

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:

The monitoring of tropospheric Kr-85 activity concentrations at Jungfraujoch (JFJ) has been continued also in 2009. Krypton separated from about 10 m³ of air, which is continuously collected during one week, is sent to the Bundesamt für Strahlenschutz in Freiburg i.Br for the measurement of the Kr-85 activity concentration..

The major source of atmospheric Kr-85 are releases from nuclear reprocessing plants. Over the last 40 years the Kr-85 activity concentration in the atmosphere has increased rather continuously with a mean increase rate of about 0.03 Bq/m³ per year and has reached in the last years a maximal value of about 1.45-1.50 mBq/m³ at the stations located in the northern hemisphere (Figure 1, Inset). The release from the reprocessing facilities occurs pulsed. The resulting plumes can be detected at sampling stations which are located in downwind direction within a few hundred kilometres from the source (spikes in Figure 1). Above the planetary boundary layer the strength and frequency of such spikes is reduced compared to stations in lower elevations (Figure 1). In nowadays for the first times since the start of the reprocessing activities a trend reversal can be observed. This means that the world wide reprocessing activities do not increase any longer or even decrease.

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.

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. Advantageous for dating was up to know the steadily increase of the input activity which provides unique groundwater age estimations. The observed declining trend, is from the point of view of Kr-85 dating a change for the worse because ambiguous age estimations result for groundwaters which recharged in the last few years.

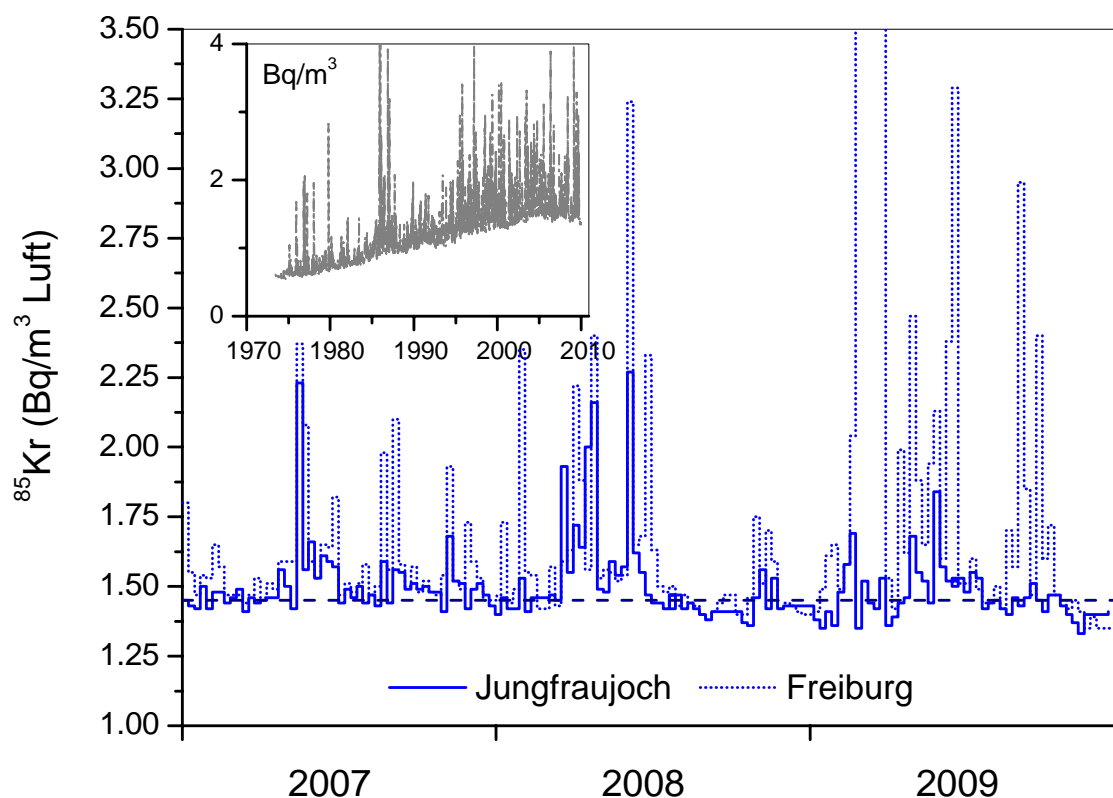


Figure 1: Measured atmospheric ^{85}Kr activity concentrations in weekly air samples, collected at Jungfraujoch (3500 m a s l) and Freiburg i. Br., in the last three years (dotted line: reference line at 1.45 Bq/m³ air). Inset: Values for Freiburg i. Br. over the last 35 years

Key words:

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

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Scientific publications and public outreach 2009:

Umweltradioaktivität und Strahlendosen in der Schweiz, Bundesamt für Gesundheit, Abteilung Strahlenschutz, 2004, 2005, 2006, 2007, 2008, 2009 (in preparation)

Umweltradioaktivität und Strahlenbelastung, Deutschland, Jahresberichte 2007, 2008 (in print), 2009 (in preparation); Reihe Umweltpolitik; Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit.

Althaus R., Klump S., Omnis A., Purtschert R., Kipfer R., Stauffer F., and Kinzelbach W. (2009) Noble gas tracers for characterisation of flow dynamics and origin of groundwater: A case study in Switzerland. *Journal of Hydrology* **370**(1-4), 64-72.

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