

Data harmonization and quality management for atmospheric GHG measurements: what have we learned in the InGOS project?

S. Hammer¹, M. Lopez², M. Galkowski³, T. Aalto⁴, F. Apadula⁵, P. Bergamaschi⁶, Z. Barcza⁷, H. Chen⁸, G. Forster⁹, L. Hazan², L. Haszpra^{10/11}, J. Helle², O. Hermansen¹², C. C. Hoerger¹³, J. Lavric¹⁴, D. Lowry¹⁵, G. Manca⁶, A. Manning⁹, F. Meinhardt¹⁶, J. Moncrieff¹⁷, J. Necki³, S. O'Doherty¹⁸, N. Paramonova¹⁹, S. Piacentino²⁰, A. Vermeulen²¹, M. Ramonet², M. Schmidt^{1/2}, M. Steinbacher¹³, and I. Levin¹

- [1] Institut für Umweltphysik, Heidelberg University, Germany
- [2] Laboratoire des Sciences du Climat et de l' Environnement (LSCE), CEA, Gif sur Yvette, France
- [3] AGH University of Science and Technology, Kraków, Poland
- [4] Finnish Meteorological Institute (FMI), Helsinki, Finland
- [5] Ricerca sul Sistema Energetico - RSE Spa, Milan, Italy
- [6] European Commission Joint Research Centre, Institute for Environment and Sustainability, Ispra, Italy
- [7] Department of Meteorology, Eotvos Lorand University, Budapest, Hungary
- [8] Centrum voor Isotopen Onderzoek (CIO), Rijksuniversiteit Groningen, Netherlands
- [9] School of Environmental Sciences, University of East Anglia, Norwich, United Kingdom
- [10] Hungarian Meteorological Service, Budapest, Hungary
- [11] MTA Research Centre for Astronomy and Earth Sciences, Sopron, Hungary
- [12] NILU - Norwegian Institute for Air Research, Kjeller, Norway
- [13] Empa, Laboratory for Air Pollution / Environmental Technology, Dübendorf, Switzerland
- [14] Max-Planck-Institute for Biogeochemistry, Jena, Germany
- [15] Royal Holloway, University of London, United Kingdom
- [16] Umweltbundesamt, Messstelle Schauinsland, Kirchzarten, Germany
- [17] Edinburgh University, Edinburgh, United Kingdom
- [18] University of Bristol, School of Chemistry, Bristol, United Kingdom
- [19] Main Geophysical Observatory (MGO), Voeikov, Saint Petersburg, Russia;
- [20] Laboratory for Earth Observations and Analyses, ENEA. Rome, Italy
- [21] Energy research Center Netherlands (ECN), Petten, Netherlands

Data harmonization and quality management for historical (i.e. starting from 2000) atmospheric, non-CO₂ greenhouse gas measurements was an important task for the European station PIs which gathered in the InGOS ("Integrated non-CO₂ Greenhouse gas Observing System") project. This retrospective of European CH₄, N₂O and H₂ datasets, collected at about 20 different stations, was needed, since European in situ atmospheric greenhouse gas (GHG) monitoring is traditionally conducted by a multiplicity of national organizations and institutions, each with its own measurement procedure, quality control and link to the international GHG calibration scales. The future ICOS infrastructure (Integrated Carbon Observing System; www.icos-infrastructure.eu) intends to overcome this heterogeneity in the observational network. Furthermore, uniform and comprehensive uncertainty estimates were calculated for all sites and all species to provide additional, valuable information to the data users. In this presentation we summarize and review the aims and achievements of this work package. In addition we highlight examples of revisited datasets and give recommendations for a future ICOS uncertainty quantification scheme.