Quality Assurance and Quality Control in the WMO-GAW-VOC Network

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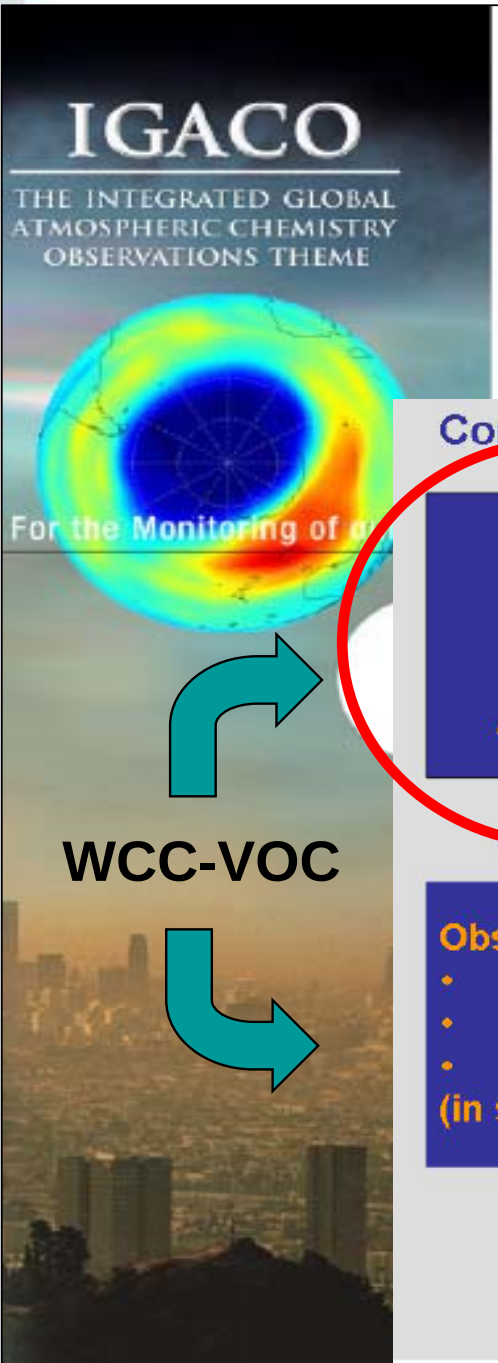
http://imk-ifu.fzk.de/wcc-voc/

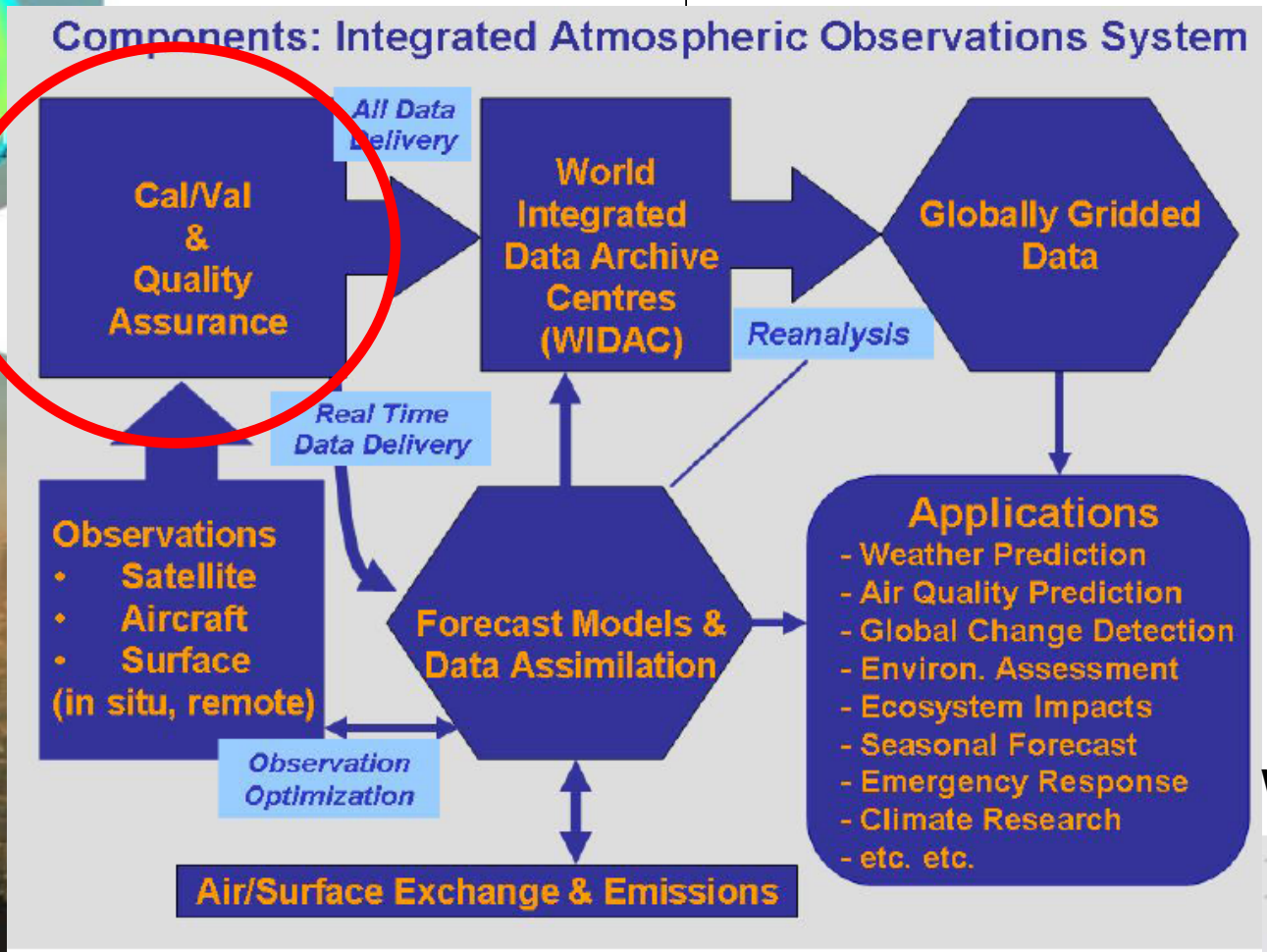
GAW Network for VOC



IGOS
Integrated Global Observing Strategy

- **Provides a framework for the next generation GAW program 2008-2015**

WCC-VOC

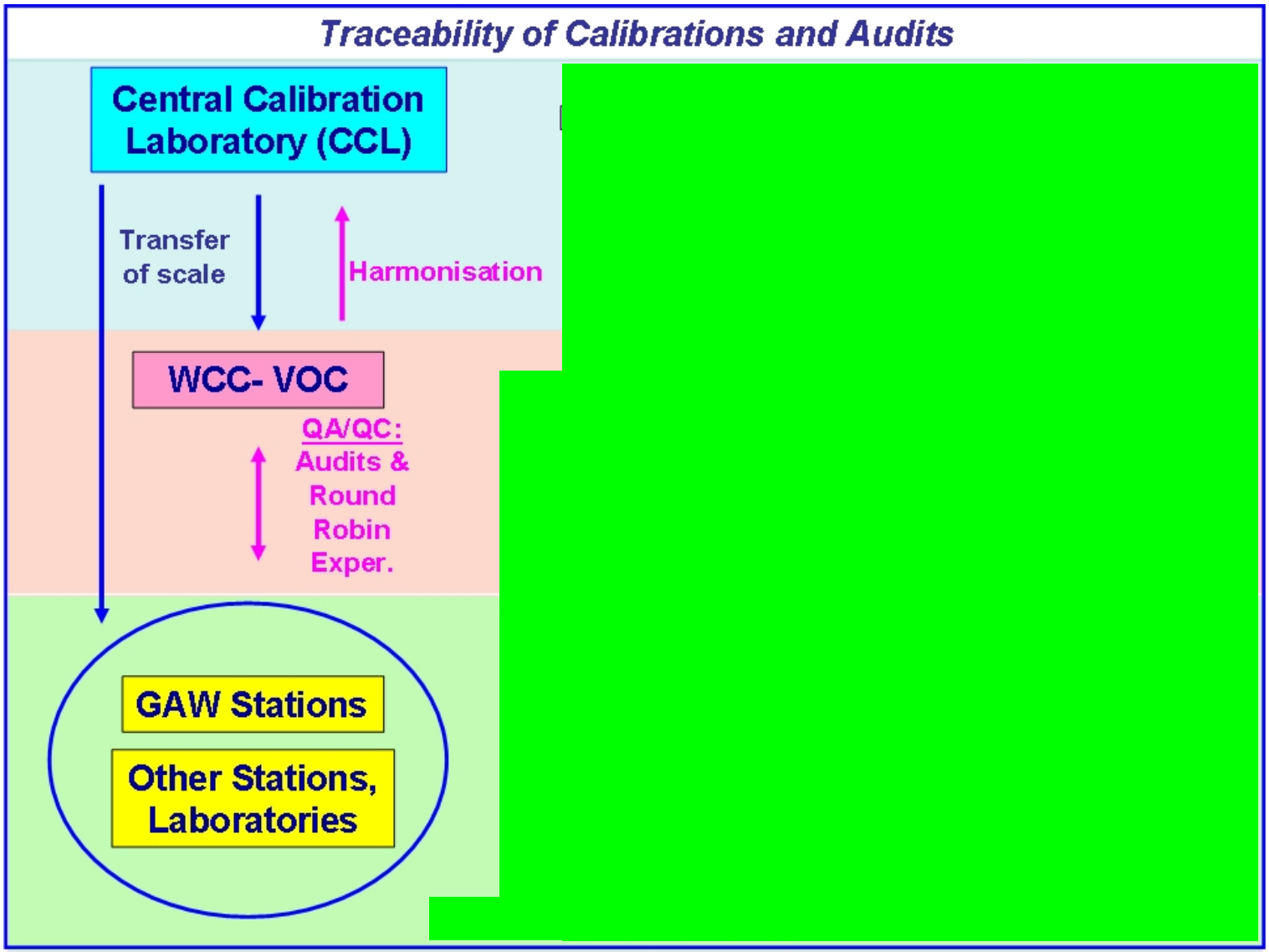


WMO Report 172; 2007

The WCC-VOC Activities

- **Operation of the WCC-VOC**
- **Quality assurance of the WCC-VOC**
- **Round-Robin Exercises and Audits**
- **Central Calibration Laboratories (CCLs)**
- **Training in WCC-VOC and GAWTEC**
- **Workshops and international co-operations**
- **Interactions WCC-VOC and GAW institutions**
- **Outreach**

The GAW-VOC QA/QC Strategy



The GAW-VOC QA/QC Control of Success

Round robin Exercises

- Evaluate Results on the basis of data quality objectives
- Report findings to the participants
- Enquire reasons for deviations in bilateral meetings
- Suggest joint measures to improve quality
- Check progress by repeating QC/QA experiments

Audits

- Report discovered discrepancies to station staff
- Take possibilities to solve detected problems on-site
- Set up an action priority list with deadlines to solve encountered problems together with station personal in the final audit meeting
- Check progress by repeating audit

The GAW-VOC Target Compounds

Ethane	Acetone
Propane	DMS
Acetylene	Benzene
Isoprene	Toluene
Formaldehyde	Iso-Butane
Monoterpenes	n-Butane
Acetonitrile	Iso-Pentane
Methanol	n-Pentane
Ethanol	

Realisation of QA/QC

- **Stage approach**
  - **hydrocarbons**
  - **other compounds**

→ Full suite in 2011

WMO Report 171; 2007

Current WCC-VOC Standards

high precision VOC standard NPL_D296263

Compound	Nominal value /ppb	Uncertainty 2σ ppb	Overall uncertainty 2σ of analysis/ ppb
Ethan	2,70	0,05	
Ethine	2,66	0,05	
Propane	2,67	0,05	
i-Butane	2,68	0,05	
n-Butane	2,60	0,05	
i-Pentan	2,59	0,05	
n-Pentane	2,63	0,05	
Isoprene	2,60	0,05	
Benzene	2,62	0,05	
Toluene	2,59	0,05	
α-Pinene	2,01	0,06	

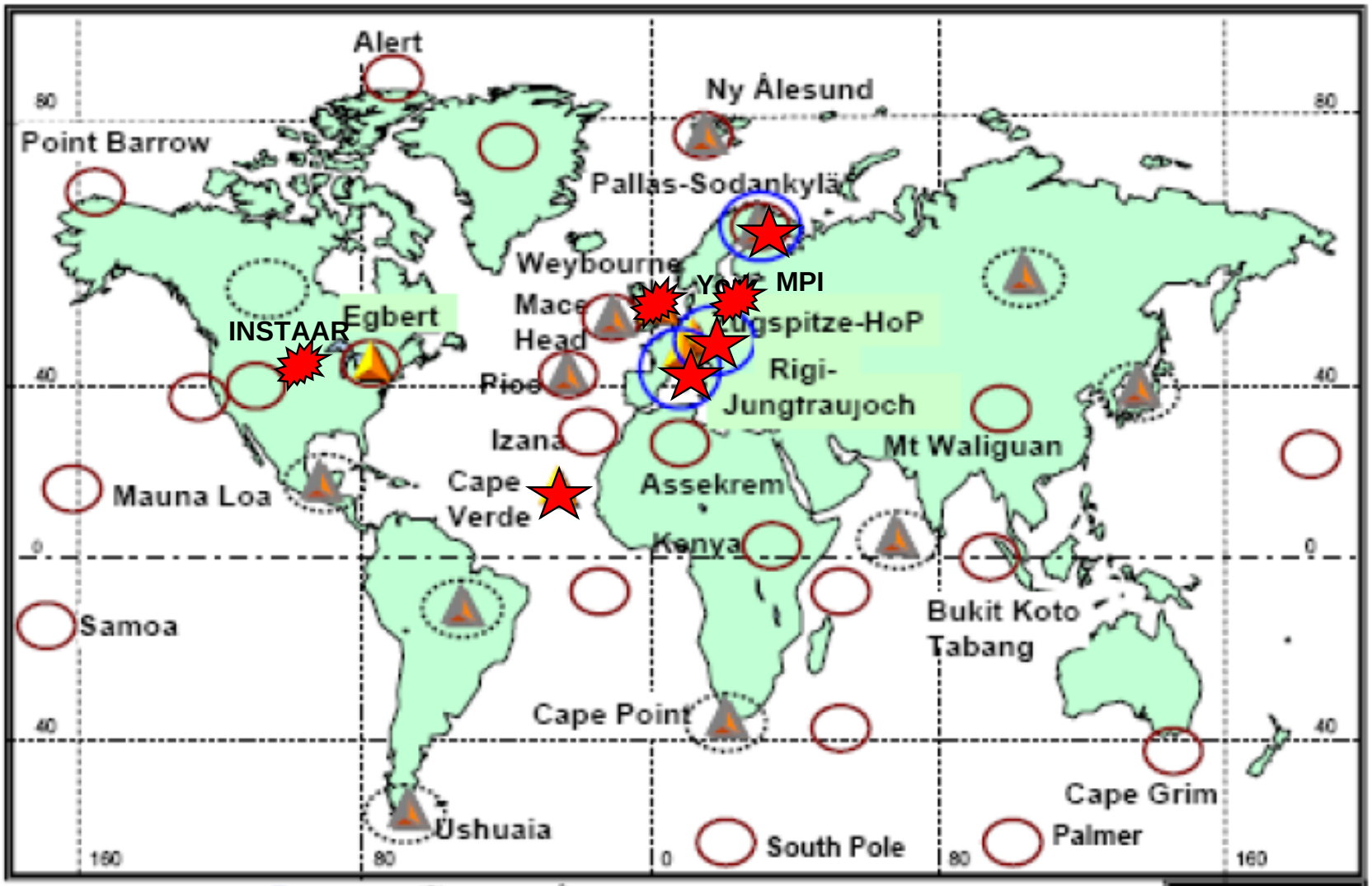
Current WCC-VOC Standards

Recalibrated laboraory/working/travelling standard
Apel/Riemer 2006

Compound	*Nominal value after recalibration/ ppb*	*Uncertainty 2σ / ppb*	*Δx after recalibration / %*	*Uncertainty specified /%*
Ethane	13,8	0,13		5
Ethine	8,69	0,11		5
Propane	12,56	0,17		5
i-Butane	6,13	0,07		5
n-Butane	10,99	0,08		5
i-Pentane	7,96	0,08		5
n-Pentane	9,58	0,08		5
Isoprene	5,57	0,07		5
Benzene	2,36	0,21		5
Toluene	3,3	0,52		5
α-Pinene	10,47	0,15		5

Prospective GAW VOC Network

Prospective GAW VOC Network



The GAW-VOC Audits

Title

STANDARD OPERATING PROCEDURE (SOP) FOR SYSTEM AND PERFORMANCE AUDITS OF ATMOSPHERIC TRACE GAS MEASUREMENTS AT WMO/GAW SITES

Version

Version 1.1-20080131

Contributors

J. Klausen (QA/SAC Switzerland), Ch. Zellweger (WCC Empa), H.-E. Sche
Steinbrecher (WCC-VOC)

Approval

SAG Reactive Gases: pending

Scope

This document gives guidelines on how to conduct combined system and p
trace gas measurements at WMO Global Atmosphere Watch (GAW) statio
audits of measurement systems that use either a gas chromatographic me
continuous gas analysers. This SOP has been optimised for audits of VOC

Definitions

According to the GAW Strategic Implementation Plan (WMO/GAW Report
audit is defined as a voluntary check of conformity of a measurement wher
are the DQOs for that parameter. In the absence of formal DQOs, an audit
ensuring the traceability of measurements to the Reference Standard. A sy
generally defined as a check of the overall conformity of a station with the
QA system. The reference for conformity of a station will evolve as the GA
evolves.

Site	
Planned date of audit	Auditor

Document Title

AUDIT QUESTIONNAIRE FOR SYSTEM AND PERFORMANCE AUDITS OF ATMOSPHERIC TRACE GAS MEASUREMENTS AT WMO/GAW SITES

Version

Version 1.1-20080131

Contributors

J. Klausen (QA/SAC Switzerland), Ch. Zellweger (WCC Empa), H.-E. Scheel (WCC N_2O); R. Steinbrecher (WCC-VOC)

Approval

SAG Reactive Gases: pending

Scope

This document contains a questionnaire for combined system and performance audits of trace gas measurements at WMO Global Atmosphere Watch (GAW) stations. It is recommended for use during audits of measurement systems that either use a gas chromatographic method and/or continuous gas analysers. This questionnaire has been optimized for audits of NMVOC.

Definitions

According to the GAW Strategic Implementation Plan (WMO/GAW Report 142), a *performance audit* is defined as a voluntary check of conformity of a measurement where the audit criteria are the DQOs for that parameter. In the absence of formal DQOs, an audit will at least involve ensuring the traceability of measurements to the Reference Standard. A *system audit* is more generally defined as a check of the overall conformity of a station with the principles of the GAW QA system. The reference for conformity of a station will evolve as the GAW QA system evolves.

Site		Compound
Date of Audit	Auditor	

Audit Results

Compound	WCC-VOC Nominal value /ppb	WCC-VOC Overall uncertainty 2σ of analysis/ ppb	GAW Station Reported Values /ppb	Δx to WCC-VOC /%	GAW Station Reported uncertainty 2σ /%	GAW VOC DQO Accuracy /%
Ethan	2,70	0,08				10
Ethine	2,66	0,05				15
Propane	2,67	0,11				10
i-Butane	2,68	0,05				10
n-Butane	2,60	0,05				10
i-Pentan	2,59	0,05				10
n-Pentane	2,63	0,05				10
Isoprene	2,60	0,05				20
Benzene	2,62	0,09				15
Toluene	2,59	0,25				15
α-Pinene	2,01	0,06	-	-	-	-

Audit Results

Compound	WCC-VOC Nominal value /ppb	WCC-VOC Overall uncertainty 2σ of analysis/ ppb	GAW Station Reported Values /ppb	Δx to WCC-VOC /%	GAW Station Reported uncertainty 2σ /%
Ethan	2,70	0,08			
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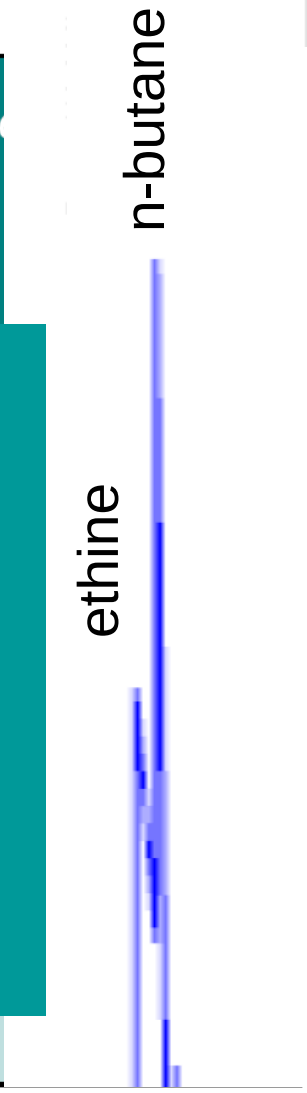
Toluene	2,59	0,25			
α-Pinene	2,01	0,06	-	-	-



Audit Results Summary

GAW Station R

- No major flaws
- All reported GAW target compounds within DQO
  Uncertainty < 6%
- No monoterpenes

GAW Station J

- No major flaws
- All reported GAW target compounds within DQO
  Uncertainty < 9%, except i-butane and n-pentane
- No ethane, ethine, propane, isoprene, monoterpenes

GAW Station H

- No major flaws
- All reported GAW target compounds within DQO
  Uncertainty < 1%
- No ethine, n-butane, monoterpenes

Audit Results Summary

GAW Station Y

- No major flaws
- All reported GAW target compounds within DQO, except ethane Uncertainty < 10%
- No monoterpenes

GAW Station i

- No major flaws
- All reported GAW target compounds within DQO except ethane and isoprene, Uncertainty < 10%
- No monoterpenes

GAW Station B

- No major flaws
- All reported GAW target compounds within DQO Uncertainty < 2%
- No monoterpenes

What comes next in 2008?

- Further promotion for CCLs for VOC in co-operation with NMIs and GAW-VOC.
- A CCQM-GAWG-GAW-VOC expert workshop in July at EMPA.
- Inter-comparisons, audits and re-audits are going to be performed at GAW central laboratories at UC, Irvine, CA, AQRDE, Toronto, MPI, Mainz, and at the global GAW station Cap Verde.

Thank You for Your Attention

and we appreciate

the Excellent Co-operation of the GAW Stations
in Audits and Inter comparison experiments