

Name of research institute or organization:

Climate and Environmental Physics, University of Bern
Bundesamt für Strahlenschutz, Freiburg i.Br.

Title of project:

⁸⁵Kr Activity Determination in Tropospheric Air

Project leader and team

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Project description:

Since more than 15 years the tropospheric Kr-85 activity has been continuously monitored at Jungfrauoch (JFJ). In the last year this valuable data record has been expanded. Krypton separated from about 10 m³ of air, which is collected during one week, is sent to Freiburg i.Br for activity measurement (Figure 1).

At present the baseline of the Kr-85 activity concentration is app. 1.45 mBq/m³ at the stations located in the northern hemisphere (Fig. 1). The Kr-85 activity concentration in ground level air showed a regular increase of about 0.03 Bq/m³ per year during the last decades. However, the data from 2007 indicate that the Kr-85 activity has stabilized in the last two years. This means that the yearly global release rate of about 5·10¹⁷ Bq is constant and the emissions are exactly compensated by radioactive decay in the atmosphere. This is also supported by the published emissions of the reprocessing plant at La Hague in France (Fig.1, inset) which are rather stable since the year 2000. Future measurements will show in how far the start of a new reprocessing plant in Japan will cause a renewed rise of atmospheric Kr-85 activity concentrations.

The data of the global Kr-85 measuring network, provide an instrument for the surveillance of radioactivity in the environment. The location of the JFJ sampling site is strategically important because at this altitude the northern tropospheric background level can best be determined. Secondly, the gradient of the baseline concentration and the occurrence of elevated peak concentrations allow some conclusion about the global and local reprocessing activities, respectively. This feature of Kr-85 could be an important tool to monitor clandestine nuclear reprocessing activities.

Known Kr-85 emissions can also be used for the validation and calibration of global circulations models. The well known atmospheric Kr-85 activity provides last but not least the basis for one of the most reliable dating methods for groundwater.

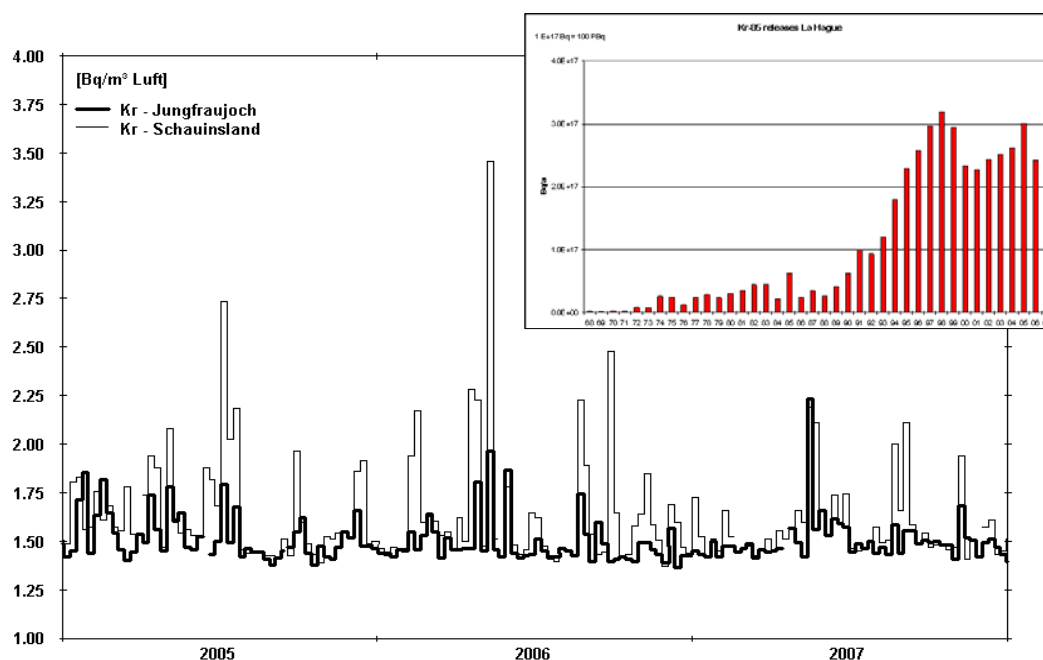


Figure 1: Measured ^{85}Kr activities in weekly samples of air, collected at Jungfrauoch (3500 m a s l) and at Schauinsland (1284 m a s l) near Freiburg i.B. in the last three years.

Key words:

Krypton, ^{85}Kr , radioactivity in air, reprocessing plants

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Scientific publications and public outreach 2007:

Umweltradioaktivität und Strahlendosen in der Schweiz, Bundesamt für Gesundheit, Abteilung Strahlenschutz, 2004, 2005, 2006, 2007 (in preparation)

Winger K., Feichter M. B., Kalinowski M., Sartorius H., and Schlosser P. (2005) A new compilation of the atmospheric ^{85}Kr inventories from 1945 to 2000 and its evaluation in a global transport model. *Journal of Environmental Radioactivity* **80**, 183-215.

R. Purtschert, H. H. Loosli, H. Sartorius, C. Schlosser, S. Schmid, ^{85}Kr measured at Jungfrauoch and elsewhere, A versatile global tracer, JFJ booklet, 2007.

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