

KIT World Calibration Centres (WCCs) in the WMO-GAW Programme

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The Role and Activities of WCCs

- Conducting data quality assessments of specific parameters by means of regular system and performance audits; accomplish laboratory cross-comparisons and data reviews.
- Providing training and long-term support for station personnel, especially in countries with limited national funding resources (e.g. through the GAW Training and Education Centre).
- Development of Standard Operating Procedures (SOPs) or Measurement Guidelines (MGs) for VOCs, N₂O and aerosols, respectively, and foster the implementation at GAW sites.
- Agree upon these activities in the corresponding Scientific Advisory Groups (SAGs) and QA/SACs.

The GAW Network

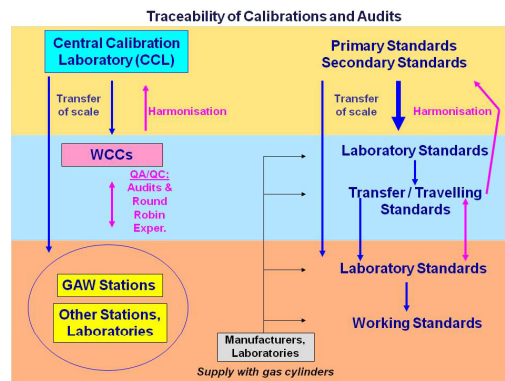
GAW consists of a worldwide measuring network of observations and scientific infrastructure with 28 Global Stations (Picture 1), more than 400 regional stations and about 100 contributing stations in more than 100 countries.



Picture 1: Locations of Global Atmosphere Watch Stations (<http://www.wmo.int/pages/prog/arep/gaw/measurements.html>)

The Traceability Chain

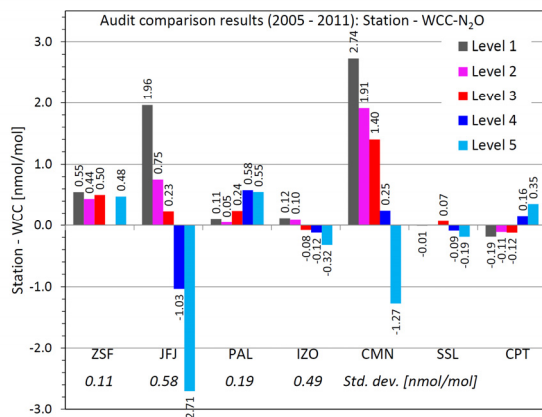
Based on the calibration scale hosted by a specific Central Calibration Laboratory (CCL) – with primary and secondary standards kept at the CCL – standards on the tertiary level are used as "Laboratory Standards" by the KIT WCCs and GAW laboratories/stations (Picture 2).



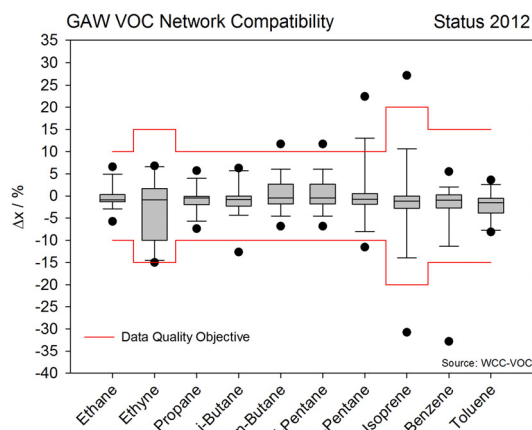
Picture 2: Hierarchy of standards used in QA/QC measures of the GAW N₂O and VOC network

The GAW Network Compatibility

The current data quality for N₂O (Picture 3) and VOC (Picture 4) measurements at the GAW stations reveal contrasting results.



Picture 3: System and performance audits by the WCC-N₂O with 5 Travelling Standards (range: 296 – 347 nmol/mol).
Data Quality Objective: 0.1 nmol/mol.
Zugspitze (ZSF); Jungfraujoch (JFJ); Pallas (PAL); Izaña (IZO); Monte Cimone (CMN); Schauinsland (SSL); Cape Point (CPT).



Picture 4: Observed differences between reported and and target values (Δx) during audits by the WCC-VOC with two Travelling Standards (range: 1-2 nmol/mol; 14 laboratories). The Box Plot indicates the median and the corresponding 25th and 75th percentiles. Error bars denote the 10th and 90th percentiles, respectively. The black dots mark the outliers.

Summary and Outlook

- GAW data are available to the scientific community through the world data centres and are used to detect atmospheric trends, to improve forecast models, for the near-surface calibration of satellite measurements or for consultation purposes as well as for the evaluation of climate and air pollution policy measures (e.g. Kyoto Protocol or Gothenburg Protocol).
- The high data quality with a known traceability achieved and maintained through rigorous QA/QC procedures is a prerequisite for the validity of the products and highlighted by the data users.
- The system and performance audits over the past 10 years reveal considerable progress over the years regarding the network compatibility of N₂O and VOC measurements.
- A crucial point in the analysis is the sufficient separation of the target compounds from other substances present in air samples (e.g. unknown compounds, CO₂, SF₆).
- A careful determination of the detector response curve is of importance, in particular for N₂O measurements, for achieving the DQOs for the full range of target mole fractions.

Further Information:
<http://imk-ifu.fzk.de/wcc-voc/>
<http://imk-ifu.fzk.de/wcc-n2o/>

Acknowledgements: Special thanks goes to the German Federal Environment Agency for funding the work of the WCCs in Germany for the next years. The past contributions of S. Thiel to the WCC-VOC are very much appreciated. The ongoing excellent cooperation with Ch. Zellweger, EMPA Switzerland, aiming at increasing the number of stations with N₂O comparisons deserves our full appreciation.