

GAW QC – an interactive dashboard to facilitate quality control of in situ atmospheric composition measurements



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Introduction

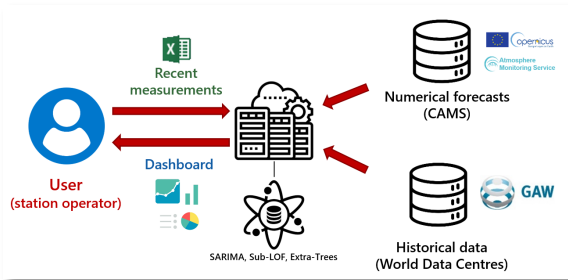
- The Global Atmosphere Watch (GAW) network encompasses hundreds of atmospheric monitoring stations worldwide
- Network-wide, near-real-time quality control (QC) tools to support operators and quickly detect unreliable data are often missing
- GAW-QC, <https://www.empa.ch/gaw-qc/>, is a newly developed interactive dashboard for QC
- It combines data science and numerical forecasts to help operators identify anomalous values in their time series
- GAW-QC enables near-real-time quality control for CH₄, CO₂, CO, O₃ and N₂O for >130 stations



GAW-QC interface

How it works

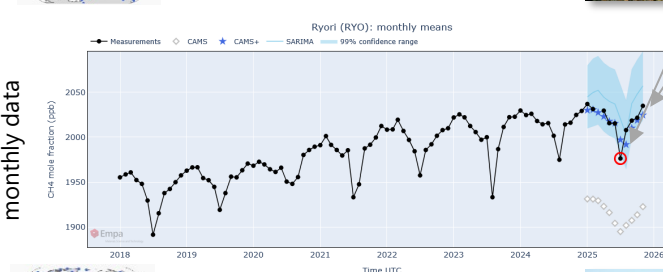
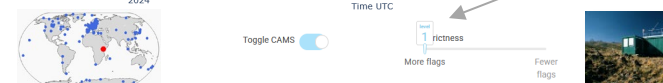
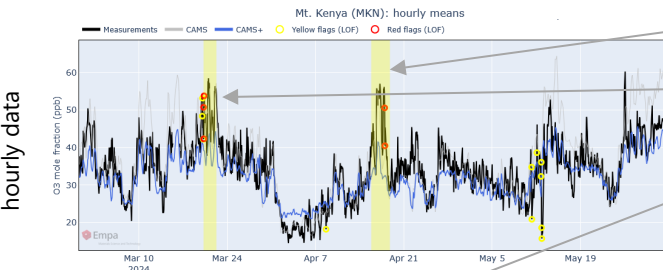
- GAW-QC allows unpublished data to be analyzed and published measurements to be verified.



Schematic GAW-QC data flow

- Anomalous measurements are identified with
 - a Subsequence Local Outlier Factor (Sub-LOF) algorithm for hourly measurements,
 - CAMS forecasts combined with machine learning that provide predictions at hourly resolution, allowing the detection of systematic biases on most time scales (down to a few days),
 - a Seasonal Autoregressive Integrated Moving Average (SARIMA) regression model (for monthly averages)
- Data science needs training data, thus, stations are included when CH₄, CO₂, CO, O₃ or N₂O data after 2020 are available in the World Data Centers (WDCGG, WDCRG)

Examples – Dashboard Output



- Yellow shaded areas highlight periods of significant deviation from the prediction
- The yellow and red circles indicate anomalous hourly outliers with respect to historical data based on the anomaly score of the Sub-LOF method
- The strictness slider allows you to adjust the significance levels required to produce yellow and red flags
- Monthly data that are outside the confidence range of the SARIMA prediction are marked with a red circle
- CAMS+ data, i.e. CAMS data debiased through machine learning (ML), give additional insights for biases
- Time series & flags can be downloaded with one click
- GAW-QC flags are only indicative. Station operators have best local knowledge and access to logbooks and maintenance reports for ultimate decisions.

Brugnara et al., 2025, Technical note: An interactive dashboard to facilitate quality control of in-situ atmospheric composition measurements, *ACP*, <https://doi.org/10.5194/acp-25-14221-2025>.