

Name of research institute or organization:

**Section of Environmental Radioactivity, Radiation Protection
Division of the Swiss Federal Office of Public Health**

Title of project:

Aerosol Monitoring Station at the Jungfrauoch (RADAIR)

Project leader and team

Prof. H. Völkle, Section Head, Pierre Beuret, project responsible

Project description:

An automatic aerosol radioactivity monitor FHT59S is operated at Jungfrauoch research station by the Swiss Federal Office of Public Health. It has the following particular features:

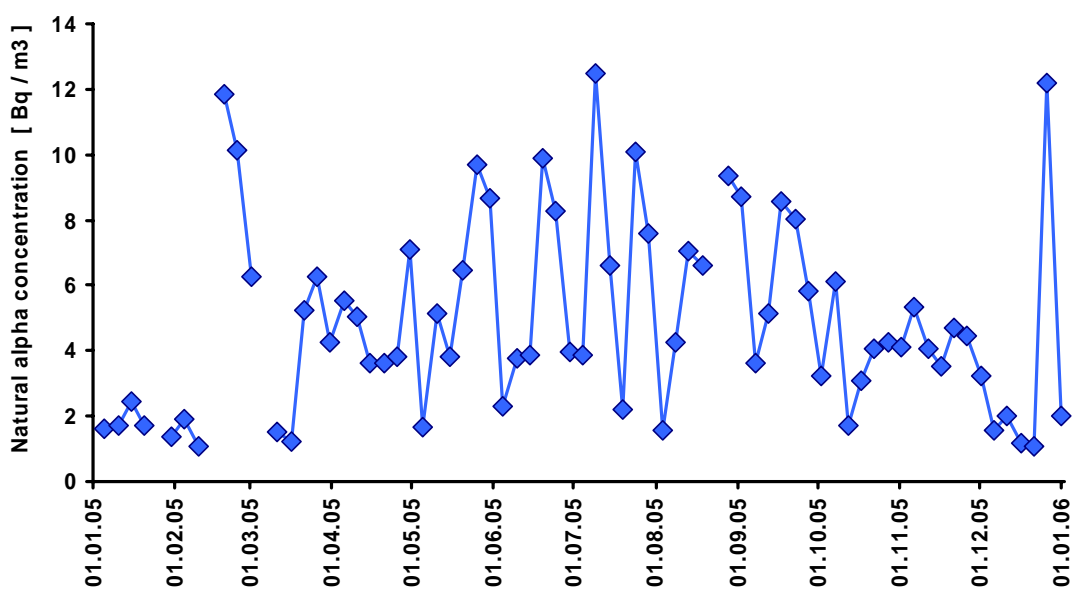
- To detect rapidly any increase of air radioactivity at the altitude of 3400 m above sea level,
- A detection limit for artificial radioactivity of less than 0.1 Bq/m³. This extremely low value - five times lower than on the Swiss Plateau - is made possible due to the very low Radon concentration at this altitude.

Comments on the measurement of 2005:

Graph 1 shows the contribution to the alpha radioactivity during 2005.

- Alpha radioactivity - Radon daughter products - is transported mainly up to the Jungfraujoch by air masses from the lowlands;
- During the period January 1st to December 31 maximal values were observed every 5 days;
- This maximal values are approximately 3 to 9 times lower at the Jungfraujoch than those on the Swiss Plateau;
- The highest values are normally observed in summer time, but there are two additional maxima in February and December due to meteorological effects;
- The missing values are explained in the “Comments on technical aspects”.

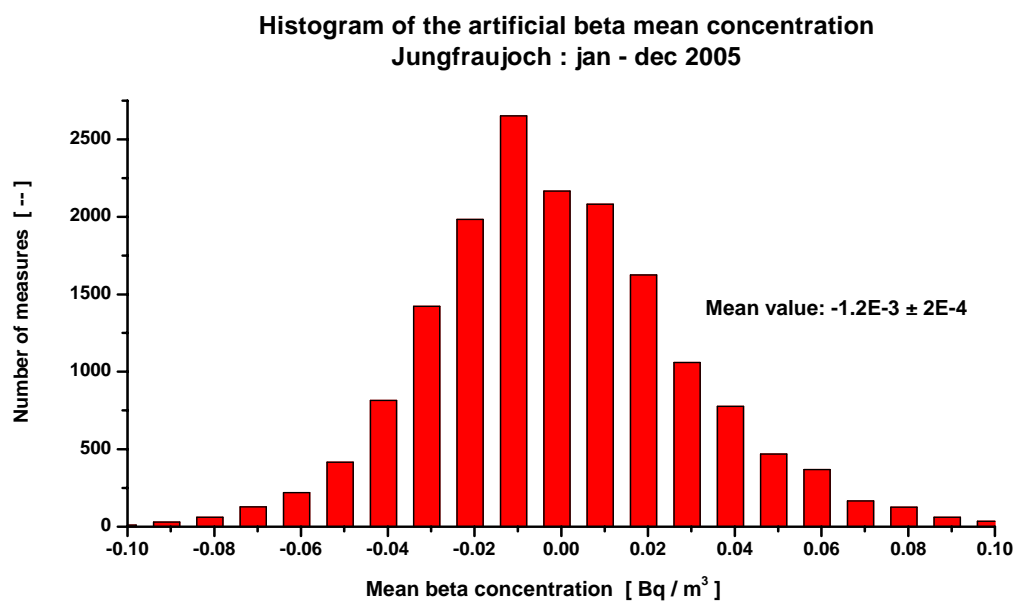
Maximal values of the natural alpha concentration
Jungfraujoch: jan-dec 2005



Graph 1

Graph 2 shows the calculated net beta radioactivity for 2005.

- No artificial beta concentration above the detection limit was observed;
- As the subtracted value for the natural radioactivity was too high, the histogram is slightly shifted towards negative values. At the Jungfraujoch natural radioactivity is extremely low, and so a precise determination of this value is important for a correct calibration of the monitor but is rather difficult;
- As shown in the histogram below some 95 percent of the values of 2005 were below 0.08 Bq/m³.



Graph 2

For normal situations, i.e. with no artificial radioactivity in the air, the calculated net Beta radioactivity at the Jungfraujoch, using the Alpha-Beta compensation technique (See below), is less than 0.1 Bq/m³. At the top of Europe, a radiation incident causing an increase of the artificial beta radioactivity in the atmosphere of as low as 0.1 Bq/m³ could therefore be detected.

The automatic α/β -compensation technique applied by our aerosol monitoring stations is based on the simultaneously measured gross Alpha (A_G) and gross Beta (B_G) radio-activity of the aerosols collected on the filter. The net (artificial) Beta radioactivity (B_N) is calculated by the following formula: $B_N = B_G - f \cdot A_G$. The constant factor f can be adapted either by the software program or by the operator.

Comments on technical aspects:

The missing data (graph 1) during the period of February and March are due to technical problems with the filter transport mechanism. The missing data during August are due to power failure caused by extreme meteorological situations (thunderstorm).

Apart from some minor telecommunication troubles, no major breakdown at the aerosol monitor was registered during 2005.

The new «INAIR» project of the Swiss Federal Office of Public Health plans to install an aerosol collector «DIGITEL» at the same room as the FHT59S monitor.

The air output line for both instruments had to be modified in order to evacuate the heat produced by the two pumps and the old heating head for the air inlet had to be restored and reactivated.



Key words:

Environmental Radioactivity Monitoring

Address:

Sektion Überwachung der Radioaktivität, Bundesamt für Gesundheit,
Abt. Strahlenschutz,
Ch. du Musée 3
CH-1700 Fribourg

Contacts:

Prof. H. Völkle
Tel.: +41 26 300 9161
Fax: +41 26 300 9743
http://www.bag.admin.ch/strahlen/ionisant/radio_env/surveillance/d/surveiller.php