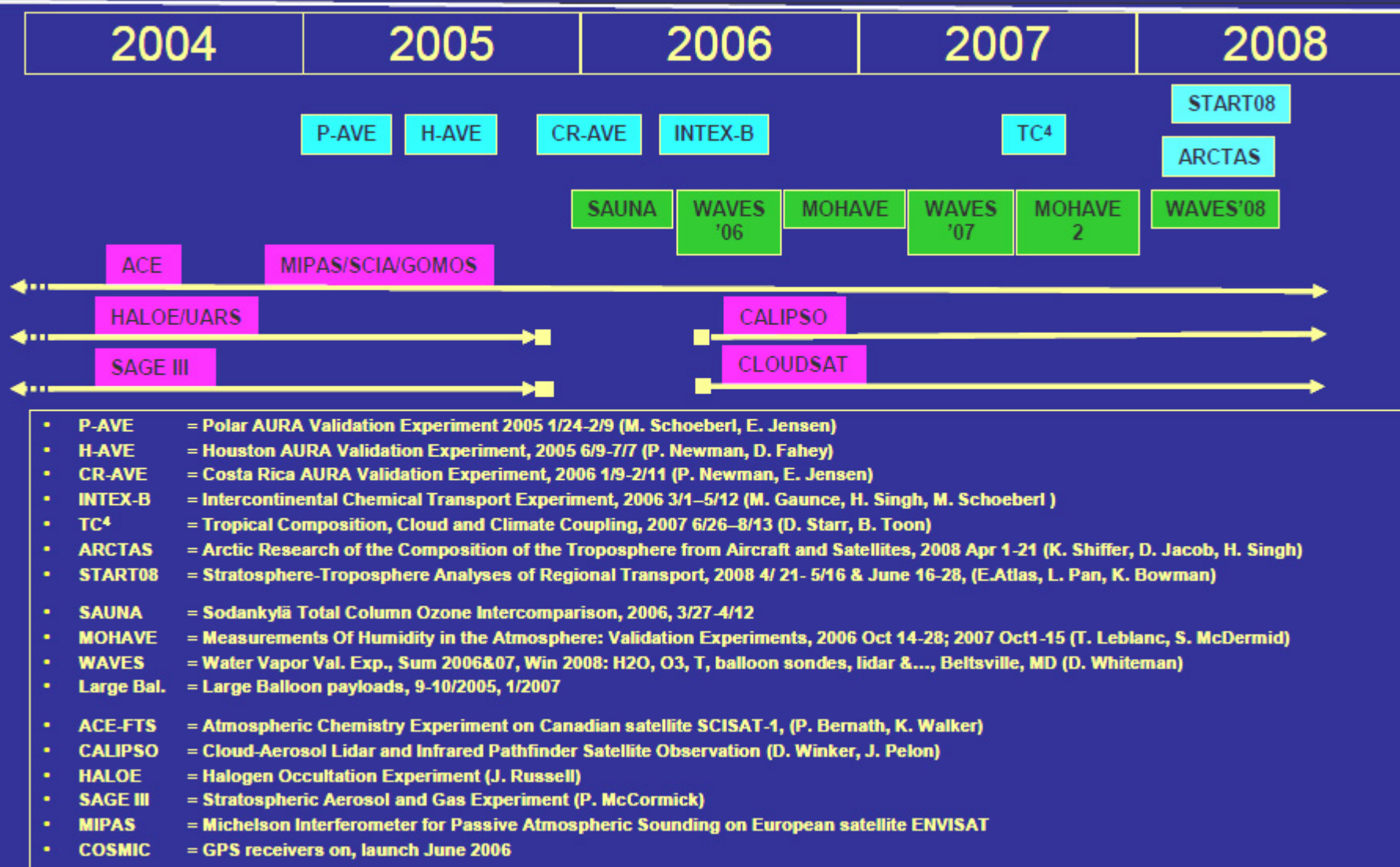
- ✓ NASA Glory : aerosols/black carbon, to join A-Train in 10/2010
- ✓ NPOESS Preparatory Project (NPP) launch scheduled for 2011
- ✓ ESA ADM-Aeolus: wind and aerosols, launch planned 2012
- ✓ ESA EarthCARE: clouds, aerosols and radiation, launch planned 2013
- ✓ GMES Sentinel 5 Precursor: TropOMI, launch planned 2014
- ✓ EU/ESA/EUMETSAT Sentinels 4 (geostationary) and 5 (polar) 2019+
- ✓ STEAM, SWIFT
- ✓ Under study
 - *BIRA-IASB ALTIUS*
 - *CIAC SEOSAT UVAS*
 - *CSA SOAR, STEP, CLIM/AQ mission*
 - *ESA Earth Explorers: A-SCOPE, CoReH2O, PREMIER, TRAQ; new call EE8*
 - *NASA's EDS CLARREO, GEO-CAPE, ACE, GACM, CASS*
- ✓ Mission gap expected after Envisat and Aura, solutions being studied

ACSG Meeting Feb. 2010

- ✓ Hosted by ESA at ESRIN on February 11-12, 2010
- ✓ Large participation despite weather hazards
- ✓ Highlights:
 - *Agencies reports (ongoing and future missions)*
 - *MERIS atmospheric retrievals*
 - *CEOS-triggered CINDI campaign*
 - *Aerosols, sand and dust*
 - *International efforts on harmonisation of cross sections (O_3 , NO_2)*
 - *ACSG mission and scope , membership, QA4EO, links with ACC*



Validation Schedule and Missions



Courtesy R. Eckman, NASA HQ

Airborne

Ground & Balloon

Satellite

ESA Instrument Intercomparisons

- ✓ ACSG-triggered ESA-funded instrument (ground-based + satellites) intercomparison project:

- CINDI: NO₂ instrument intercomparison at Cabauw (Netherlands)



Building on DANDELIONS (and SAUNA and NDACC campaigns)

Took place in June-July 2009; very successful

- Brewer/Dobson calibration at Izaña (Tenerife) at the Regional Brewer Calibration Centre for WMO RA-VI Region (Europe)

Building on SAUNA campaigns results

- European aerosol LIDAR (EarliNet) traveling calibration support

Harmonisation of cross sections (1)

- ✓ WMO / IGACO-O3-UV / IO3C / NDACC Ozone Theme Meeting 2009 on ozone absorption cross sections, held at WMO HQ on May 11-13, 2009.

ACSG recommendations :

- *O₃ cross sections harmonisation should be carried out over the entire spectral range (not limited to Huggins/Hartley bands)*
- *NO₂ and SO₂ cross sections at least need similar effort*
- *(Too) slow process if done on voluntary basis. Motivation and appropriate funding to come most likely from space agencies (ESA started with NO₂ XS studies in the past and more recently with a project revisiting GOME FM XS).*

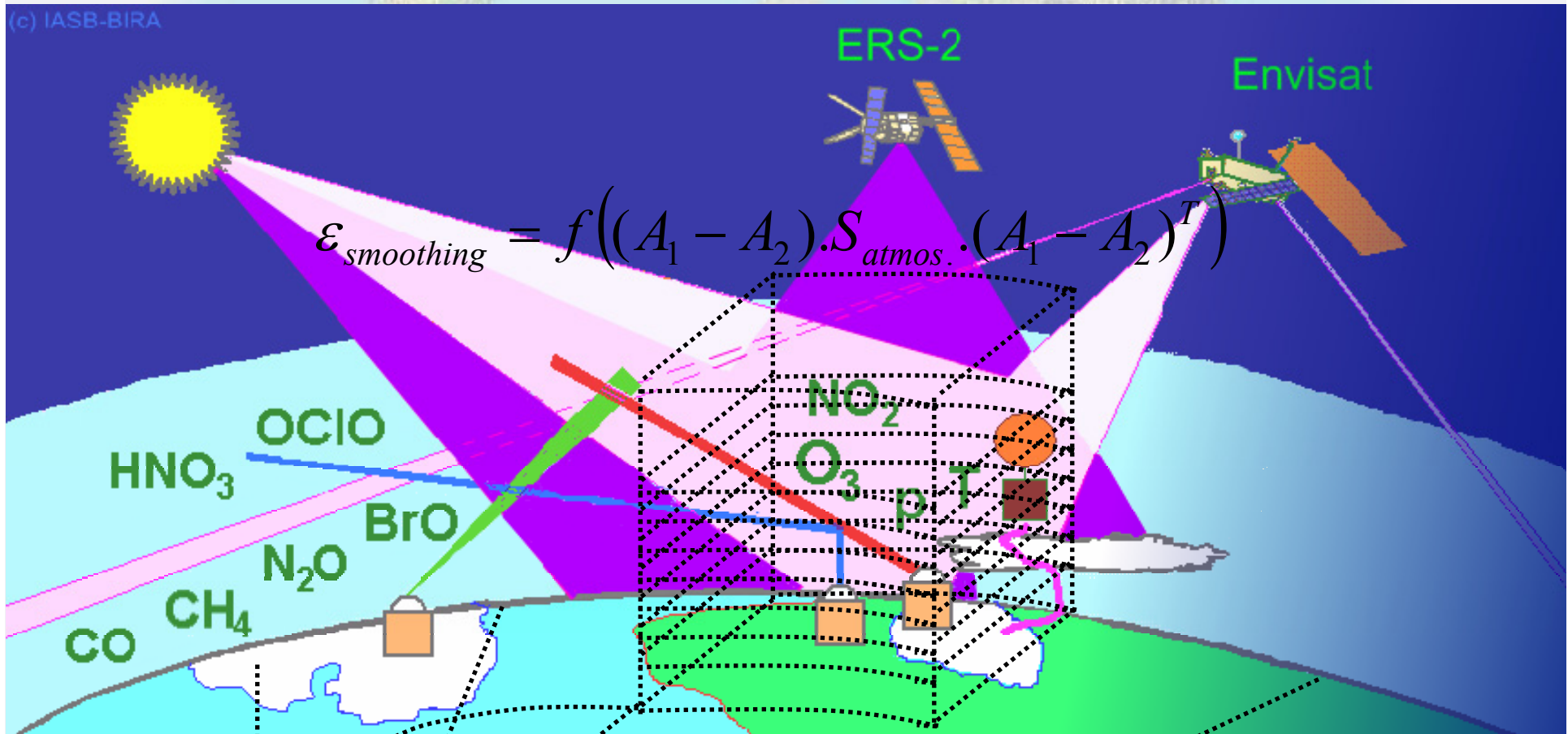
Harmonisation of cross sections (2)

- ✓ Report to ACSG (Feb. 2010) on XS studies :
 - *For GOME, SCIAMACHY and GOME-2 (by DLR and BIRA-IASB)*
 - *For GOME, SCIAMACHY and GOME-2 (by IUPB)*
 - *For SBUV, TOMS, OMI and OMPS (by NASA/GSFC)*
 - *For SBUV/2 and GOME-2 (by NOAA/NESDIS)*
 - *For total and Umkher (profile) measurements by Dobsons and Brewers (by WMO/GAW O₃ SAG Chair et al.)*

GEOmon support to AC satellites

- ✓ EC FP6 IP GEOmon (Global Earth Observation and Monitoring of the Atmosphere, 2007-2011) is to:
 - *Unify and harmonize the main Europeans networks of surface- and aircraft-based measurements for greenhouse gases, air quality/pollution, aerosols, and stratospheric ozone*
 - *Support data gathering at existing networks*
 - *Coordinate access to data and data-products at a common data centre*
 - *Integrate surface measurements with those of satellites*
 - *Develop new methodologies to use these data for satellite validation*
 - *Enable new ground-based measurements complementary to satellites*
 - *Reduce biases and random errors in satellite observations*

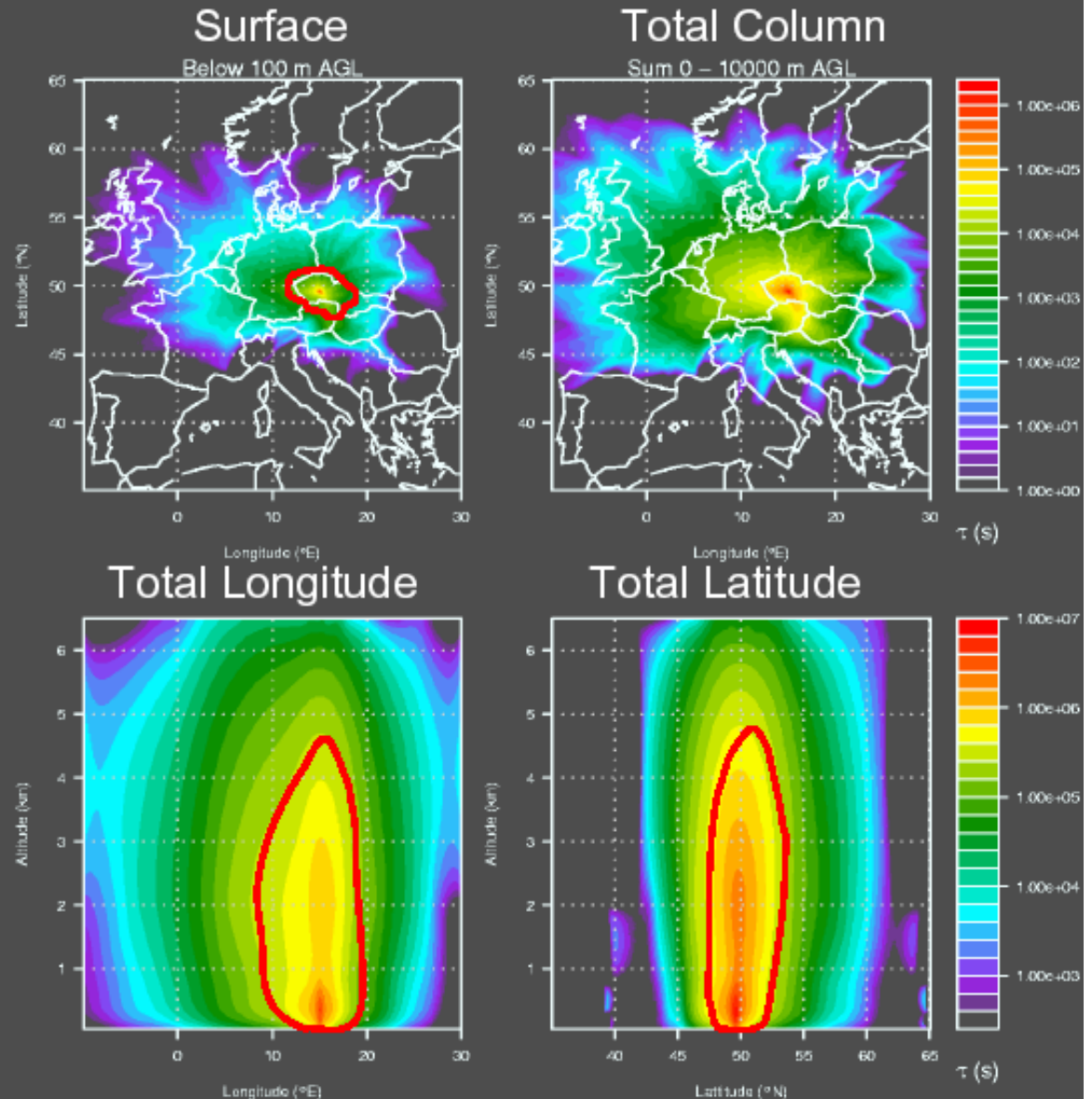
GEOMon – Progress with observation operators and site classification



Definition of Surface Catchment

- Volume of largest res. time containing 50 % of total (not surface!) res. time
- No major contribution of individual grid points outside determined catchment
- Defined for different integration intervals (12h, 24h, 48h)

Total residence time
Kosetice 24 hours



GEOmon Satellite Session Summary

- ✓ [...]
- ✓ List of Cal/Val common/best practices used/explored by GEOmon => tangible contribution to GEOSS
- ✓ Convergence and complementarity of concepts of site representativeness, surface catchment, observation operators...
- ✓ Concept of validation metadata (traceability of validation process)
- ✓ Massive participation encouraged to COSPAR/CEOS Joint Event in July 2010 (Bremen), on Satellite Validation
 - Development of reference practices for the calibration and validation of atmospheric composition remote sensing

✓ [...]

QA4EO and ACSG

- ✓ Long lasting history of coordinated validation campaigns, projects etc. Several structural coordinations are acknowledged references, with pre-QA4EO compliance: e.g. SCIAMACHY (SCIAVALIG, <http://www.sciamachy.org>) and Aura (AVDC, <http://avdc.gsfc.nasa.gov>).
- ✓ ESA's GSE (ended 2009) pioneering quality strategy for services: PROMOTE for the atmosphere, but also GSEs for marine/coastal, land, polar, food, risk, humanitarian... ⇒ major precursors of QA4EO implementation (before QA4EO birth)
- ✓ Sustained reciprocal exchanges between "QA4EO Committee", data providers, service providers and users are crucial. Exchange mechanisms developed within GSEs do work: Central QA Office, User Federation and User Executive Board, protocols, SLAs, reporting procedures and templates... GSE ended in 2009.

QA4EO and ACSG (2)

- ✓ Dissemination of QA4EO philosophy also in progress in upstream contributors to the future GAS, in satellite validation, data product generation and networks: AVDC/EVDC, GECA, ACCENT AT-2, EUMETSAT O3M-SAF, COSPAR Commission A11, GEOmon, NDACC *ad hoc* WG on metadata, ESA DUE Glob, ISSI H₂O WG...
- ✓ Development of ACSG Cal/Val best practices: atmospheric data validation addresses specific and various issues. Starting from QA4EO high level guidelines, more technical practices will be established as a community effort. This will take time.
- ✓ COSPAR A11/CEOS ACSG Joint Event (July 2010, Bremen):
“Development of reference practices for the calibration and validation of atmospheric composition remote sensing”.

Issues to be addressed (2nd reminder of SanYa concerns)

- ✓ Practical implementation, particularly regarding uncertainty estimation of algorithms inputs (models, climatologies, constraints, assumptions) and their weight in the retrieved data product (information content actually contributed by the measurement), is unclear.
- ✓ New/recent algorithms, particularly in air quality, rely on some form of post Level-2 processing using models (domain filling, filtering, assimilation, etc.). How does one estimate uncertainties and information content?

Where does the process begin and/or end?

Issues to be addressed (new)

- ✓ Generic issue: satellite operators need to think more about sustained funding for ground-based observations (and particularly newer activities in AQ)

GMES Atmospheric Service (GAS) quality strategy

- ✓ The GAS Architecture Implementation Group recognises the need for an independent unit dealing with quality issues ("QA Office").

Status: Ad hoc implementations in FP7 projects

- ✓ Towards operationalisation: GMES Atmospheric Core service (MACC) and GMES Atmospheric Downstream AQ services (PASODOBLE)

Status: Project level coordination of QA, as well as QA4EO and INSPIRE compliance, are explicit tasks of System Engineering and Management.

- ✓ Conclusion: GAS data quality strategy is being established with inspirations from the meteo, satellite and ground network communities. But no structural coordination at the moment. Also, significant uncertainties about sustainability, evolution and upscaling of QA mechanisms when GAS will become operational.

Various

- ✓ The ACCENT-Troposat-2 Network of Excellence (AT-2) is publishing a book on tropospheric measurements from space, including a chapter on validation. Status: final review completed.
- ✓ The ISSI WG on Atmospheric Water Vapour is publishing a book on remote sensing and in situ methods for H₂O monitoring, including substantial validation material, a chapter reviewing H₂O satellites, and a chapter on issues of integrated data use.
- ✓ ESA Climate Change Initiative (CCI): proposal deadline March 5. Data quality matters. Several colocation meetings to ensure consistency between ECVs, including 3 dealing with data quality issues (requirements, specifications, achievable performance...)

Thank you !