Geophysical Research Abstracts
Vol. 18, EGU2016-12378, 2016
EGU General Assembly 2016
© Author(s) 2016. CC Attribution 3.0 License.

Determination of radiocarbon in stratospheric CO_2, obtained through AirCore sampling.

Dipayan Paul (1), Huilin Chen (1,2), Henk A. Been (1), Rigel Kivi (3), and Harro A. J. Meijer (1)

(1) Centre for Isotope Research, Energy and Sustainability Research Institute Groningen, University of Groningen, Nijenborgh 4, 9747 AG, Groningen, the Netherland, (2) Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, Colorado, USA, (3) Finnish Meteorological Institute, Arctic Research, Sodankylä, Finland

The concentration of Greenhouse Gases (GHG), with carbon dioxide as the most prominent example, has been and still is increasing, predominantly due to emissions from fossil fuel combustion. CO_2 is also the most important component of the global carbon cycle. Among other tracers, radiocarbon (Carbon-14) is a unique and an important atmospheric tracer used in the understanding of the global carbon cycle. Radiocarbon is a naturally occurring isotope (radioactive, $t_{\frac{1}{2}}$ = 5730 $\pm$ 40 years) of carbon produced through the interaction of thermalized neutrons and nitrogen in the upper atmosphere. Generally, for performing atmospheric radiocarbon measurements in the higher atmosphere, large samples (few liters of air) were collected using aircrafts and balloons. However, collecting stratospheric samples on a regular basis for radiocarbon analysis is extremely expensive. Here we describe the determination of radiocarbon concentrations in stratospheric CO_2, collected using AirCore sampling. AirCore is an innovative sampling technique for obtaining vertical atmospheric profiles and, in Europe, is done on a regular basis at Sodankylä, Finland for CO_2, CH4 and CO. The stratospheric parts of two such AirCore profiles were used in this study as a proof-of-principle. CO_2 from the stratospheric air samples were extracted and converted to elemental carbon, which were then measured at the Accelerator Mass Spectrometric (AMS) facility of the Centre for Isotope Research (CIO) at the University of Groningen. The stratospheric part of the AirCore profile was divided into six sections, each contained approximately 10 μg C. A detailed description of the extraction, graphitization, AMS analysis and the derivation of the stratospheric radiocarbon profile will be the main focus. Through our results, we will show that AirCore is a viable sampling method for performing high-precision radiocarbon measurements of stratospheric CO_2 with reasonably good spatial resolution on a regular basis. Challenges and future developments will also be discussed.