MEASUREMENTS OF ATMOSPHERIC $^{85}$Kr ACTIVITY AT DEBRECEN (HUNGARY). II

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The concentration of $^{85}$Kr in air as measured with internal GM counters has increased steadily in the last years and amounts to 16.2 pCi/m$^3$ of air in 1971. The total amount of fissioned material is estimated.

Introduction

The radioactivity of the atmosphere arises from three sources:

1. background radiation from naturally radioactive materials and from cosmic ray produced radioisotopes;

2. release of artificial radioactive substances by nuclear weapon tests and other experiments;

3. radiation from substances produced in nuclear industry.

More than 20 radioactive inert gas isotopes are among the fission products, but with the exception of $^{85}$Kr ($T_{1/2} = 10.76$ years [1]), all of them have short half-lives. Thus $^{85}$Kr is the most important noble gaseous contaminant produced in nuclear fission.

The presence of $^{85}$Kr was undetectable in the background radiation before the artificially produced fission processes. The estimated amount of the "naturally" produced $^{85}$Kr (e.g. by spontaneous fission) is absolutely negligible less than 0.1 pCi (mol Kr)$^{-1}$ [18], i.e. $5 \times 10^{-6}$ pCi (m$^3$ of air)$^{-1}$.

Nuclear weapon tests and the nuclear industry, however, have released over the past twenty years significant quantities of $^{85}$Kr into the atmosphere and its concentration is increasing continuously.

The first measurements of the atmospheric $^{85}$Kr content were undertaken in France [2] -- [3] from 1954 on. These and the later reported data from other laboratories [4] -- [14] are collected in Fig. 1.

Most of the early measurements were made with internal gas proportional counters. In the last years liquid scintillators were used as well [10], [11], [13] for the determination of the $^{85}$Kr activity level.

Two striking discrepancies emerge from a comparison of the trend of Fig. 1 with the curve of the fallout activity originating from nuclear weapon tests:
(a) there is no correlation with the nuclear weapon tests of the years 1961—1962;  
(b) the typical seasonal variation of fallout activity is not observable in the $^{85}$Kr content.  

These two facts strongly suggest that the nuclear weapon tests are not the main sources of the atmospheric $^{85}$Kr.

Later on it will be proved quantitatively that the large $^{85}$Kr content of the atmosphere is almost entirely due to the nuclear industry.

**Experimental**

The $^{85}$Kr concentration of the atmosphere has been measured at Debrecen (Hungary) regularly since 1966 [19]. The Krypton gas samples used for the measurements are supplied by the Krypton-Factory of Tungsram Works Ltd. (Miskolc, Hungary), where the 1.14 ppm Kr concentration of the air is