

The Global Atmosphere Watch Reactive Gases Measurement Network

M. Schultz¹, D. Helmig², H. Akimoto³, J. Bottenheim⁴, B. Buchmann⁵, I. Galbally⁶, S. Gilge⁷, H. Koide⁸, A. Lewis⁹, P. Novelli¹⁰, C. Plass-Dülmer⁷, T. Ryerson¹¹, M. Steinbacher⁵, R. Steinbrecher¹², O. Tarasova¹³, K. Tørseth¹⁴, V. Thouret¹⁵ and C. Zellweger⁵

¹Institute for Energy and Climate Research, Troposphere IEK-8, Research Center, Juelich, Germany; 49-2461-61-2831, E-mail: m.schultz@fz-juelich.de

²Institute of Arctic and Alpine Research (INSTAAR), University of Colorado, Boulder, CO 80309

³Asian Center for Atmospheric Pollution, Niigata-shi, 950-2144, Japan

⁴retired formally at Environment Canada, Toronto, Canada, New York, ON M3H 5T4, Canada

⁵Swiss Federal Laboratories for Materials Science and Technology, Dübendorf, Switzerland

⁶Commonwealth Scientific Industrial Research Organization (CSIRO), Aspendale, Australia

⁷Deutscher Wetterdienst, Hohenpeissenberg, Germany

⁸Japan Meteorological Agency, Tokyo, Japan

⁹University of York, York, United Kingdom

¹⁰NOAA Earth System Research Laboratory, Global Monitoring Division, Boulder, CO 80305

¹¹NOAA Earth System Research Laboratory, Chemical Sciences Division, Boulder, CO 80305

¹²Institute for Meteorology and Climate Research, Karlsruhe Institute of Technology, Karlsruhe, Germany

¹³World Meteorological Organisation, Geneva, Switzerland

¹⁴Norwegian Institute for Air Research NILU, Kjeller, Norway

¹⁵Laboratoire d'Aérodologie, The National Center for Scientific Research (CNRS), and Université Paul Sabatier Toulouse III, Toulouse, France

Long-term observations of reactive gases in the troposphere are important for understanding trace gas cycles, assessing impacts of emission changes, verifying numerical model simulations, and quantifying the contributions of short-lived compounds and their response to climate change. The World Meteorological Organization's (WMO) Global Atmosphere Watch (GAW) program coordinates a global network of surface stations some of which have measured reactive gases for more than 30 years. Gas species included under this umbrella are ozone, carbon monoxide, nitrogen oxides, and volatile organic compounds. There are many challenges involved in setting-up and maintaining such a network over many decades and to ensure that data are of high quality, regularly updated and made easily accessible to users. This presentation describes the GAW surface station network of reactive gases, its unique quality management framework, and it discusses the data that are available from the central archive. Highlights of data-use examples from the published literature are reviewed, and a brief outlook into the future of GAW is given. A special issue on the GAW reactive gases program with individual peer-reviewed papers reporting on research of particular compounds being covered by the program is currently open for submission in the journal *Elementa* (<https://home.elementascience.org/special-features/global-atmosphere-watch/>).

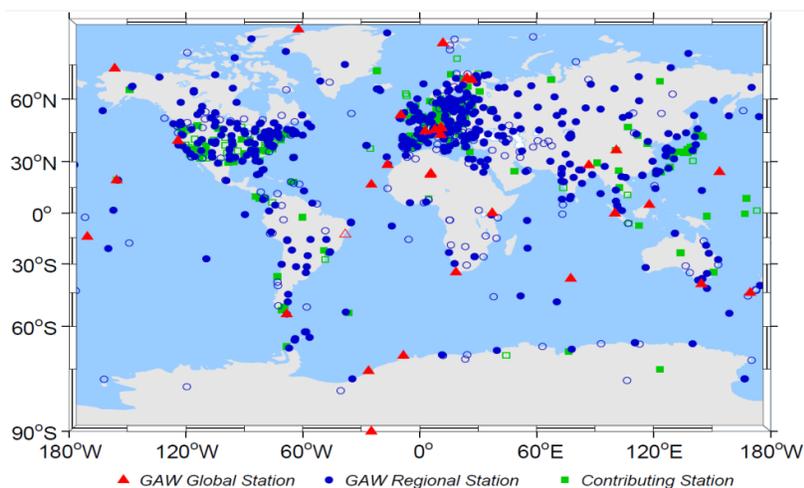


Figure 1. The Global Atmosphere Watch network of reactive gases observations. This map shows all stations measuring at least one reactive gas according to the GAW station information system (GAWSIS; <http://gaw.empa.ch/gawsis/>). Inactive stations or discontinued measurements are shown as open symbols. Note that the actual density of measurements varies by parameter, and that not all of the stations registered in GAWSIS regularly report data to the World Data Center for Greenhouse Gases.