

Abstract

The Office for Coordination of Climate Change Observation in Japan has established a national alliance of the laboratories of seven organizations: the Japan Meteorological Agency, the Tohoku University, the National Institute for Environmental Studies, the National Institute of Advanced Industrial Science and Technology, the National Institute of Polar Research, the Meteorological Research Institute, and the National Metrology Institute of Japan. The mission of the alliance is to compare the standard gas scales used for measurements of atmospheric greenhouse gases (GHGs). Within the framework of this alliance, a working group committee (Chair: T. Nakazawa from Tohoku University) has organized and initiated a plan: InterComparison Experiments for Greenhouse Gases Observation (iceGGO). The purpose of the iceGGO is to examine the differences between the GHG standard gas scales used for atmospheric observations as well as to evaluate the consistency of the scales with the International System of Units traceable standard gases prepared by the gravimetric method of the National Metrology Institute of Japan. The iceGGO program performed six round-robin experiments for carbon dioxide (CO₂), methane (CH₄), carbon monoxide (CO), and nitrous oxide (N₂O) during the period 2012–2016. An additional iceGGO experiment was also carried out using round-robin cylinders provided by the National Oceanic and Atmospheric Administration. Details of experimental methods and results for all experiments are reported herein. Throughout the seven experiments, the iceGGO program was successful in precisely determining the differences between the GHG standard gas scales. This report provides information that will facilitate combining atmospheric GHG measurements made by different Japanese laboratories into an integrated observation database based on a common standard gas scale consistent with the compatibility criteria recommended by the World Meteorological Organization.