The AQUILA Network

& Quality Assurance /Quality Control Programmes in Europe

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Joint Research Centre

Institute for Environment and Sustainability

Air & Climate Unit

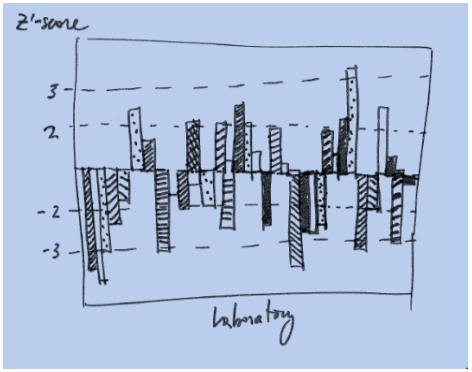
with contributions from Michel Gerboles,

Pascual Perez Ballesta, Claudio Belis and Fritz Lagler

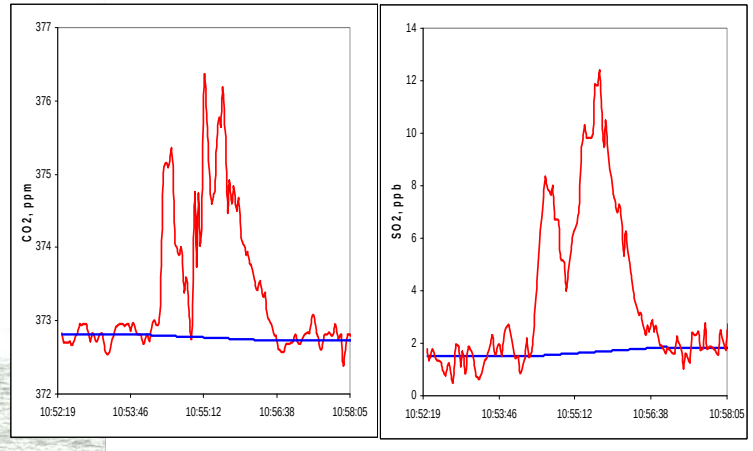
Structure of presentation

JRC/ERLAP & AQUILA QA/QC programmes

- JRC – ERLAP
- gaseous air pollutants
- particulate air pollutants

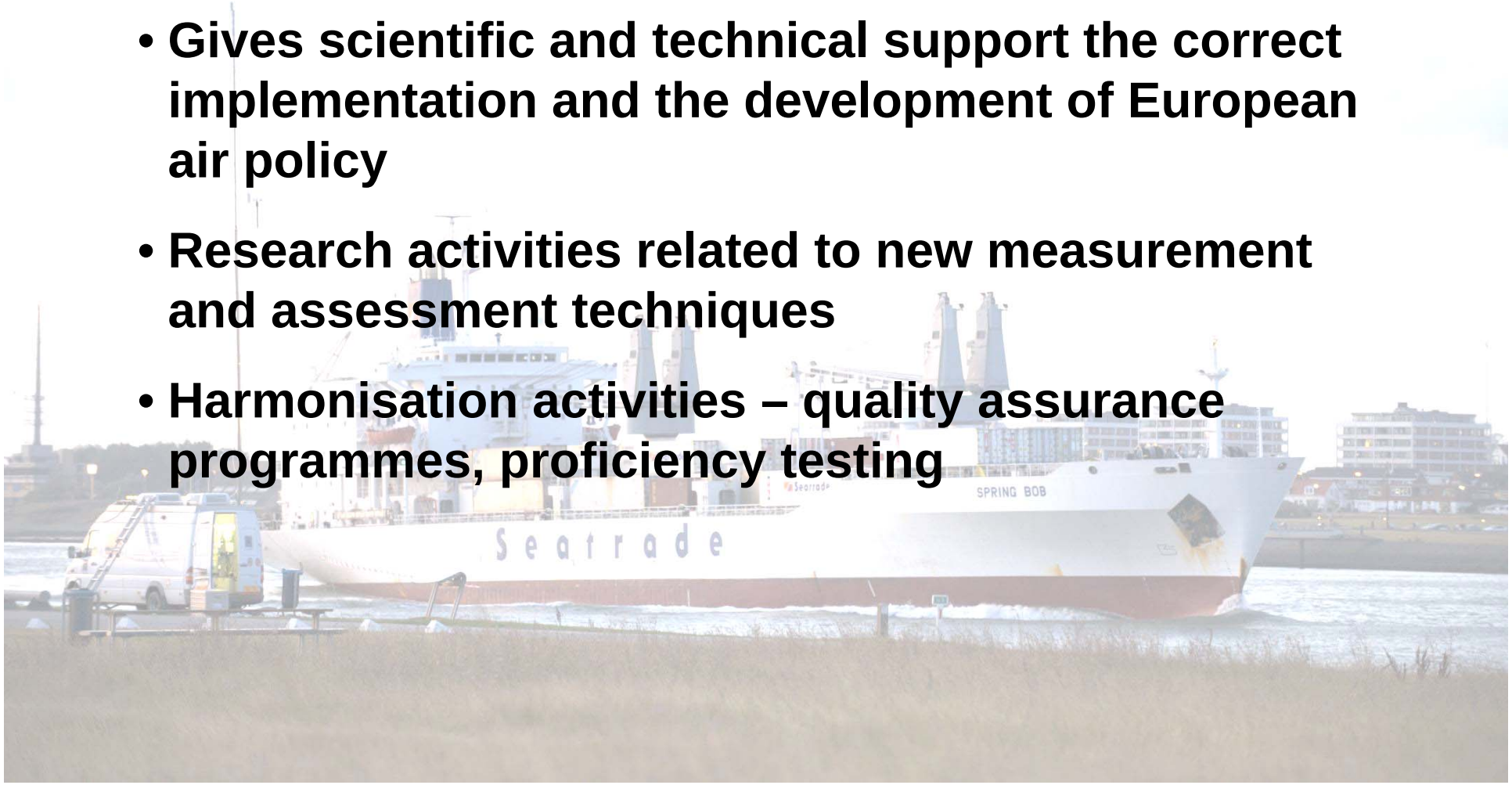


AQUILA & recent activities



JRC's European Reference Laboratory for Air Pollution

- **Gives scientific and technical support the correct implementation and the development of European air policy**
- **Research activities related to new measurement and assessment techniques**
- **Harmonisation activities – quality assurance programmes, proficiency testing**



AQ Measurements & Method Development at JRC-ERLAP

European Commission

Method development and improvement (sampling and analysis)

Diffusive sampling technique.
Sensor validation for monitoring.
Innovative system for sample preparation.
Development of methods for analysis and quantification.

Field assessments

Remote measurements of ship emissions.
Air quality assessment.
Source apportionment studies.
Exposure to air pollutants.

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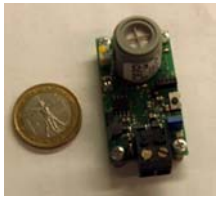
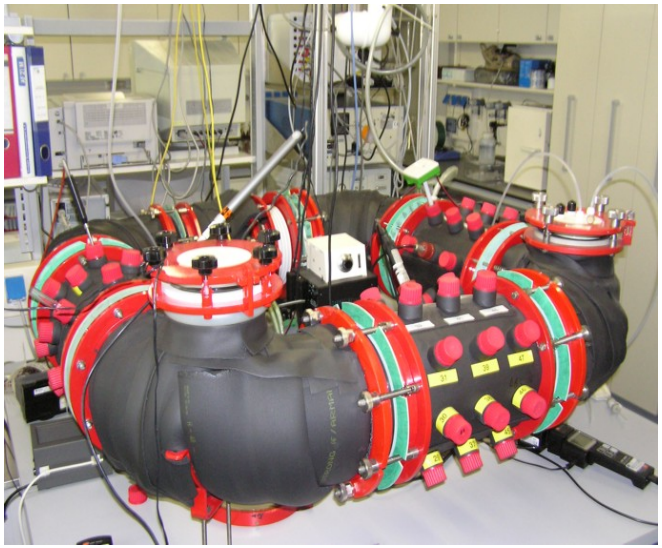
Testing & validation of micro-sensors for air pollution assessment

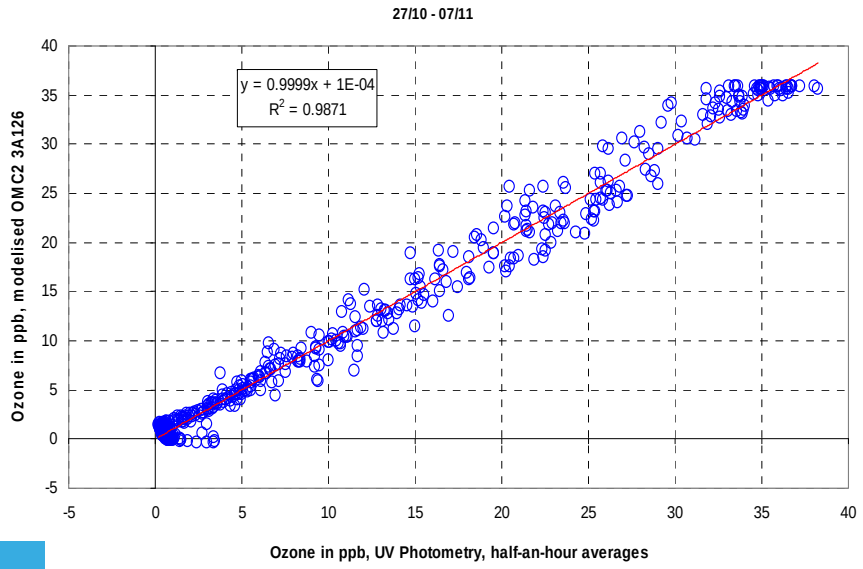




Laboratory testing at controlled wind/temperature/humidity conditions with varying air pollutant and interfering substances

Field validation studies: obtaining results through modelling sensor response according to influencing parameters

With "special treatment" some sensors can measure air quality (O_3, NO_2) within data quality requirements of EU Directives.



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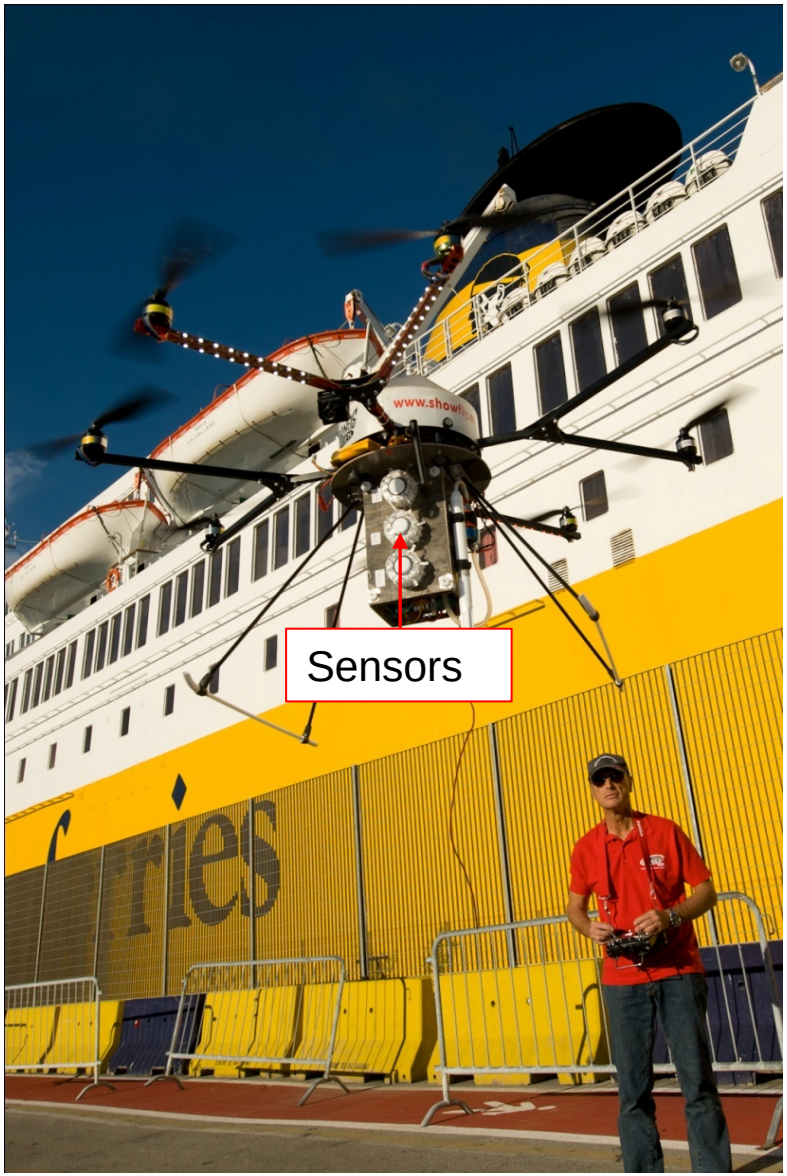
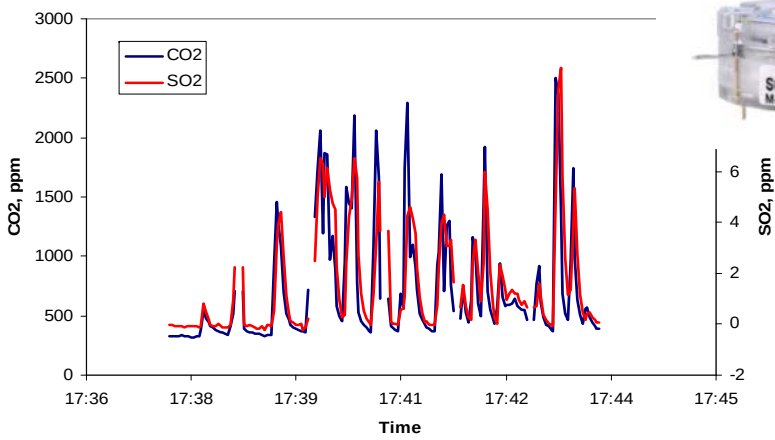


Ship exhaust plume measurement from unmanned flying platform: verification of “ship fuel” directive on sulphur in marine fuel:



- Measurement of SO_2 and CO_2 concentrations: Calculation of S-content in fuel
- Validation of sensor results with canister sample & classical reference gas analyzers
- Difference < 8%.

European Commission

JRC - AQUILA harmonisation activities

- Intercomparison exercises for NO_2 since early 90s
- Regular intercomparison exercises for NOx, O_3, SO_2, CO
- VOC round robin tests (gas cylinder)
- BTX intercomparisons
- AQUILA (EUSAAR/ACTRIS) EC/OC intercomparison
- 1st metal intercomparison
- 1st PAH intercomparison
- Unique PM10 & PM2.5 QA/QC programme

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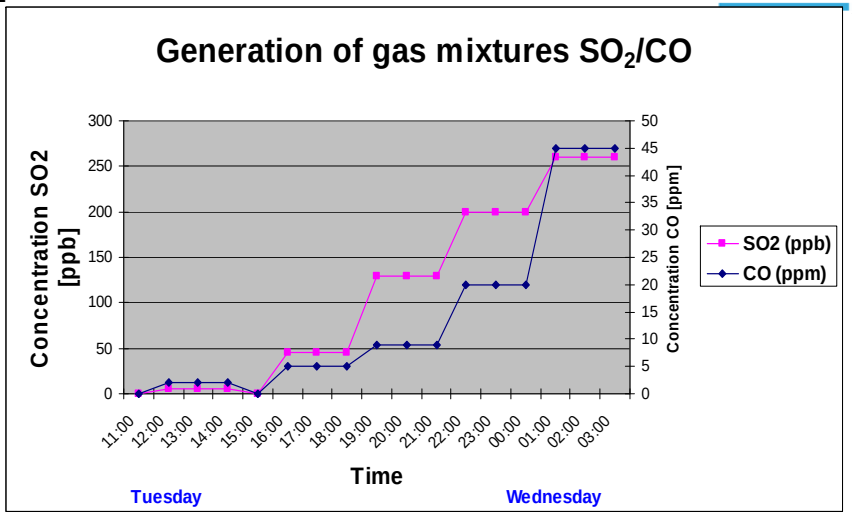
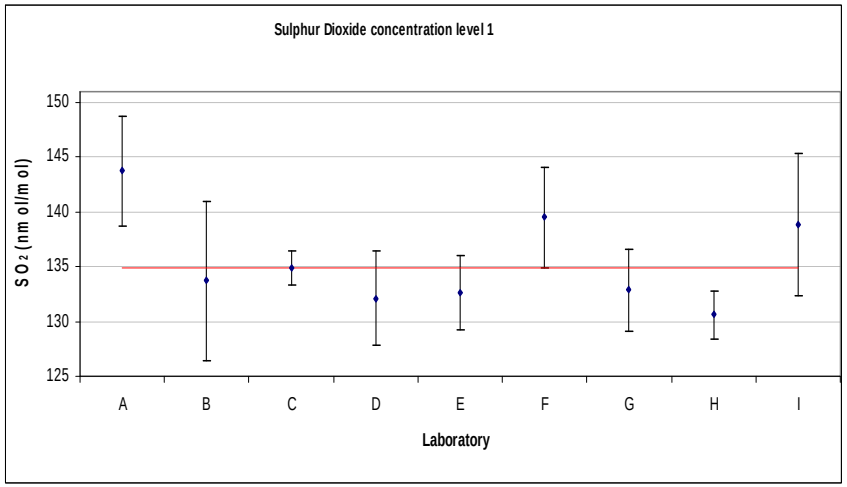
Intercomparison inorganic gaseous compounds

European Commission

E.g. SO_2





In collaboration with WHO CC at UBA (D)

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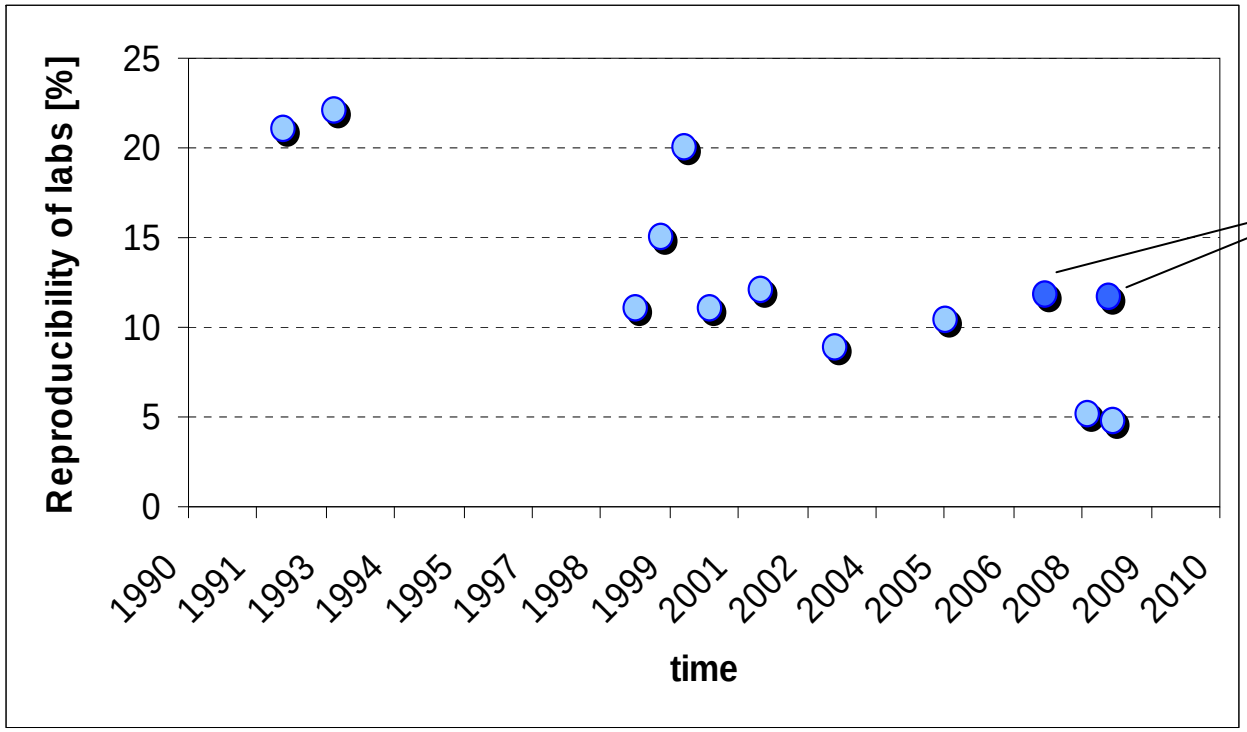
Intercomparison inorganic gaseous compounds

European Commission

Example NO_2



High proportion of new members

Average reproducibility of participating national reference laboratories for NO_2 measurements

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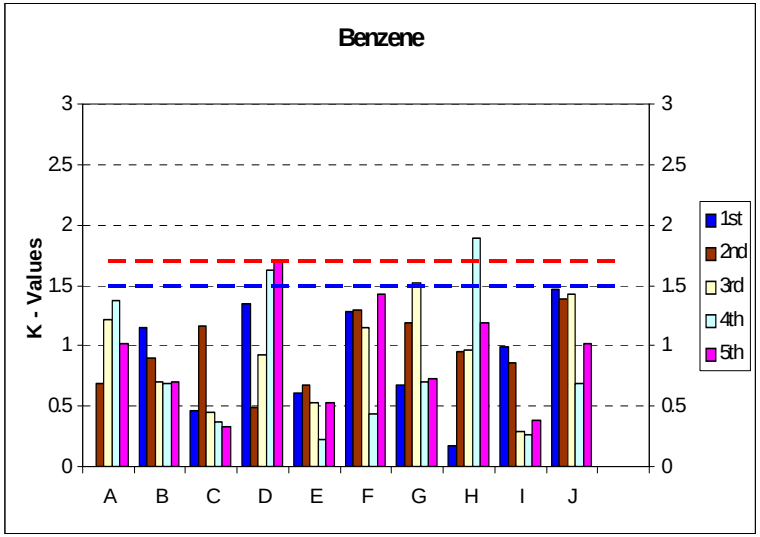
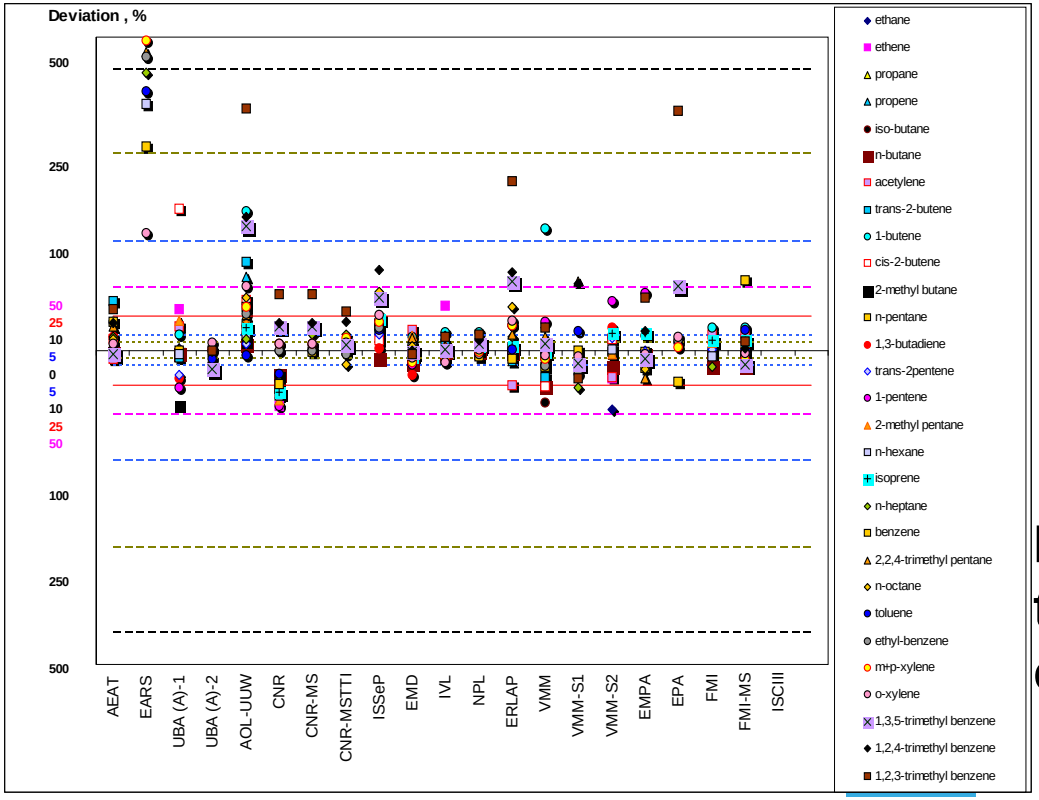
Intercomparison exercises *organic* gaseous compounds



Example intercomparison BTX - generated on ERLAP bench



Example VOC round robin test – circulating special gas cylinders

1st metals intercomparison

European Commission

S_1, liquid CRM,	S_2, digested dust CRM	S_3, dust CRM, 10 mg	S4, digested filter, 117 ng/m³	S5, filter, 55 ng/m³
Calibration bias *Repeatability/ reproducibility*	 JRC	*Digestion (dust matrix)* *Calibration bias*	 JRC	*Digestion (filter matrix), DQO* *Repeatability/ reproducibility*
				

Joint Research Centre

1st metals intercomparison

S4/S5/S6 PM10 filters

1st metals intercomparison

European Commission

DIGESTION AND ANALYTICAL METHODS

Digestion

- Microwave, HNO_3, H_2O_2 (EN 14902)
- Hot plate with concentrated HF then Microwave, HNO_3, H_2O_2 (1 lab)
- Soxhlet extraction (1)
- High pressure digestion (1)

Analysis

- ICP-MS (11)
- GF-AAS (5)
- ICP-OES (1 for Cd, Pb, Ni)
- Voltammetry (1)
- WD and ED-XRF (1)

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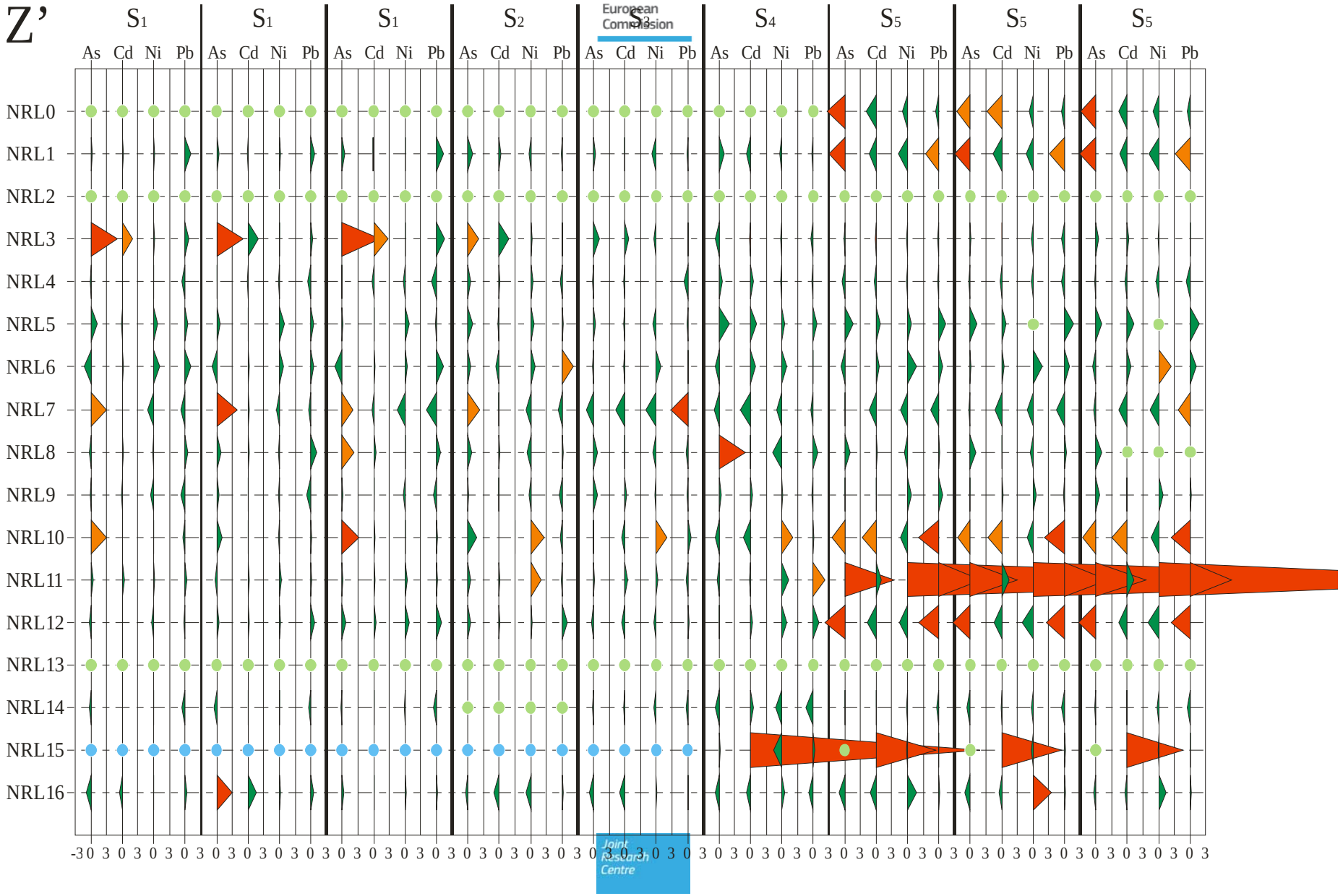
1st metals intercomparison



1st metals intercomparison

European Commission

Repeatability, Reproducibility for S_5

	All results		Outliers discarded	
	r	R	r	R
As	31%	183%	19%	46%
Cd	15%	181%	9%	54%
Ni	66%	620%	7%	68%
Pb	7%	98%	6%	41%

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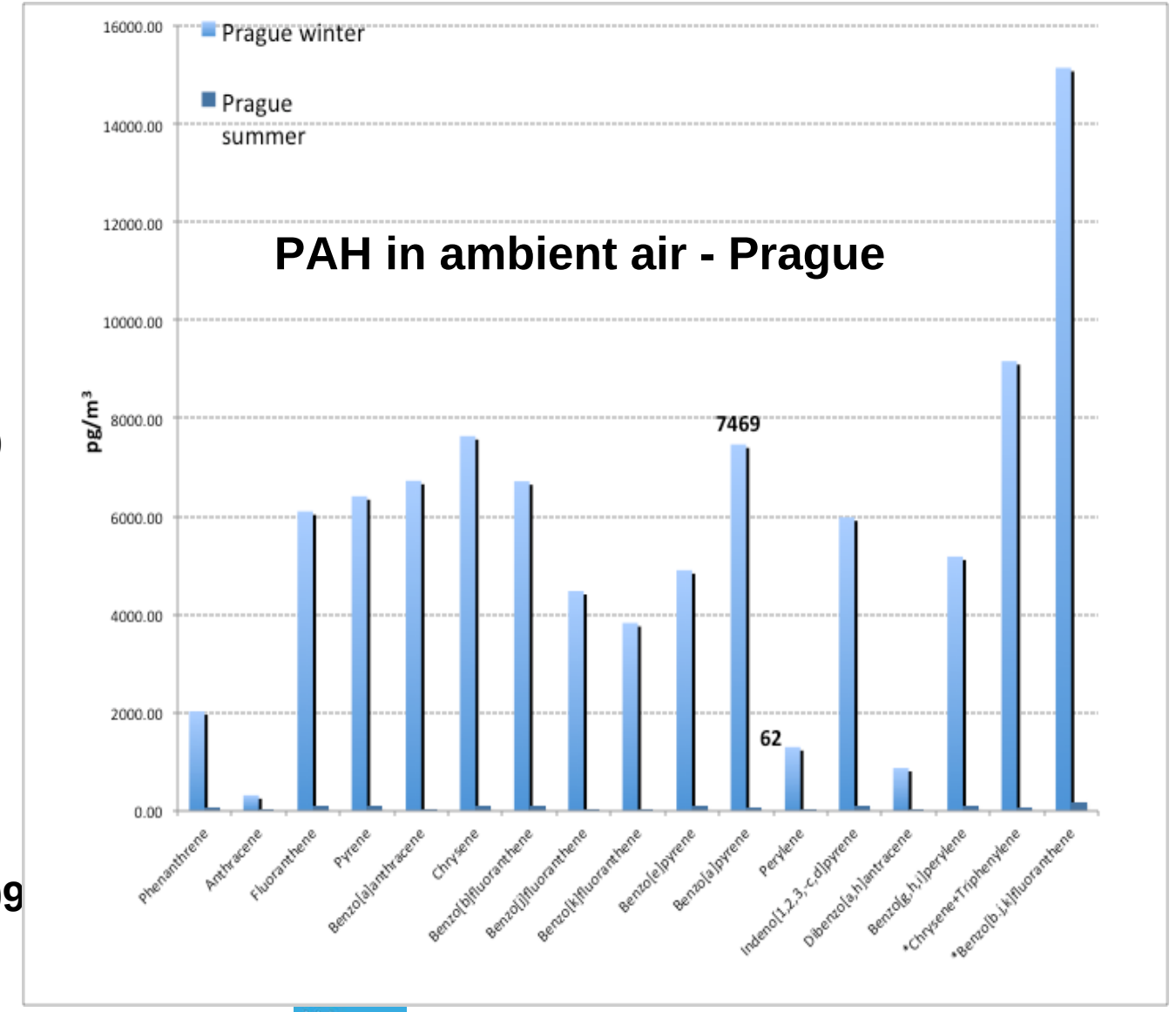
1st PAH intercomparison

Summer F21
T = 22.8 C
HR = 63 %
O3= 70 ppb
PM10= 24.3 µg/m3
PM2.5= 16.7 µg/m3
Volume (m3)= 1590
Period 27-28/8/2009

Winter F30
T = 7.28 C
HR = 87 %
O3 = 5 ppb
PM10 = 89
Pm2.5 = 64
Volume (m3)= 1708
Period 21-22/11/2009



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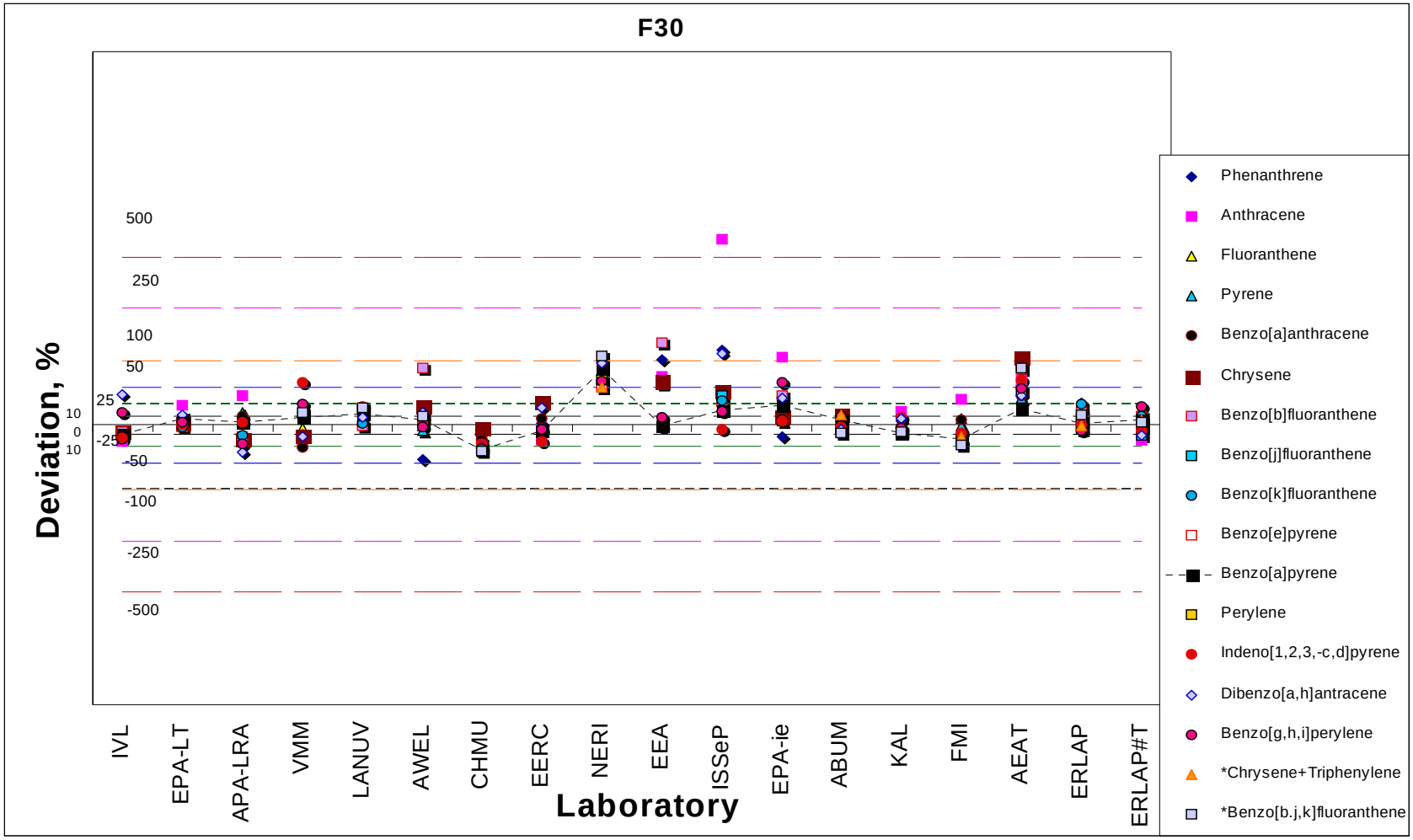
1st PAH intercomparison

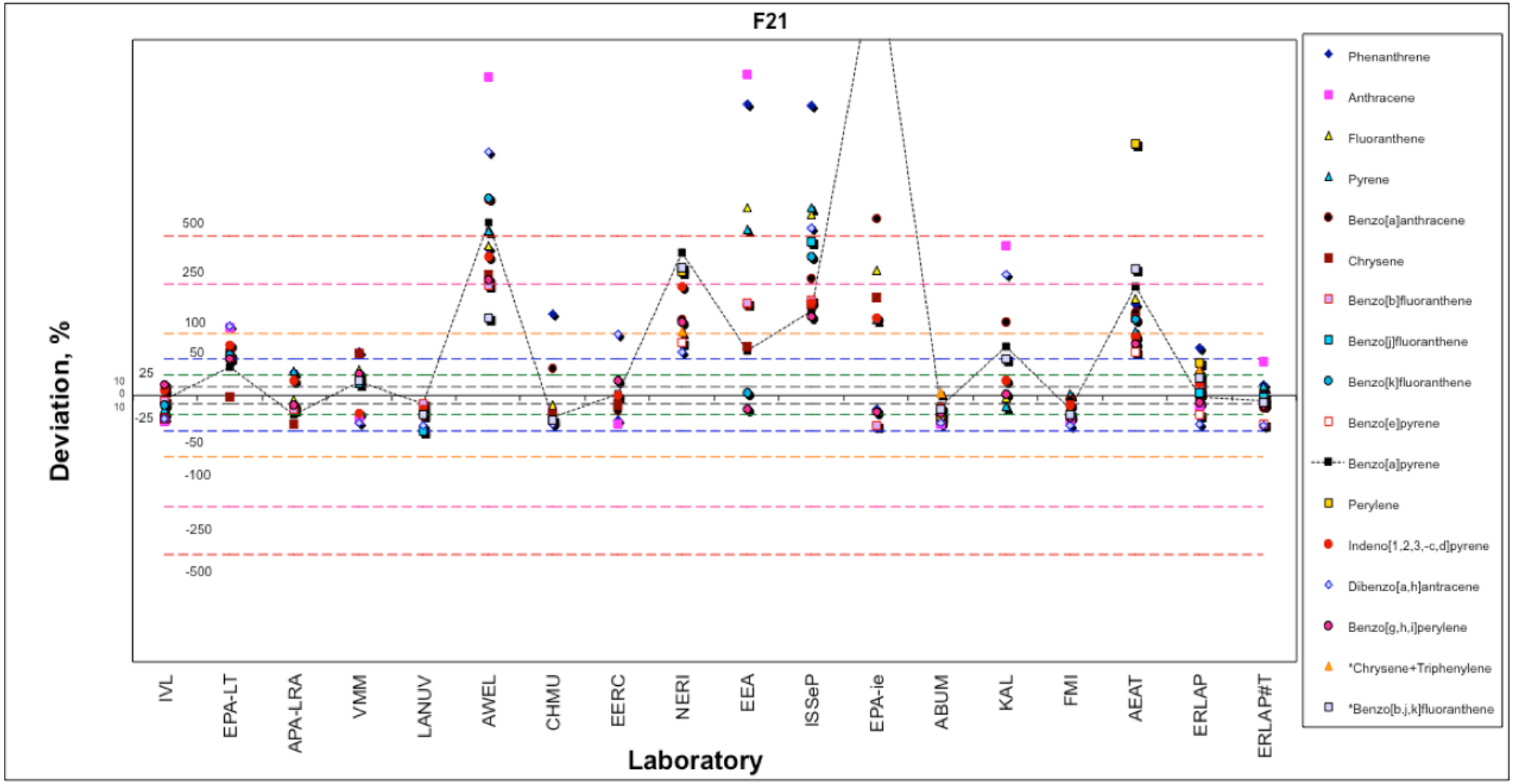
PRAGUE WINTER 16 PAH = 79.14 ng/m³, 7.47 ng/m³ of BaP, Sampled Volume = 49.9 m³



T = 7.3 ° C, HR = 87 %, O_3 = 5 ppb, PM10 = 89 µg/m³, PM2.5 = 64 µg/m³

1st PAH intercomparison

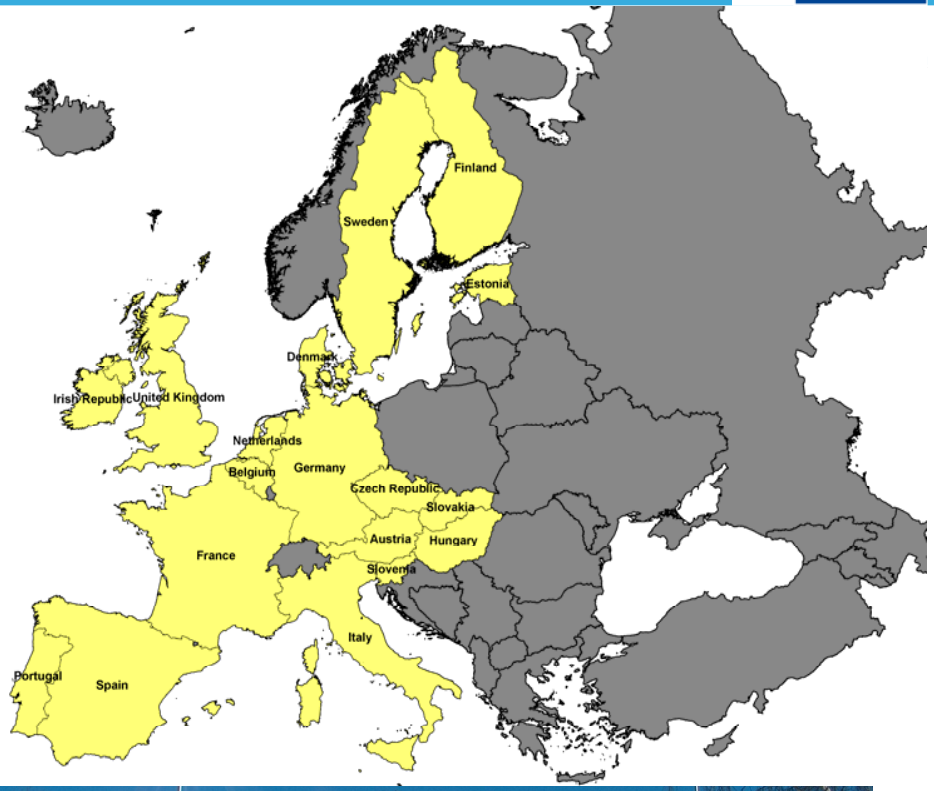
PRAGUE SUMMER 16 PAH= 1.15 ng/m³, 62 pg/m³ of BaP , Sampled Volume= 46.5 m³



T= 22.8 ° C, HR= 63 %, O_3= 63 ppb, PM10 = 24 µg/m³, PM2.5 = 17 µg/m³

Research Centre

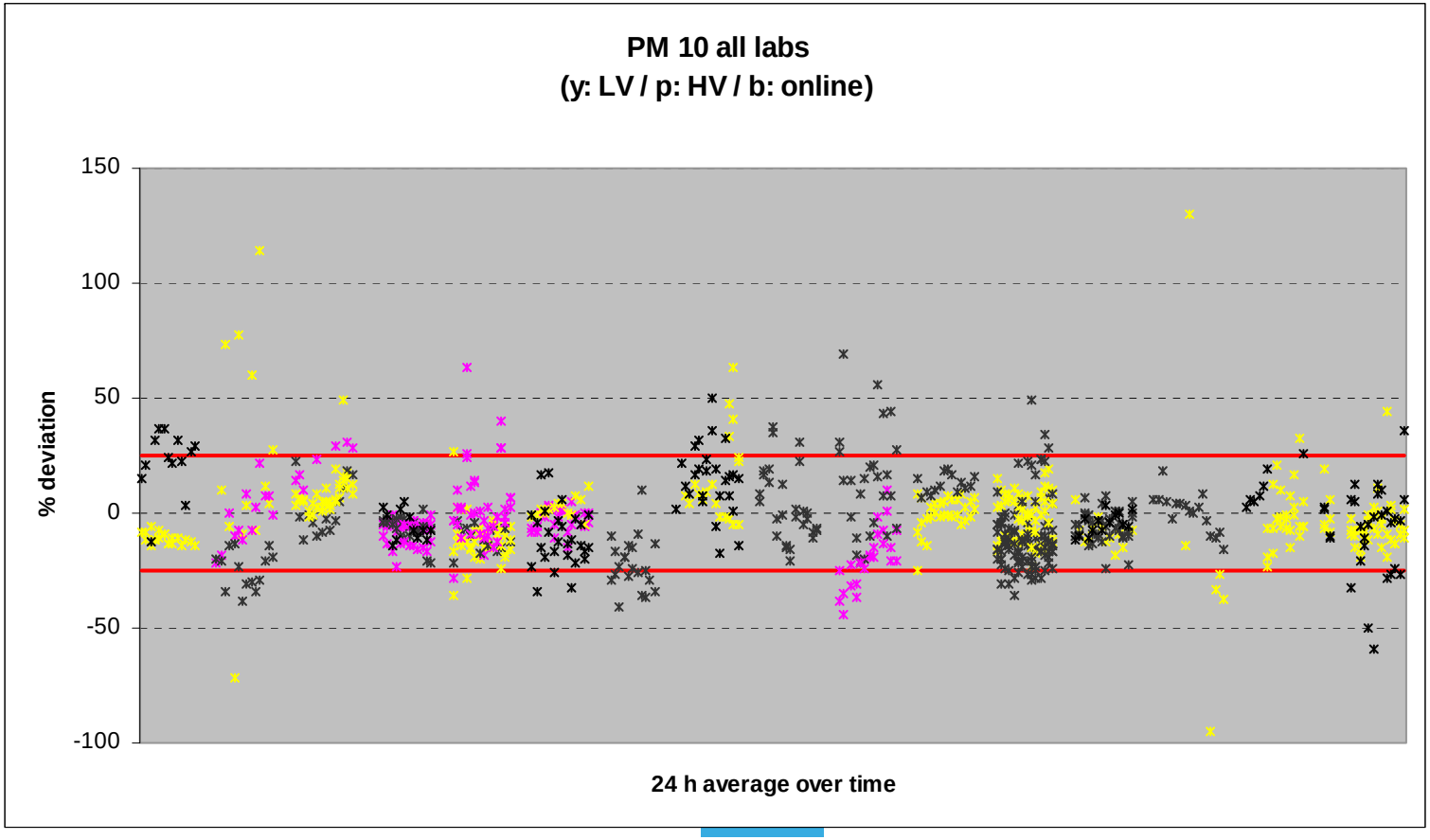
PM QA/QC



2006 – 2009: JRC mobile PM laboratory equipped with EN reference instrumentation carried out 17 parallel measurement campaigns

PM QA/QC

- Provide information on comparability of PM measurements (MS, reference, equivalent)
- Check performance of NRL & routine monitoring network
- Implementation and validity of correction factors
- Performance LV, HV, automatic instruments, info filter material and filter blanks, …



Under AQUILA-FAIRMODE: Source Apportionment

European Commission

JRC Inter-comparison for Receptor Models

Kick-off Workshop in Ispra (4th-5th November 2010)

Step 1
Survey of receptor models suitable for the purposes of the inter-comparison
Identification of the pollutants and metrics to test, according to the needs and to the most up-to-date technical developments.
Revision of the methodologies for uncertainty estimation and expression
Definition of criteria for the assessment of model performance
Discussion about the feasibility of a Common Protocol for source apportionment (including quality assurance procedures, validation criteria and quality standards)

Step 2
Carry out an Inter-comparison between the involved research groups by applying the Harmonized Protocol and other widely accepted techniques to one or more common databases.
Evaluate the outputs according to quality criteria and assess the influence of critical variables
Check the influence of different scientific backgrounds/ approaches in source identification.
Use the results of this exercise to set up common standards for the interpretation of receptor model outputs and to draft a common protocol to be used for obligations under AQD.

Results of the European Intercomparison exercise for Receptor Models 2011-2012. Part I. **Report EUR 25727 EN**

3rd Workshop in Ispra (27th-28th February 2013)

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AQUILA

Air Quality Reference Laboratories

Network Members: 37 National Reference Laboratories from the 27 Member States & EFTA

Observers: Turkey, Croatia, Macedonia, Serbia

http://ies.jrc.ec.europa.eu/aquila-homepage.html

annette.borowiak@jrc.ec.europa.eu

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AQUILA: Members

European Commission

http://ies.jrc.ec.europa.eu/aquila-project/members.html

AQUILA Members - EU-27 & EFTA

Country	Institute	Contact	Website
Austria	Umweltbundesamt	Marina Froehlich	http://www.umweltbundesamt.at
	Oberösterreichische Landesregierung	Mario Gabrysch	http://www.land-oberoesterreich.gv.at/
Belgium	IRCEL/CELINE	Philippe Maelz	http://www.irceline.be
Bulgaria	Executive Environmental Agency	Milena Parvanova	http://vfp-bg.eionet.eu.int/vfp-bg/index.html
Czech Republic	Czech Hydrometeorological Institute	Jiri Novak	http://www.chmi.cz
Cyprus	Ministry of Labour and Social Insurance	Savvas Kleanthous	http://www.airquality.dli.mlsi.gov.cy/
Denmark	NERI	Claus Nordstrøm	http://www.dmu.dk/Pollution/default_en.asp
Estonia	Estonian Environmental Research Centre	Toivo Thuuts	http://www.klab.ee
Finland	FMI	Jari Walden	http://www.fmi.fi
France	LCSQA-EMD	Francois Mathe	http://www.ecole-cloud.fr/
	LCSQA-INERIS	Olivier Favez	http://www.ineris.fr
	LCSQA-LNE	Tatiana Macé	http://www.lne.fr/
Germany	LANUV NRW	Ulrich Pfeffer	http://www.lanuv.nrw.de/
	Umweltbundesamt	Klaus Wirtz	http://www.umweltbundesamt.de/
Greece	Ministry of Environment		http://www.minenv.gr
Hungary	Hungarian Meteorological Service	Viktor Dezsi	http://www.kvvm.hu/olm
Ireland	EPA	Barbara O'Leary	http://www.epa.ie
Italy	CNR	Rosanna Mabilia	http://www.iia.cnr.it
	ISPRA	Maria Belli	http://www.isprambiente.it
Latvia	Latvian Hydrometeorological Agency		http://www.meteo.lv
Lithuania	Environment Protection Agency	Jouzas Mole	http://taa.am.lt/vsi/
Luxembourg	Adm. de l'Environnement	Serge Solangna	http://www.environnement.public.lu/
Malta	Malta Environment & Planning Authority	Michael Nolle	http://www.mepa.org.mt/
Poland	Chief Inspectorate for Environmental Protection		http://www.gios.gov.pl
Portugal	Instituto do Ambiente	Joao Matos	http://www.iambiente.pt
Romania	National R & D Institute for Environment Protection		http://www.icim.ro
Slovakia	Slovak Hydrometeorological Institute	Ladislav Ronchetti	http://www.shmu.sk/
Slovenia	Environmental Agency of the Republic of Slovenia	Tanja Bolte	http://www.arso.gov.si/
Spain	ISCIII	Saul Garcia Dos Santos	http://www.isciii.es/public/
Sweden	IVL	Eva Brorstrom-Lunden	http://www.ivl.se/
	ITM	Hans Areskoug	http://www.itm.su.se/itm/index.html
The Netherlands	RIVM	Theo Hafkenscheid	http://www.rivm.nl/
United Kingdom	AEAT	Brian Stacey	http://www.aeat.co.uk/
	NPL	Paul Quincey	http://www.npl.co.uk/environment
Norway	NILU	Kjersti Karlsen Tonnhöst	http://www.nilu.no/
Switzerland	EMPA	Robert Gehrig	http://www.empa.ch
	BAFU		http://www.umwelt-schweiz.ch
European Commission	DG Joint Research Centre	Annette Borowiak	http://ies.jrc.ec.europa.eu/
	DG Environment	Andrej Kobe	http://ec.europa.eu/environment/air

and: associated members & observers

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AQUILA: background

European Commission

Article 3 (2008/50/EC): Responsibilities

For the implementation of this Directive, the Member States shall designate at the appropriate levels the competent authorities and bodies responsible for:

- **Assessment of ambient air quality,**
- **Approval of measurement systems (methods, equipment, networks, laboratories),**
- **Ensuring accuracy of measurements,**
- **Analysis of assessment methods,**
- **Coordination on their territory of Community-wide quality assurance programmes organized by the Commission,**
- **Cooperation with other MS and the EC.**

Where relevant competent bodies shall comply with Section C of Annex I:

QA/QC at national and EU level, traceability, accreditation according to EN/ ISO 17025

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AQUILA: role of NRL's

Role and tasks of National Reference Laboratories

Verifying and supporting the correct implementation of AQDs, by:

- **Implementing a quality system in the laboratory**
- **Approving measurement systems (instruments, laboratories, networks)**
- **Ensuring the traceability of the measurements at national level, by providing/certifying reference materials to networks**
- **Organizing intercomparisons/round robin tests at national level**
- **Participating in EC QA/QC programmes**
- **Exchanging information through the organisation of training sessions, workshops, conferences and guidance documents**

"AQUILA's role and the tasks of a NRL" has been approved by DG ENV's "Air Quality Committee" in 2009 (download of document *'roles & requirements*' from ENV or AQUILA website).

AQUILA: structure

- **Steering committee: chair, vice-chair and co-chairs**
- **Election of chair and vice-chair (4 years)**
- **Co-chair: DG ENV, JRC-IES (4 years)**
- **Secretariat: JRC-IES**

Chair	Vice - chair	Senior advisor
F. Mathe EMD, FR	J. Walden FMI, FI	P. Woods, NPL, UK

Co - chair	Co - chair
D. Buzica DG ENV	A. Borowiak JRC

AQUILA: meetings

1st meeting: December 2001

20th meeting: 22/23 April 2013

focussing on, e.g.:

- Accreditation of NRL's
- Common PM equivalence tests
- Development of CRM
- Training on measurement uncertainty
- PM2.5 measurement uncertainties
- *Review of EU policy*

AQUILA activities

European Commission

Examples of AQUILA's activities:

PM QA/QC campaign (2006 - 2009)

VOC round robin test (2009)

Co-Organisation of conferences and workshops

JRC Intercomparison exercises in collaboration with WHO and AQUILA

Production of documents/papers to topics of interest (e.g. guidance on equivalence)

Contribution to implementation of AQ Directives (e.g. uncertainty of PM2.5 measurements to evaluate AEI)

AQUILA recomendations to review of TSAP 2013

Thank you!

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