The Global Atmosphere Watch (GAW) *Reactive Gases* Measurement Network

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(on behalf of the RG Scientific Advisory Group)

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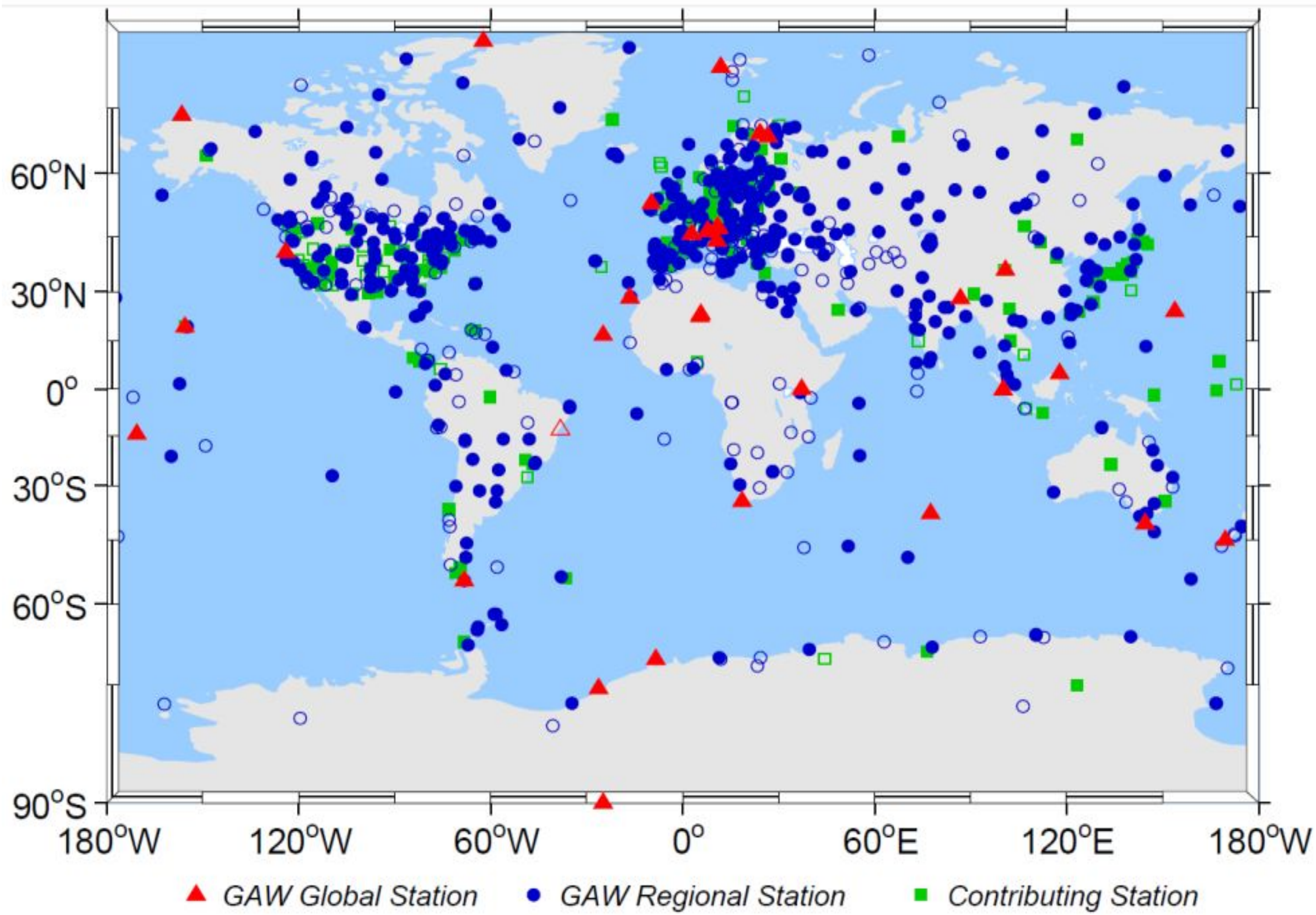
Global Atmosphere Watch Program

Provides international leadership in research and capacity development in atmospheric composition observations and analysis through:

- *maintaining and applying long-term systematic observations of the chemical composition and related physical characteristics of the atmosphere*
- *emphasizing quality assurance and quality control*
- *training, coordination, standardization*
- *data harmonization, archiving, dissemination*

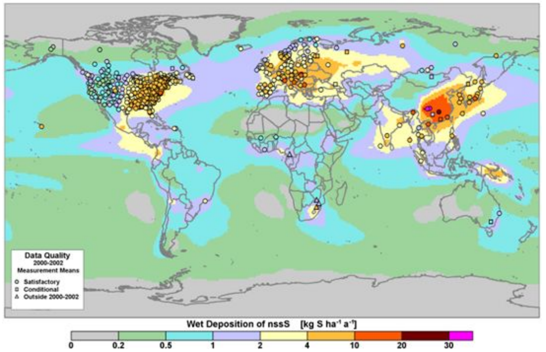
GAW builds on partnerships involving contributors from >**100** countries

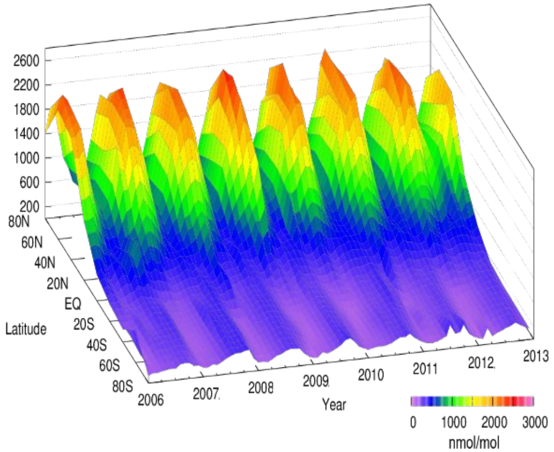
Global GAW Station Network



GAW Focal Areas:

GAW





- Stratospheric Ozone and Vertical Ozone Distribution
- Greenhouse Gases (*CO_2 and its isotopes , CH_4 and its isotopes, N_2O, SF_6, CFCs*)
- Reactive Gases (*O_3, CO, VOC, NO_x, SO_2*)
- Precipitation Chemistry
- Aerosols (*chemical and physical properties, AOD*)
- UV Radiation

GAW Focal Areas:

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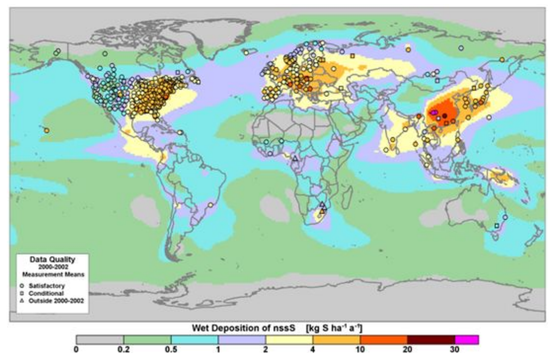

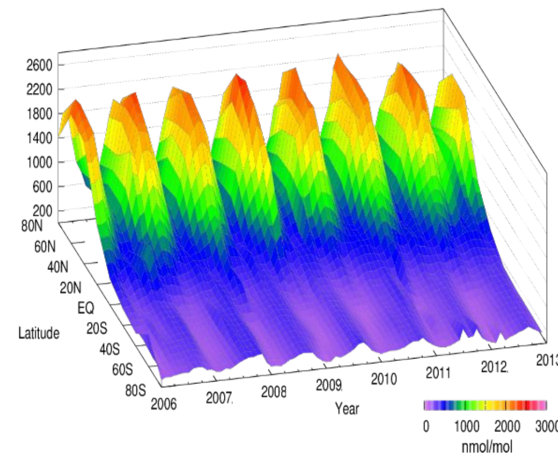

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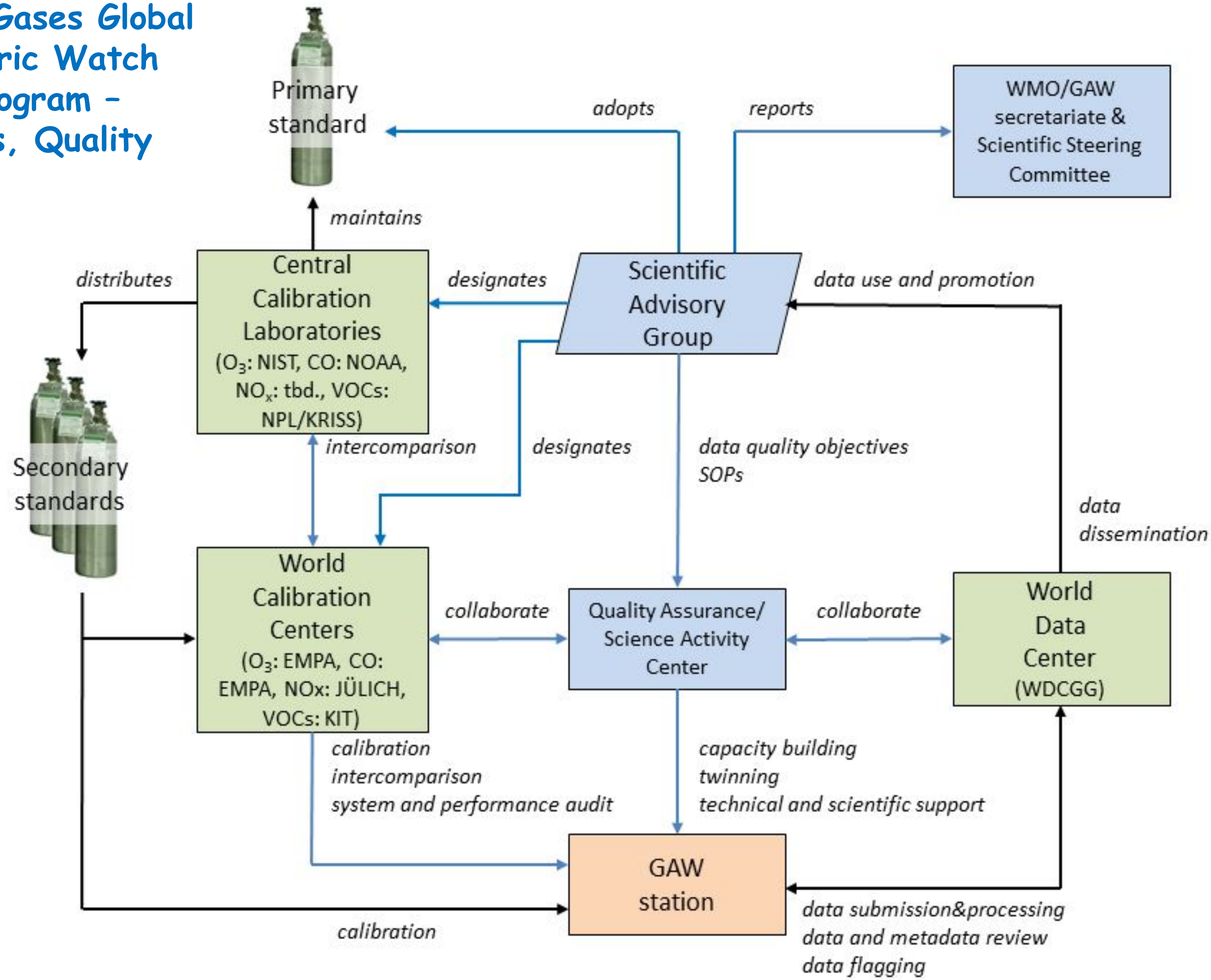
Reactive Gases Global Atmospheric Watch (GAW) Program

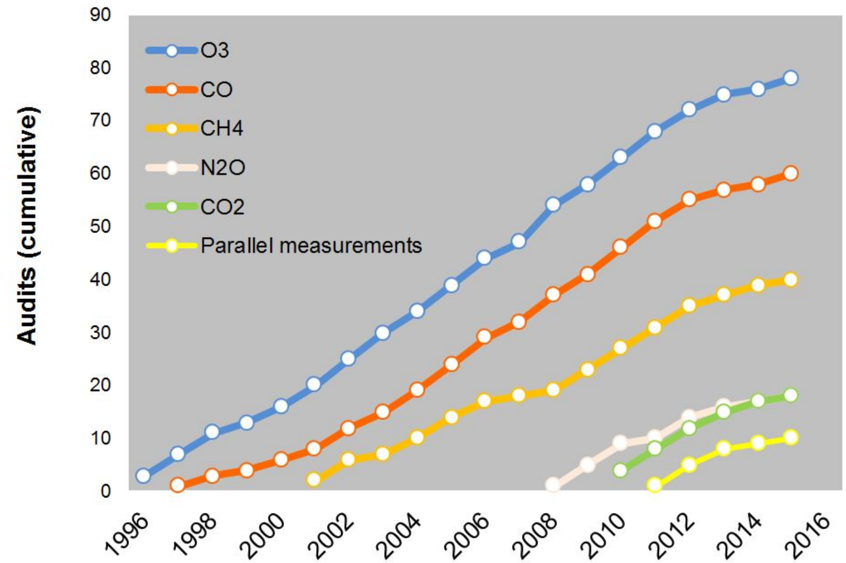
Scientific Advisory Group Meeting, Osaka, October 2018

Reactive Gases Global Atmospheric Watch (GAW) Program – Standards, Quality Control



Reactive Gases Global Atmospheric Watch (GAW) Program – Standards, Quality Control

Audits by WCC-Empa from 1996 - 2015



System and performance audits by WCC-Empa (sfc. ozone and CO):


Mt. Waliguan (China), O_3, CO, CH_4, Sept 2009


Lauder (New Zealand), O_3, CO, CH_4, CO_2, N_2O, March 2010


Cape Grim (Australia), O_3, CO, CH_4, CO_2, N_2O, March 2010


Mt. Kenya (Kenya), O_3, CO, June 2010


Cape Point (South Africa), O_3, CO, CH_4, CO_2, March 2011


Zugspitze (Germany), O_3, CO, CH_4, CO_2, N_2O, June 2011


Hohenpeissenberg (Germany), O_3, CO, CH_4, CO_2, July 2011


Bukit Kototabang (Indonesia), O_3, CO, CH_4, CO_2, November 2011


Pallas (Finland), O_3, CO, CH_4, CO_2, April 2012

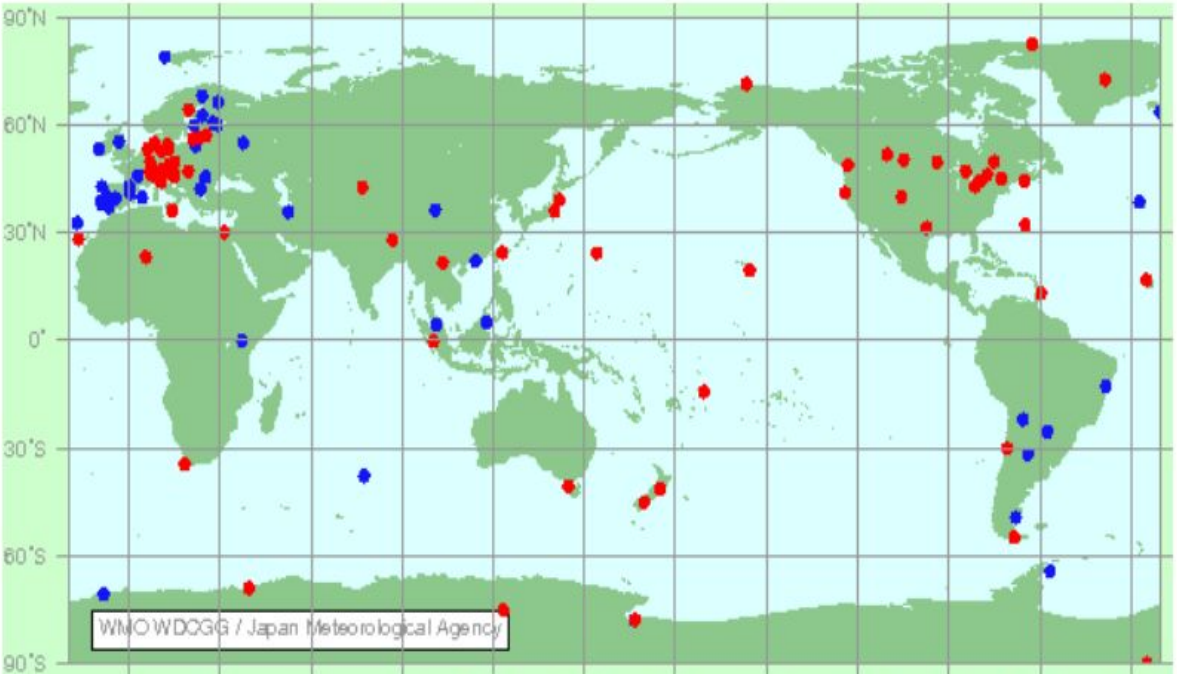

Zeppelin Mountain (Norway), O_3, CO, CH_4, CO_2, August 2012


Mt. Cimone (Italy), O_3, CO, CH_4, CO_2, N_2O, September 2012

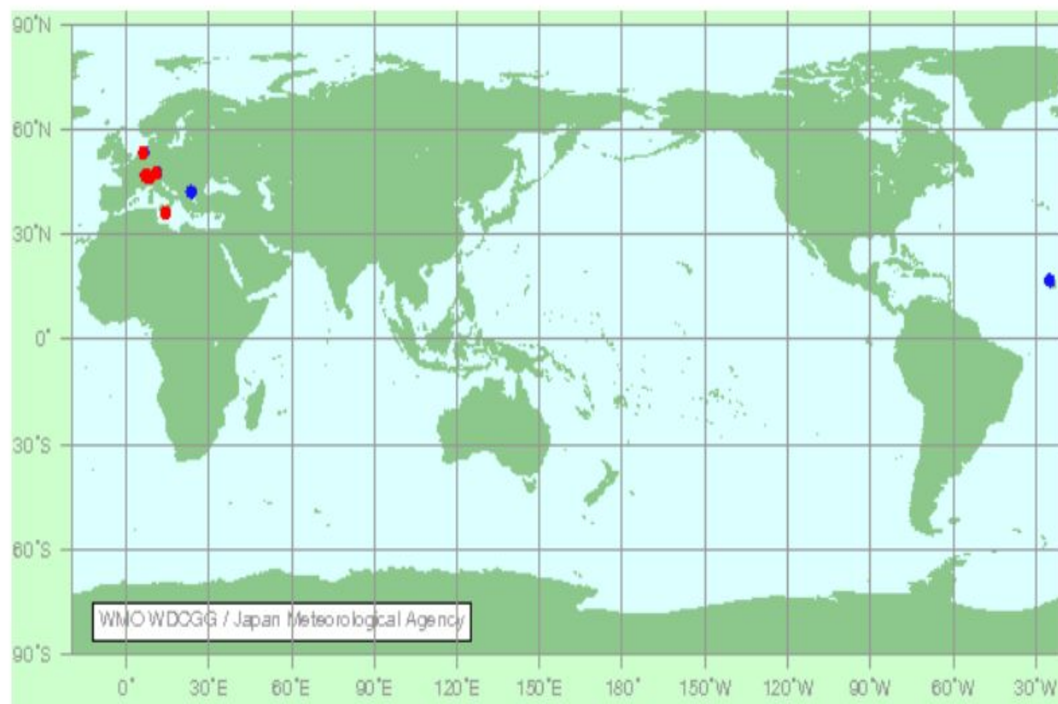

Cape Verde (Cape Verde), O_3, CO, CH_4, CO_2, N_2O, December 2012

Reactive Gases Global Atmospheric Watch (GAW) Program

Data Dissemination



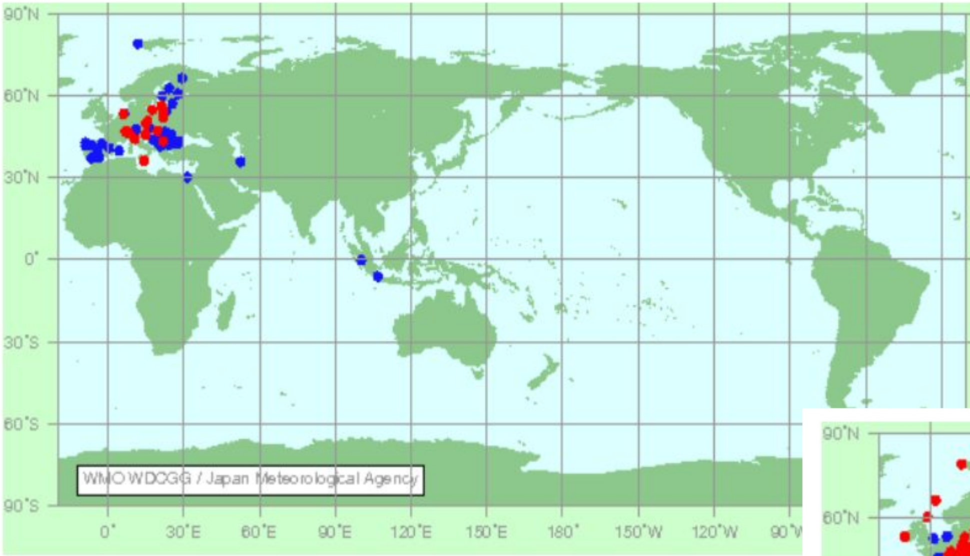
Surface Ozone



NOx

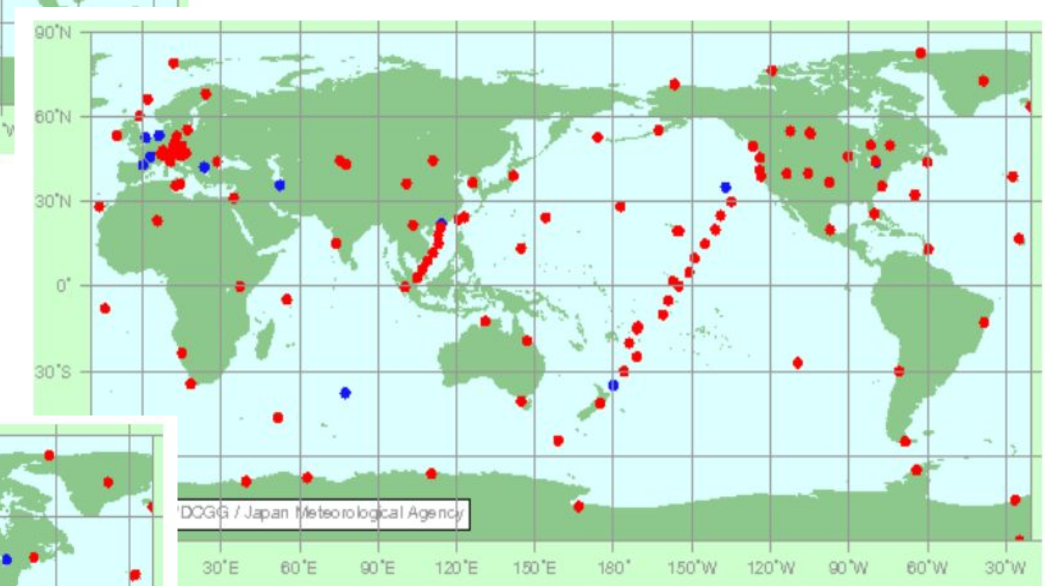
Reactive Gases Global Atmospheric Watch (GAW) Program

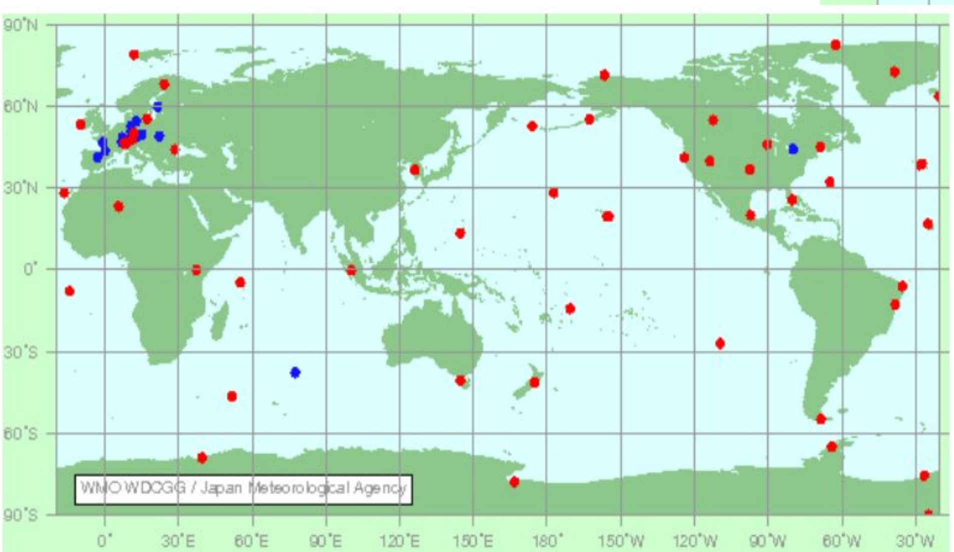
Data Dissemination



SO_2

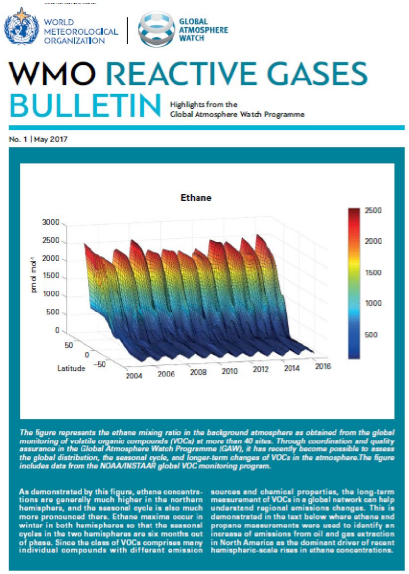
CO

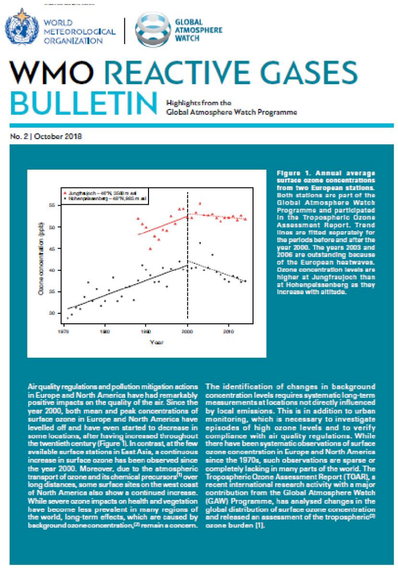


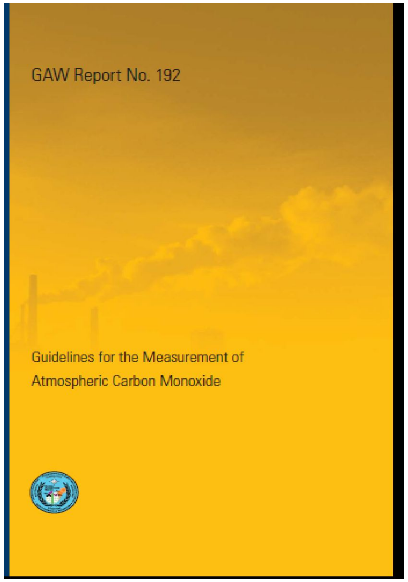


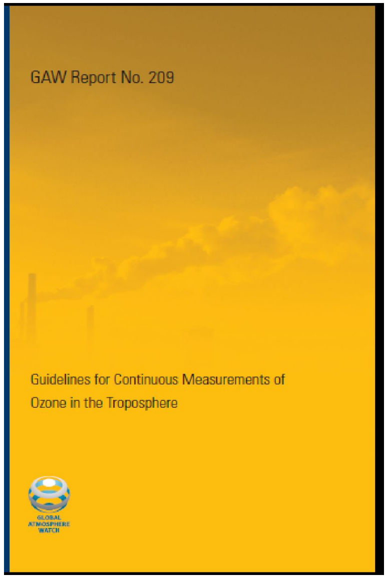
VOC

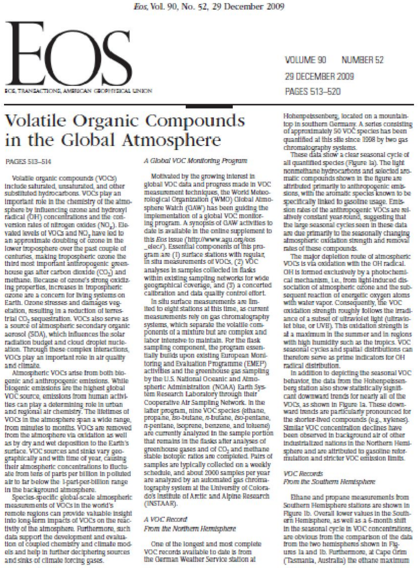
GAW Reactive Gases Literature

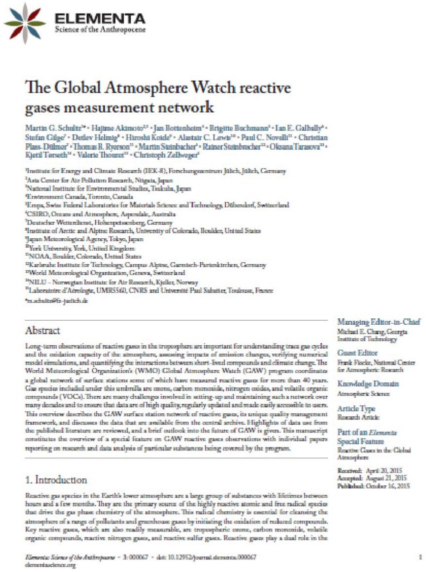












An *Elementa* Special Feature

Reactive Gases in the Global Atmosphere

Frank Flocke, Guest Editor • NCAR Earth System Laboratory

Published Articles

Additional articles under review

Cooper, O. R., Parrish, D. D., Ziemke, J., Balashov, N. V., Cupeiro, M., Galbally, I. E., Gilge, S., Horowitz, L., Jensen, N. R., Lamarque, J. F., Naik, V., Oltmans, S. J., Schwab, J., Shindell, D. T., Thompson, A. M., Thouret, V., Wang, Y., and Zbinden, R. M.: **Global distribution and trends of tropospheric ozone: An observation-based review**, *Elementa: Science of the Anthropocene*, *2*, 000029, doi:10.12952/journal.elementa.000029, 2014.

Cristofanelli, P., Busetto, M., Calzolari, F., Ammoscato, I., Gulli, D., Dinoi, A., Calidonna, C. R., Contini, D., Sferlazzo, D., Di Iorio, T., Piacentino, S., Marinoni, A., Maione, M., and Bonasoni, P.: **Investigation of reactive gases and methane variability in the coastal boundary layer of the central Mediterranean basin**, *Elementa-Science of the Anthropocene*, *5*, 1-21, doi:10.1525/elementa.216, 2017.

Duchi, R., Cristofanelli, P., Landi, T. C., Arduini, J., Bonafe, U., Bourcier, L., Busetto, M., Calzolari, F., Marinoni, A., Putero, D., and Bonasoni, P.: **Long-term (2002-2012) investigation of Saharan dust transport events at Mt. Cimone GAW global station, Italy (2165 m a.s.l.)**, *Elementa-Science of the Anthropocene*, *4*, 1-14, doi:10.12952/journal.elementa.000085, 2016.

Helmig, D., Munoz, M., Hueber, J., Mazzoleni, C., Mazzoleni, L., Owen, R. C., Val-Martin, M., Fialho, P., Plass-Duelmer, C., Palmer, P. I., Lewis, A. C., and Pfister, G.: **Climatology and atmospheric chemistry of the non-methane hydrocarbons ethane and propane over the North Atlantic**, *Elementa-Science of the Anthropocene*, *3*, 1-16, doi:10.12952/journal.elementa.000054, 2015.

Petetin, H., Jeoffrion, M., Sauvage, B., Athier, G., Blot, R., Boulanger, D., Clark, H., Cousin, J. M., Gheusi, F., Nedelec, P., Steinbacher, M., and Thouret, V.: **Representativeness of the IAGOS airborne measurements in the lower troposphere**, *Elementa-Science of the Anthropocene*, *6*, doi:10.1525/elementa.280, 2018.

Petetin, H., Thouret, V., Athier, G., Blot, R., Boulanger, D., Cousin, J. M., Gaudel, A., Nedelec, P., and Cooper, O.: **Diurnal cycle of ozone throughout the troposphere over Frankfurt as measured by MOZAIC-IAGOS commercial aircraft**, *Elementa-Science of the Anthropocene*, *4*, doi:10.12952/journal.elementa.000129, 2016.

(4 more)

Insights from contributions to the World Meteorological Organization Global Atmosphere Watch program

GAW

Reactive trace gases in the Earth atmosphere can have adverse effects on human health, environment and materials, they influence regional climate and are involved in many biogeochemical cycles. Atmospheric chemical reactions also play an important role in cleansing the atmosphere from anthropogenic and natural emissions. Assessing the importance and impacts of