

Name of research institute or organization:

Institut für Umweltphysik, Universität Heidelberg

Title of project:

Long-term observations of $^{14}\text{CO}_2$ at Jungfraujoch

Project leader and team:

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Project description:

^{14}C is the natural radioactive carbon isotope which is produced in the atmosphere by cosmic ray induced reactions with atmospheric nitrogen. The radioactive half life of ^{14}C is 5730 years. The natural equilibrium level of atmospheric $^{14}\text{CO}_2$ has been disturbed by man's activities in the last century, via the ongoing input of fossil fuel CO_2 into the atmosphere known as Suess effect, and through nuclear detonations in the atmosphere in the 1950s and early 1960s. CO_2 from burning of fossil fuels, due to its age of several hundred million years, is free of ^{14}C ; adding fossil fuel CO_2 to the atmosphere, therefore, not only leads to an increase of its mixing ratio but also to a decrease of the $^{14}\text{C}/^{12}\text{C}$ ratio in atmospheric CO_2 . From this decrease we can directly calculate the contemporary fossil fuel CO_2 surplus at a measurement site, e.g. on the European continent, if the undisturbed background level is known.

Atmospheric $^{14}\text{CO}_2$ observations at Jungfraujoch serve as a background for other observational sites in Central Europe. They were started in 1986 have been in continuous operation since then. The Jungfraujoch background $^{14}\text{CO}_2$ level was used to calculate the fossil fuel CO_2 component at Schauinsland station as well as in Heidelberg from respective $^{14}\text{CO}_2$ observations. These results are described in detail in a paper recently published by Levin et al. [2003].

Key words:

carbon dioxide, Radiocarbon, fossil fuel emissions, climate, Kyoto Protocol

Internet data bases:

<http://www.iup.uni-heidelberg.de/institut/forschung/groups/kk/>

Collaborating partners/networks:

CARBOEUROPE, AEROCARB (<http://www.aerocarb.cnrs-gif.fr/>)

Scientific publications and public outreach 2003:

Refereed journal article

Levin, I., B. Kromer, M. Schmidt and H. Sartorius, 2003. A novel approach for independent budgeting of fossil fuel CO_2 over Europe by $^{14}\text{CO}_2$ observations. *Geophys. Res. Lett.* 30(23), 2194, doi. 10.1029/2003GL018477.

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