Geophysical Research Abstracts
Vol. 21, EGU2019-8524, 2019
EGU General Assembly 2019

Using atmospheric 14CO to provide additional constraints for global OH: results from a new approach and potential for future measurements

Vasilii Petrenko (1), Lee Murray (1), Andrew Smith (2), Edward Crosier (1), Aidan Colton (3), Quan Hua (2), Bin Yang (2), Roxana Kazemi (1), Peter Neff (1,4), David Etheridge (5), Ilya Usoskin (6), and Stepan Poluianov (6)

(1) Dept of Earth and Environmental Sciences, University of Rochester, Rochester, USA (vpetrenk@ur.rochester.edu), (2) Australian Nuclear Science and Technology Organisation (ANSTO), Kirrawee DC, Australia, (3) NOAA Earth System Research Laboratory, Global Monitoring Division, Boulder, USA, (4) Earth and Space Sciences, University of Washington, Seattle, USA, (5) CSIRO Oceans and Atmosphere, Aspendale, Australia, (6) University of Oulu, Oulu, Finland

The primary source of 14C-containing carbon monoxide (14CO) in the atmosphere is via 14C production from 14N by secondary cosmic rays, and the primary sink is removal by hydroxyl radicals (OH). Variations in the global abundance of 14CO that are not explained by variations in 14C production are mainly driven by variations in the global abundance of OH. Monitoring OH variability via methyl chloroform is becoming increasingly difficult as methyl chloroform abundance is continuing to decline. Measurements of atmospheric 14CO have previously been successfully used to infer OH variability. However, these measurements have only continued at one location (Baring Head, New Zealand), which is insufficient to infer global trends.

We propose to restart global 14CO monitoring with the aim of providing an additional constraint on OH variability. A new analytical system for 14CO sampling and measurements has been developed, allowing for a ten-fold reduction in the required sample air volumes and simplified field logistics. The first 14CO measurements from Mauna Loa Observatory show good agreement with prior measurements in the same latitude band. Preliminary work with a state-of-the-art chemical transport model is exploring sensitivity of 14CO at potential sampling locations to changes in production rates and OH.

This presentation will also provide an update on a project which aims to improve the understanding of long-term OH variability via reconstructing a 150-year history of atmospheric 14CO from ice cores at Law Dome, Antarctica. Sampling of the ice and on-site extractions of large volumes of ancient air were in progress during December 2018 – January 2019.