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EUROPEAN ATOMIC ENERGY COMMUNITY - EURATOM

ENVIRONMENTAL RADIOACTIVITY
ISPRA 1963

by

M. DE BORTOLI, P. GAGLIONE,
A. MALVICINI and E. VAN DER STRICHT

1965

Joint Nuclear Research Center
Ispra Establishment - Italy

Security Service
Site Survey and Meteorology

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

In this report are summarized the results of the measurements of environmental radioactivity performed by the site survey group of the Protection Service. This group consists of 3 persons with University degree and 6 technicians.

The work is carried out in a chemical laboratory and in a radioactivity measurements laboratory, equipped with the instruments allowing to perform gamma and alfa spectrometry and low-level beta counting.

The following reports on the same subject have already been published:

CNI - 43 Misure di radioattività ambientale, Ispra 1958 - 59

CNI - 95 Misure di radioattività ambientale, Ispra 1960

EUR - 223i Misure di radioattività ambientale, Ispra 1961

EUR - 481i Misure di radioattività ambientale, Ispra 1962

Main object of the measurements performed is the constant knowledge of the radioactivity levels in the environment of the Euratom Ispra Establishment, in order to identify and evaluate incidental radioactive contaminations caused by the Establishment itself.

Since the beginning of the survey the data collected concern only the artificial radioactivity produced by weapons testing and natural radioactivity, both of them contributing, almost entirely, to the irradiation dose of the population in the environs. The personnel devotes itself almost completely to routine activities, yet efforts are made to improve the techniques and to test new methods, with the aim of improving the work as well from a qualitative stand point as from a quantitative one.

During 1963 the following new techniques have been adopted:

- flame photometry for the determination of potassium, calcium and strontium in different matrixes and for the determination of the chemical recoveries in the separation procedure of strontium.

- the method for the separation of cesium by means of filtration through thin ammonium phosphomolibdate layer (1).
- the spectrum stripping technique, which allows to evaluate the gamma emitting nuclides in complex gamma spectra.

The actual survey programme, in spite of its incompleteness, may by regarded as fairly satisfactory, if one considers the personnel and the means employed in it.

Efforts will be made to improve this programme in the future and to keep it always adequate to the activities of the Establishment as they will develop, in order to guarantee constantly the protection of the population in the environs against ionizing radiation, according to the Regulations and Recommendations of the European Atomic Energy Community (Euratom).

1. AIR RADIOACTIVITY.

The control of air radioactivity has been carried out by means of five stations situated on the boundary of the Establishment. Three new stations will problably begin to work during 1964.

The equipment of the stations and the measurements performed have remained those described in the last annual report.

In order to increase the quantity of radioactivity collected on the filters and to improve the representativity of the samples, the volume of filtered air has been increased adopting, up to now only in one station, a device of larger size, filtering about 600 cubic meters per day.

In tables 1 to 12 are reported the daily values of gross beta radioactivity concentrations in air measured in each station, the daily values averaged over all the stations and the montly average values. The maximum daily value, average of the stations, 32.6 pc/m^3 occurred on january 27; the same day the absolute maximum value was 37.2 pc/m^3.

In order to know the concentrations in air of the biologically important radionuclides and thus to evaluate the inhalation doses, radioactive strontium and cesium have been chemically separated from atmospheric dust samples; the concentrations of other radionuclides have been estimated by means of gamma spectrometry measurements performed directly on the filters. These measurements are judged necessary because of the large inaccuracy in estimating radionuclide concentrations by gross-beta measurements.

As the composition of the fission products mixture is fairly constant over very wide regions, provided that there are no more injections of fresh nuclear debris, the percentages of some radionuclides, found in few sites, may by considered to hold also for the other more numerous sites, where only gross-beta measurements are performed.

From measurements of single radionuclides, besides the other data, also wash-out data may be drawn, making a comparison between radionuclide concentrations in air and in rain water.

In table 13 are reported the monthly average concentrations in air of the most important radionuclides.

In figures 1a and 1b may be found the histograms of the daily average concentrations of gross beta radioactivity in air.

A plot of the monthly average concentrations of strontium-90 and cesium-137 in air during the year is reported in figure 2.

From all these data one may notice that:

i) the average concentration of strontium-90 in air during 1963 has been 5.06×10^{-14} c/m^3, value 2.4 times higher than the corresponding one of 1962 (2.1×10^{-14} c/m^3);

ii) the monthly average concentration of strontium-90 in air has been higher than the yearly average concentration during the period march-august, with a maximum of 9.6×10^{-14} c/m^3 in the month of july;

iii) the cesium-137 to strontium-90 ratio (calculated on the yearly average values) has been 1.61.

2. FALLOUT RADIOACTIVITY.

Fallout collection and measurements have continued on a monthly basis.

The 16 poliethylene pots (2.5 m^2), used up to now, have been replaced by 4 stainless steel collectors, with a total collecting area of 4 m^2 (see figure 3), obtaining thus an increased area and a more satisfactory durability (the poliethylene pots cracked after few months owing to temperature excursions).

The bottom of the collectors has always been kept covered with deionized water.

As in the past, no attempt has been made to collect separately dry fallout and wet fallout; therefore samples include both types of fallout.

2.1. Beta radioactivity.

The values of gross beta radioactivity deposited monthly at Ispra during 1963 are reported in table 14, together with the monthly average values of beta radioactivity concentrations in rain water.

It is apparent from the table that the latter values have been keeping high from march to august and reached a maximum of 2470 pc/l

in the month of may.

In figure 4 is represented the histogram of beta radioactivity monthly deposition at Ispra since february 1958 and in figure 5 the plot of the beta radioactivity cumulative deposit, calculated taking into account radioactive decay.

It must be pointed out that all the values of beta radioactivity reported here are referred to a potassium chloride standard and, therefore, they do not give the true beta activity of fission products. From measurements performed in this laboratory it results that the values found should be multiplied by a factor of 2.2 ± 0.2 to obtain the true values of fission products beta radioactivity.

2.2. Gamma spectrometry.

Gamma spectrometry measurements are performed in standard geometry, on 4g aliquots of the dry residue obtained after evaporation of the rain water.

The gamma spectrum of a fallout sample (may 1963) is reported in figure 6. It is apparent from this spectrum that, owing to its complexity, the concentrations of some radionuclides cannot be calculated directly. The spectrum stripping technique, which has been succesfully adopted in 1963, has made possible the identification and measurement of radionuclides such as cesium-137 and manganese-54. A comparison was made of the values obtained by this way with those of the same radionuclides obtained after chemical separation; the agree between the two sets of measurements has proved to be satisfactory, beeing almost for all cases within 10%.

2.3. Strontium-90 and cesium-137 in fallout.

The measurements of strontium-90 and cesium-137 deposited monthly at Ispra have been continued; the data are reported in table 14, together with the concentrations of the two radionuclides in rain water.

In figures 7 and 8 are represented the histograms of strontium-90 and cesium-137 monthly deposition at Ispra since february 1958 and the plot of strontium-90 cumulative deposit in the same period.

2.4. Other important radionuclides in fallout.

The results of the measurements of the most important radionuclides found in fallout are reported in table 15; in figure 9 are represented the per-cent contributions to fallout composition of all the measured radionuclides.

The strontium-89 to strontium-90 ratio since september 1961, date of resumption of weapon tests in the atmosphere, is represented in figure 10.

From fallout data it may seen that:

i) during 1963 the strontium-90 deposition was of 45.65 mc/Km^2, that is 3.2 times greater than that of 1962. The increase is partially due to a marked increase in the precipitation (1942 mm in 1963 against 1131 mm in 1962);

ii) the higher strontium-90 fallout rates occurred in the months of april, may, june and july; a heavy strontium-90 deposition occurred also in november in connection with abundant precipitation;

iii) the cesium-137 deposition during 1963 was of 74.75 mc/Km^2; the cesium-137 to strontium-90 ratio is thus 1.64;

iv) the strontium-89 to strontium-90 ratio has decreased from january to december from 22 to 0.3.

3. HERBAGE RADIOACTIVITY.

The measurements have been continued on the samples collected in the four sites already known: Barza, Brebbia, Ispra and Osmate; three sampling sites, i.e. Taino, Monvalle and Roccolo, have been added in 1963.

In order to intensify the survey, herbage has been collected no more in connection with harvest cuttings, but every month during the growing season.

Each sample is made up of several sub-samples, collected in different fields at each site, in order to have a good representativity.

Samples are dried to constant weight and then submitted to a gamma spectrometry measurement; on an aliquot of each sample, after ashing, are performed the chemical separations of strontium and cesium and the flame photometric determinations of calcium and potassium.

In table 16 are reported the results of the measurements, together with the values of the fresh matter to dry matter weight ratio. From these values and from the concentration values the concentrations in the fresh herbage may be calculated.

From the data in table 16 it may be seen that the average strontium-90 concentration in the herbage of the four sites near to the Establishment (Barza, Brebbia, Ispra, Osmate) has been 560 pc/g Ca (186 pc/g Ca in 1962).

Making a comparison of these values with those of the fallout in the last two years a relationship may be noticed between fallout radioactivity and herbage radioactivity. The proportionality factors, that is the strontium-90 concentrations in herbage per unity of deposited strontium-90, have been calculated and found to be: 12.5 pc/g Ca per mc/Km^2 of annual deposition and 88.5 pc/g Ca per mc/Km^2 of monthly average deposition (average calculated only on the months of the growing period).

The same calculations have been made for cesium-137 and the corresponding values are: 3.0 pc/g K and 23.3 pc/g K.

A more detailed discussion on this subject may be found elsewhere (2).

The measurements of herbage radioactivity in the environment of the Establishment have allowed to infer some factors, which are peculiar of the zone and very useful for the operation of a nuclear plant.

4. MILK RADIOACTIVITY.

For the monitoring of the milk produced in the vicinity of the Establishment, samples were collected in the dairies of the four villages: Barza, Brebbia, Ispra, Osmate and, moreover, for comparison purposes, in the two milk supply stations of Varese and Milano.

Two samples of one liter have been collected weekly and the measurements have been performed on the pooled monthly samples.

Milk is dried, ground and then submitted to gamma spectrometry, by which cesium-137 and potassium are determined.

On an aliquot of the sample, after ashing, are performed the chemical separations of strontium and cesium and the determinations of calcium and potassium by flame photometry.

In tables 17 to 22 the data obtained are reported.

A plot of strontium-90 in the milk of Ispra (average values of the four sampling sites) and in that of Milano since january 1960 is reported in figure 11.

A discussion on strontium-90 and cesium-137 concentrations in milk and on the relationships with herbage contamination and fallout rate is the subject of two papers (2) (3), in which more details may be found.

5. STRONTIUM-90 AND CESIUM-137 IN DAIRY PRODUCTS.

The series of measurements of cheese radioactivity, started in 1962, have been continued with two groups of samples, purchased on the market.

The results of the measurements are reported in table 23.

6. RADIOACTIVITY OF SURFACE WATERS.

6.1. Beta radioactivity.

The measurements of the radioactivity of lakes, streams, wells and tapwater have been carried out with sampling rate and techniques unchanged with respect to 1962.

The dislocation of water sampling points is represented in the map of figure 12 and the geographic coordinates of the points may be found in table 24.

In tables 25 and 26 are reported the values of the concentrations of beta radioactivity subtracted potassium-40.

6.2. Strontium-90, cesium-137 and other radionuclides in lake water.

The quarterly measurements of the concentrations of strontium-90, cesium-137 and other radionuclides as well as of potassium, calcium and strontium have been continued during 1963, owing to the great importance of these measurements in the study of the dispersion into the environment of radioactive products, which could be present in the water discharged from the Establishment.

By the gamma spectrometry measurements on the dry residue two more radionuclides, i. e. manganese-54 and antimony-125, have been identified and measured.

The concentrations of strontium-90, cesium-137, calcium and potassium are reported in table 27; those of the other measured radionuclides may be found in table 28.

Making a comparison between strontium-90 values in lake water with those in rain water, it may be calculated that, during 1963, the average ratio of the former to the latter was 0.06 for the lake "Maggiore" and 0.23 for the lake "Monate".

7. STRONTIUM-90, STRONTIUM-89 AND CESIUM-137 IN LAKE FISHES.

As in the past years strontium-90 and cesium-137 in the fishes of the four lakes near to the Establishment have been measured.

The gamma spectrometry measurement of cesium after chemical separation has been added to that performed by direct gamma spectrometry.

The data of the concentrations of strontium-90, strontium-89, cesium-137, calcium and potassium are reported in tables 29 to 32.

8. STRONTIUM-90 AND STRONTIUM-89 IN ANIMAL BONES.

During 1963 bone samples (femour) of 28 calves, most about two months old and milk-fed, have been collected and measured in order to obtain information concerning strontium-90 transfer from the diet to the skeleton of these animals.

The concentrations of strontium-90, strontium-89 and calcium in bones are reported in table 33. It may be noticed that the values of 1963 are higher than those of 1962 by a factor of about 2.

9. STRONTIUM-90 AND CESIUM-137 IN VEGETABLES.

Sampling of vegetables have continued at the market of Milano, where agricultural products are pouring from the most important production zones of Italy.

Each sample, dried and ground, has been submitted to gamma spectrometry measurement; the chemical separations, as well as calcium and potassium determinations, have been performed only on the yearly pooled samples of each species.

The results of the measurements are reported in table 34.

The authors thank all the members of the site survey group, whose technical co-operation has allowed the realization of this report, and particularly Mr. E. Pecchio for the chemical separations.

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To be published.

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CONCENTRATIONS OF GROSS BETA RADIOACTIVITY IN AIR AT ISPRA

JANUARY 1963

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value pc/m^3	Precipitation mm
1	4.50	4.33	3.96	4.12	3.63	4.10	2.4
2	4.92	5.68	4.40	4.58	5.11	4.93	6.4
3	1.17	1.38	1.37	1.17	1.44	1.30	36.6
4	1.63	1.00	1.40	1.07	1.92	1.40	5.0
5	4.92	4.40	4.40	4.07	4.10	4.37	6.8
6	-	4.52	4.56	4.50	5.64	4.80	2.4
7	4.38	4.74	4.16	3.70	3.85	4.16	5.0
8	4.68	5.30	4.80	4.25	4.68	4.74	
9	6.76	7.48	6.72	-	7.00	6.99	
10	8.55	11.05	8.55	8.00	8.00	8.83	2.2
11	6.00	6.34	6.80	6.32	6.36	6.36	1.6
12	5.70	6.20	5.72	5.72	5.94	5.85	2.0
13	8.10	8.40	7.60	7.76	7.84	7.94	
14	12.75	14.90	13.75	12.60	20.30	14.86	
15	9.25	9.60	9.60	9.85	12.25	10.11	
16	9.20	7.00	6.44	6.20	6.85	7.13	
17	6.28	8.10	7.56	5.74	7.80	7.09	
18	8.00	9.00	10.16	8.00	9.30	8.89	
19	7.70	8.70	8.34	7.52	8.20	8.09	
20	5.70	5.86	5.32	5.40	5.04	5.46	
21	9.00	9.20	9.20	8.10	11.80	9.46	
22	7.05	6.64	-	6.20	6.04	6.48	
23	8.60	8.85	-	8.10	8.30	8.46	
24	9.50	9.80	-	9.00	9.30	9.40	
25	14.30	12.20	-	11.00	12.20	12.42	
26	14.75	15.80	-	14.30	14.40	14.81	
27	37.20	32.00	-	29.00	32.00	32.55	
28	16.20	21.80	-	18.65	17.70	18.58	
29	10.50	12.00	-	11.55	10.40	11.11	
30	7.68	8.45	-	7.68	8.00	7.95	
31	10.30	10.80	-	9.80	10.40	10.32	
Av. value	8.84	9.08	6.41	8.13	8.89	8.66	
Min. value	1.17	1.00	1.37	1.07	1.44	1.30	
Max. value	37.20	32.00	13.75	29.00	32.00	32.55	
Total precipit.							70.4

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY IN AIR AT ISPRA

FEBRUARY 1963

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value pc/m^3	Precipitation mm
1	9.20	8.45	-	8.00	8.30	8.48	
2	7.60	7.60	-	7.48	7.88	7.64	
3	9.40	9.55	-	8.30	6.92	8.54	0.2
4	8.40	9.20	-	8.30	9.05	8.73	
5	10.25	10.60	-	9.30	9.10	9.81	
6	12.00	12.35	-	10.30	11.25	11.47	
7	10.30	12.05	-	10.70	10.90	10.98	
8	11.50	12.70	12.00	11.10	10.85	11.63	
9	14.85	14.60	16.25	15.20	13.90	14.96	
10	11.55	12.95	12.65	12.40	11.10	12.13	
11	5.40	6.96	5.56	6.16	5.96	6.00	28.2
12	2.45	2.54	2.56	2.42	2.30	2.45	0.6
13	3.20	3.42	3.35	2.88	3.00	3.17	
14	5.00	5.16	4.68	4.50	4.84	4.83	
15	3.75	4.06	2.80	3.85	3.55	3.60	
16	4.20	3.90	4.00	3.45	3.78	3.86	3.8
17	-	3.37	3.17	3.13	3.00	3.16	
18	3.60	4.28	3.73	3.77	3.61	3.79	
19	3.09	3.06	2.95	2.93	2.64	2.93	
20	3.12	3.80	3.27	3.33	2.81	3.26	
21	6.34	7.14	6.24	6.34	6.06	6.42	
22	4.88	5.38	4.68	4.44	4.70	4.81	3.4
23	7.24	7.84	7.52	6.04	6.90	7.10	
24	7.80	8.40	7.90	7.50	7.86	7.89	
25	8.00	8.90	7.64	7.45	6.95	7.78	
26	9.00	9.15	8.95	8.50	8.55	8.83	
27	8.65	9.20	8.90	9.14	9.14	9.00	
28	19.20	20.40	18.50	18.20	17.80	18.82	
Av. value	7.77	8.10	7.01	7.32	7.23	7.57	
Min. value	2.45	2.54	2.56	2.42	2.30	2.45	
Max. value	19.20	20.40	18.50	18.20	17.80	18.82	
Total precipit.							35.2

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

MARCH 1963

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value pc/m^3	Precipitation mm
1	16.80	18.55	16.80	18.05	16.20	17.28	
2	16.45	20.00	16.65	16.70	15.25	17.01	
3	16.00	16.75	16.10	14.80	15.50	15.83	
4	15.40	16.05	15.15	15.00	14.00	15.12	
5	14.30	14.85	14.16	13.25	12.60	13.83	
6	14.00	14.00	13.40	12.00	9.90	12.66	
7	12.30	13.10	12.70	11.40	11.30	10.16	
8	12.00	11.65	10.10	10.60	10.20	10.91	
9	9.40	10.20	9.25	9.10	9.22	9.43	
10	1.49	1.51	1.31	1.40	1.28	1.39	8.2
11	1.66	1.48	1.33	-	1.32	1.44	16.8
12	2.16	2.22	1.99	1.82	1.89	1.97	1.0
13	5.34	5.78	5.00	5.46	5.30	5.37	
14	8.20	8.10	7.48	7.16	7.22	7.63	
15	7.17	7.90	7.08	6.32	6.52	6.99	
16	6.10	6.00	5.95	5.68	5.52	5.97	
17	6.92	7.04	6.84	7.03	6.50	6.86	
18	4.20	4.84	4.40	4.42	4.44	4.46	
19	4.65	5.38	4.56	4.64	4.58	4.76	
20	1.77	1.61	1.52	1.58	1.53	1.60	39.2
21	5.42	6.60	5.60	4.72	5.14	5.49	4.6
22	4.62	4.82	4.54	4.18	4.33	4.49	
23	4.18	4.36	4.00	4.16	3.63	4.06	
24	8.40	8.40	7.75	7.87	7.70	8.02	
25	9.75	11.35	10.05	9.25	9.50	9.98	
26	10.60	11.35	10.60	10.80	10.10	10.69	
27	11.40	12.10	11.30	11.50	10.80	11.42	
28	7.48	8.55	7.70	6.40	6.44	7.31	
29	7.32	7.80	7.00	7.16	6.70	7.19	7.4
30	5.60	5.24	5.50	5.53	4.90	5.35	33.4
31	8.20	8.20	7.60	8.05	7.60	7.93	
Av. value	8.36	8.91	8.17	8.19	7.64	8.14	
Min. value	1.49	1.48	1.31	1.40	1.28	1.39	
Max. value	16.80	20.00	16.80	18.05	16.20	17.28	
Total precipit.							110.6

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY IN AIR AT ISPRA

APRIL 1963

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value pc/m^3	Precipitation mm
1	8.00	8.80	8.10	7.90	7.50	8.06	
2	12.00	13.00	12.20	12.30	12.20	12.34	
3	6.18	6.56	6.10	6.10	6.12	6.21	
4	4.83	5.70	4.94	5.50	5.22	5.23	9.2
5	7.84	8.40	7.90	7.74	-	7.97	6.4
6	4.30	4.20	4.18	3.87	3.80	4.07	44.8
7	2.93	3.33	3.08	3.02	3.04	3.08	9.2
8	4.72	5.00	4.65	4.56	4.36	4.65	
9	3.62	3.66	4.76	3.78	3.40	3.84	7.8
10	0.75	0.78	0.70	0.77	0.65	0.73	35.2
11	0.10	0.09	0.09	0.09	0.10	0.09	45.4
12	4.94	5.45	4.76	4.95	4.60	4.94	
13	7.10	7.56	7.30	7.26	7.06	7.25	
14	13.60	14.40	12.90	13.20	12.25	13.27	0.8
15	12.40	13.00	12.25	11.50	11.05	12.04	
16	11.25	12.45	11.35	11.10	10.85	11.40	
17	9.40	9.90	9.20	9.50	8.60	9.32	5.8
18	0.49	0.50	0.54	0.47	0.46	0.49	35.2
19	2.75	2.98	2.71	2.67	2.54	2.73	4.0
20	8.90	9.60	9.00	9.00	8.40	8.98	
21	12.70	13.40	12.45	12.60	11.50	12.53	0.4
22	12.00	12.35	11.50	11.75	10.85	11.69	
23	5.75	6.20	5.62	5.98	5.48	5.80	7.6
24	7.56	7.92	-	6.65	6.40	7.13	
25	6.64	7.20	6.68	6.65	5.82	6.59	1.6
26	6.14	6.62	6.34	5.80	5.74	6.12	15.0
27	9.10	9.65	9.25	8.50	8.10	8.92	
28	11.80	11.80	11.50	11.35	11.00	11.49	
29	10.90	11.10	10.90	10.65	9.70	10.65	
30	11.35	12.00	11.40	11.20	11.25	11.44	
Av. value	7.33	7.78	7.32	7.21	6.82	7.30	
Min. value	0.10	0.09	0.09	0.09	0.10	0.09	
Max. value	13.60	14.40	12.90	13.20	12.25	13.27	
Total precipit.							228.4

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY IN AIR AT ISPRA

MAY 1963

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value pc/m^3	Precipitation mm
1	12.00	11.60	11.20	11.90	11.20	11.58	6.2
2	8.50	8.60	8.15	8.95	-	8.55	40.0
3	5.26	5.60	5.50	5.56	-	5.48	38.4
4	3.80	3.60	3.26	-	3.15	3.45	
5	8.85	9.55	8.70	8.75	8.00	8.77	
6	7.82	8.20	7.60	7.96	6.90	7.69	
7	7.86	8.30	8.00	7.82	6.84	7.76	
8	10.00	10.20	10.30	9.30	9.10	9.78	
9	-	7.80	7.16	7.70	7.00	7.41	8.2
10	6.86	7.28	6.76	6.64	6.06	6.72	5.4
11	3.42	3.41	3.24	3.20	3.09	3.27	19.0
12	9.60	9.85	9.65	9.60	9.14	9.56	
13	10.00	10.30	9.92	9.92	9.40	9.90	
14	8.25	8.35	7.80	8.30	8.00	8.14	29.6
15	4.05	3.90	3.97	4.08	3.72	3.94	1.2
16	1.75	1.84	1.81	1.79	1.80	1.79	0.2
17	7.20	7.12	7.04	6.60	6.25	6.84	
18	7.88	7.90	7.80	7.40	6.65	7.52	
19	12.80	13.15	12.40	12.90	11.80	12.61	13.6
20	7.28	6.92	6.84	6.85	6.30	6.83	
21	6.92	6.86	7.00	6.48	6.13	6.67	
22	7.58	7.30	7.20	7.08	6.56	7.14	
23	8.90	8.85	8.76	8.76	8.25	8.70	
24	14.40	14.00	14.15	14.00	12.50	13.81	
25	11.40	11.40	10.95	10.98	9.90	10.92	
26	-	9.10	9.10	8.70	8.50	8.85	
27	8.50	8.75	8.50	8.40	7.72	8.37	
28	9.55	9.60	9.20	9.20	8.75	9.26	0.4
29	9.70	9.25	9.20	9.40	8.50	9.21	4.0
30	12.70	13.20	12.90	12.80	11.90	12.70	3.2
31	10.80	10.90	10.50	10.60	9.90	10.54	0.6
Av. value	8.40	8.47	8.21	8.38	7.69	8.18	
Min. value	1.75	1.84	1.81	1.79	1.80	1.79	
Max. value	14.40	14.00	14.15	14.00	12.50	13.81	
Total precipit.							170.0

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY IN AIR AT ISPRA

JUNE 1963

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value pc/m^3	Precipitation mm
1	9.85	10.10	9.60	10.05	8.90	9.70	8.2
2	11.96	11.60	11.20	11.70	10.20	11.33	0.2
3	8.75	8.30	7.80	8.05	7.14	8.00	3.6
4	1.37	1.44	1.33	1.36	1.36	1.37	40.6
5	4.62	4.60	4.28	4.60	4.18	4.45	26.4
6	6.74	7.04	6.48	6.36	5.60	6.44	8.6
7	5.36	5.50	5.09	5.46	5.00	5.28	10.8
8	1.66	1.78	1.54	1.68	1.49	1.63	7.0
9	3.00	4.14	3.97	3.73	3.47	3.66	0.2
10	8.20	8.65	7.85	7.36	6.65	7.74	8.2
11	6.60	6.50	6.36	6.30	6.05	6.36	0.2
12	5.48	5.56	5.20	5.40	4.90	5.30	0.4
13	6.68	6.70	6.52	6.55	5.76	6.44	11.0
14	3.70	3.87	3.62	3.72	3.04	3.59	55.0
15	6.68	6.92	6.44	6.34	5.44	6.36	0.8
16	-	4.84	4.65	4.64	4.28	4.60	
17	3.95	3.91	3.86	3.54	3.06	3.66	
18	6.52	6.50	6.44	6.32	5.60	6.27	
19	15.70	15.00	14.65	14.80	13.20	14.67	
20	16.05	15.70	15.50	15.00	13.30	15.11	0.2
21	8.05	7.70	-	6.80	6.40	7.23	
22	9.45	8.10	8.55	8.55	7.04	8.33	1.2
23	4.52	4.42	4.45	4.36	3.92	4.33	1.2
24	-	6.56	6.00	6.26	5.73	6.13	14.8
25	1.93	1.77	1.70	1.86	1.66	1.78	51.0
26	6.88	7.10	6.80	6.40	6.00	6.63	
27	8.70	9.10	9.00	8.60	8.10	8.70	
28	8.55	8.60	8.45	8.80	7.80	8.44	16.4
29	12.50	12.25	12.45	12.05	11.20	12.09	
30	18.10	17.80	17.40	17.40	16.00	17.34	1.0
Av. value	7.55	7.40	7.14	7.13	6.41	7.09	
Min. value	1.37	1.44	1.33	1.36	1.36	1.37	
Max. value	18.10	17.80	17.40	17.40	16.00	17.34	
Total precipit.							268.4

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

JULY 1963

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value pc/m^3	Precipitation mm
1	14.40	15.05	14.10	13.35	12.80	13.94	
2	16.25	15.70	15.00	15.50	14.30	15.35	
3	12.30	11.60	11.70	11.50	10.80	11.58	4.6
4	8.45	10.40	10.10	10.30	9.50	9.75	0.2
5	5.80	6.00	5.76	5.70	5.22	5.69	52.6
6	7.20	7.60	7.20	6.80	6.30	7.02	
7	8.30	8.10	8.30	8.35	7.50	8.11	
8	8.60	8.85	8.55	8.40	7.52	8.38	2.6
9	5.90	5.88	5.66	5.16	4.90	5.50	
10	7.80	7.52	7.52	7.20	6.70	7.34	16.8
11	8.40	8.80	8.50	8.70	7.80	8.44	
12	6.56	6.50	6.40	6.50	5.84	6.36	3.2
13	5.50	5.60	5.54	5.57	5.40	5.52	41.2
14	9.20	8.90	8.95	8.50	7.60	8.63	
15	10.30	10.10	10.10	9.45	9.10	9.81	
16	10.40	10.30	10.20	9.50	9.10	9.90	
17	6.66	6.14	6.08	7.05	7.00	6.58	
18	10.20	9.94	9.70	9.30	8.80	9.58	77.2
19	8.90	8.80	8.65	8.70	7.55	8.52	
20	12.30	12.50	13.60	11.75	11.10	12.25	0.2
21	15.70	15.00	15.00	14.65	14.00	14.87	
22	13.10	12.90	12.45	12.75	11.30	12.50	
23	8.90	8.45	8.30	8.40	7.67	8.34	6.0
24	8.95	8.55	8.45	8.35	7.80	8.42	
25	8.85	8.60	8.50	8.40	7.28	8.32	
26	6.28	6.26	6.08	6.04	5.43	6.01	0.4
27	7.72	7.74	7.47	7.50	6.40	7.36	1.2
28	7.76	7.65	7.48	7.32	6.40	7.32	0.4
29	8.95	8.50	8.40	8.08	7.10	8.20	4.4
30	10.05	10.03	10.05	9.25	8.35	9.54	
31	7.44	6.90	7.00	6.56	6.10	6.80	
Av. value	9.26	9.18	9.05	8.85	8.15	8.90	
Min. value	5.50	5.60	5.54	5.16	4.90	5.50	
Max. value	16.25	15.70	15.00	15.50	14.30	15.35	
Total precipit.							211.0

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

AUGUST 1963

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value pc/m^3	Precipitation mm
1	8.00	8.00	8.15	8.05	7.36	7.91	
2	11.45	11.55	11.55	10.95	10.20	11.14	
3	13.10	13.10	12.80	12.25	11.70	12.59	0.2
4	11.90	12.00	11.85	12.00	11.10	11.77	9.8
5	12.70	12.30	12.75	13.00	11.65	12.48	
6	9.45	9.64	9.60	10.00	9.25	9.58	12.2
7	-	6.74	6.60	6.62	6.08	6.51	8.4
8	5.35	5.36	5.32	5.17	4.68	5.17	
9	6.20	6.78	6.48	6.24	6.00	6.34	0.4
10	8.80	9.00	8.90	8.30	8.05	8.61	
11	7.60	7.20	7.16	6.90	6.36	7.04	
12	3.30	3.28	3.40	3.34	3.00	3.26	7.8
13	2.05	2.16	2.10	2.00	1.86	2.03	16.8
14	3.95	3.90	4.05	3.80	3.45	3.83	14.8
15	3.06	3.17	3.15	3.26	2.93	3.11	4.6
16	3.33	3.33	3.15	3.28	3.00	3.21	
17	3.14	3.47	3.30	3.23	3.10	3.24	26.0
18	2.66	2.72	2.60	2.61	2.40	2.59	
19	3.42	3.52	3.46	3.20	3.17	3.35	
20	3.81	3.75	3.77	-	3.50	3.70	1.8
21	2.45	2.42	-	-	2.03	2.30	0.4
22	2.16	2.28	2.32	-	1.79	2.13	0.2
23	2.69	2.55	2.50	-	2.27	2.50	
24	2.66	2.55	2.50	-	2.30	2.50	0.2
25	2.88	3.06	2.85	-	2.35	2.78	0.2
26	3.63	3.73	3.60	-	3.26	3.55	0.2
27	1.34	1.12	1.28	1.22	1.10	1.21	0.6
28	2.15	2.22	2.09	2.14	1.84	2.08	
29	4.16	3.85	4.28	4.22	3.76	4.05	
30	5.20	5.52	5.00	4.84	4.46	5.00	
31	6.44	6.52	6.06	6.44	6.02	6.29	
Av. value	5.30	5.38	5.42	5.96	4.83	5.22	
Min. value	1.34	1.12	1.28	1.22	1.10	1.21	
Max. value	13.10	13.10	12.80	13.00	11.70	12.59	
Total precipit.							104.6

CONCENTRATIONS OF CROSS BETA RADIOACTIVITY IN AIR AT ISPRA SEPTEMBER 1963

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value pc/m^3	Precipitation mm
1	2.56	2.58	2.58	2.42	2.18	2.46	40.8
2	1.62	1.55	1.46	1.45	1.38	1.49	34.0
3	4.45	4.64	4.36	4.56	4.17	4.43	
4	4.72	4.66	4.28	4.56	-	4.55	2.4
5	0.73	0.66	0.65	0.60	0.52	0.63	46.4
6	1.41	1.55	1.42	1.49	1.12	1.39	30.0
7	1.64	1.57	1.49	1.46	1.30	1.49	18.8
8	1.38	1.40	1.26	1.29	1.12	1.29	
9	1.49	1.22	1.38	1.28	1.05	1.28	0.2
10	1.53	1.46	1.48	1.08	1.24	1.35	
11	2.07	2.16	2.06	1.51	1.41	1.84	0.2
12	2.70	2.66	2.66	2.76	2.34	2.62	0.2
13	3.06	3.00	3.00	3.00	2.62	2.93	0.2
14	2.98	3.05	3.04	2.86	2.47	2.88	
15	2.86	2.87	2.86	2.72	2.30	2.72	0.2
16	3.47	3.17	3.31	3.15	3.00	3.22	0.4
17	4.08	4.50	4.28	4.10	3.58	4.10	
18	3.12	3.00	2.80	2.82	2.36	2.82	3.0
19	1.96	2.03	1.92	1.94	1.68	1.90	11.6
20	0.64	0.52	0.60	0.50	0.50	0.55	6.0
21	0.92	0.94	0.86	0.78	0.66	0.83	
22	0.86	0.86	0.79	0.68	0.64	0.76	0.2
23	1.45	1.40	1.27	1.15	1.10	1.27	0.2
24	1.65	1.72	1.56	1.59	1.43	1.59	9.4
25	4.16	4.09	4.00	3.88	3.88	4.00	1.2
26	5.90	6.14	5.68	5.32	5.00	5.60	
27	4.44	4.44	4.28	4.24	3.52	4.18	
28	3.57	3.55	3.40	2.73	2.55	3.16	0.4
29	3.40	3.25	3.07	2.93	2.59	3.05	0.4
30	3.54	3.57	3.46	3.40	3.15	3.42	0.2
Av. value	2.61	2.60	2.50	2.40	2.09	2.46	
Min. value	0.64	0.52	0.60	0.50	0.50	0.55	
Max. value	5.90	6.14	5.68	5.32	5.00	5.60	
Total precipit.							206.4

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY IN AIR AT ISPRA

OCTOBER 1963

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value pc/m^3	Precipitation mm
1	3.60	3.64	3.31	2.86	3.22	3.32	
2	1.58	1.48	1.42	1.20	1.28	1.39	49.8
3	0.14	0.14	0.12	0.14	0.13	0.13	16.4
4	0.70	0.74	0.74	0.66	0.58	0.68	
5	2.46	2.50	2.56	2.44	2.00	2.39	0.4
6	1.00	1.06	1.12	0.85	0.90	0.98	
7	0.38	0.40	0.38	0.22	0.22	0.32	1.2
8	2.14	2.16	2.11	2.00	1.94	2.07	0.4
9	3.32	3.14	3.22	3.12	2.82	3.12	0.2
10	2.90	2.76	2.68	1.70	2.14	2.43	0.2
11	2.28	2.36	2.32	-	1.78	2.18	0.2
12	2.14	2.26	2.18	-	2.00	2.14	0.2
13	2.50	2.34	2.32	-	2.00	2.29	0.4
14	2.57	2.74	2.55	-	2.24	2.52	
15	3.94	3.76	3.52	-	3.04	3.56	0.2
16	4.80	4.74	4.36	-	3.62	4.38	0.4
17	3.76	3.62	3.43	-	2.74	3.38	
18	2.90	2.76	2.90	-	2.00	2.64	0.4
19	3.67	3.86	3.54	-	3.02	3.52	0.2
20	3.42	3.50	3.20	-	2.17	3.07	0.2
21	2.68	2.32	2.43	-	1.56	2.24	0.4
22	2.54	2.60	2.57	-	1.31	2.25	0.2
23	2.55	2.37	2.33	-	1.47	2.18	0.4
24	2.64	2.56	2.73	-	2.17	2.52	0.2
25	3.07	3.42	3.12	-	2.75	3.09	
26	1.41	1.43	1.39	-	1.00	1.30	
27	1.84	1.78	1.93	-	1.36	1.72	0.2
28	1.66	1.40	1.56	-	0.97	1.39	
29	1.95	1.80	2.00	-	1.10	1.71	
30	1.68	1.47	1.60	-	0.74	1.37	0.2
31	0.62	0.57	0.60	-	0.61	0.60	27.2
Av. value	2.34	2.31	2.26	1.51	1.77	2.15	
Min. value	0.14	0.14	0.12	0.14	0.13	0.13	
Max. value	4.80	4.74	4.36	3.12	3.62	4.38	
Total precipit.							99.6

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY IN AIR AT ISPRA

NOVEMBER 1963

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value pc/m^3	Precipitation mm
1	0.03	0.03	0.04	-	0.03	0.03	47.4
2	0.44	0.45	0.38	-	0.39	0.41	14.8
3	0.07	0.07	0.06	-	0.08	0.07	36.4
4	0.16	0.13	0.15	-	0.13	0.14	52.2
5	0.44	0.44	0.39	-	0.36	0.40	78.4
6	0.53	0.52	0.47	-	0.40	0.48	37.4
7	0.52	0.58	0.47	-	0.50	0.51	11.2
8	1.30	1.24	1.21	1.09	1.22	1.21	0.2
9	1.57	1.59	2.68	1.37	1.51	1.74	
10	1.20	1.05	1.12	1.21	1.10	1.13	5.2
11	0.20	0.07	0.07	0.02	0.06	0.08	2.8
12	0.64	0.53	0.52	0.25	0.38	0.46	2.6
13	1.65	1.48	1.56	1.03	1.46	1.43	0.2
14	1.53	1.47	1.42	2.00	1.46	1.57	
15	0.73	0.66	0.68	0.70	0.68	0.69	14.0
16	0.14	0.14	0.17	0.14	0.16	0.15	17.8
17	1.90	1.85	1.86	1.66	1.75	1.80	0.4
18	2.16	2.29	2.12	2.00	2.05	2.12	
19	2.30	2.34	2.32	2.16	2.15	2.25	
20	1.92	1.95	1.91	1.74	1.81	1.86	
21	1.20	1.26	1.12	1.08	1.14	1.16	
22	1.30	1.22	1.28	1.10	1.25	1.23	
23	1.37	1.45	1.48	1.86	1.30	1.49	
24	1.35	1.36	1.36	1.21	1.08	1.27	
25	0.36	0.26	0.29	0.29	0.34	0.30	21.4
26	0.56	0.64	0.67	0.51	0.63	0.60	12.8
27	2.75	2.73	2.52	2.43	2.57	2.60	11.8
28	0.82	0.81	0.78	0.78	0.79	0.79	4.0
29	0.52	0.55	0.56	0.55	0.54	0.54	
30	0.39	0.39	0.38	0.31	0.34	0.36	
Av. value	1.00	0.98	1.00	1.10	0.92	0.96	
Min. value	0.03	0.03	0.04	0.02	0.03	0.03	
Max. value	2.75	2.73	2.52	2.43	2.57	2.60	
Total precipit.							371.0

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY IN AIR AT ISPRA

DECEMBER 1963

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value pc/m^3	Precipitation mm
1	0.56	0.50	0.46	0.29	0.32	0.42	
2	1.15	1.07	1.15	1.09	1.04	1.10	
3	0.64	0.54	0.46	0.56	0.62	0.56	16.4
4	0.05	0.01	-	-	-	0.03	24.6
5	0.24	0.20	0.20	0.26	0.26	0.23	
6	0.84	0.90	0.83	0.76	0.83	0.83	12.4
7	1.46	1.43	1.50	1.27	1.45	1.42	
8	1.54	1.52	1.60	1.82	1.49	1.59	
9	2.42	2.77	2.60	2.48	2.50	2.55	
10	3.48	3.42	3.42	3.40	3.50	3.44	
11	4.08	3.95	3.90	3.82	3.95	3.94	
12	3.12	2.84	3.06	2.38	2.90	2.86	
13	1.67	1.70	1.63	1.16	1.55	1.54	
14	1.08	1.01	0.90	0.97	0.97	0.98	
15	1.50	1.40	1.50	1.00	1.24	1.32	
16	-	2.20	2.48	2.49	2.14	2.32	
17	1.91	1.16	1.18	0.93	1.30	1.29	
18	1.79	1.72	1.77	1.36	1.94	1.71	
19	2.24	1.96	2.12	1.97	1.73	2.00	
20	2.58	2.50	2.47	2.43	2.43	2.48	0.6
21	1.93	1.91	1.75	1.80	1.64	1.80	
22	1.56	1.53	1.55	1.16	1.33	1.42	0.6
23	1.39	1.52	1.45	1.24	1.32	1.38	
24	1.46	1.47	1.46	1.45	1.50	1.46	
25	0.90	1.05	0.93	0.80	0.93	0.92	5.4
26	0.50	0.54	0.50	0.50	0.50	0.50	
27	0.66	0.62	0.62	0.52	0.57	0.59	
28	1.26	1.23	1.24	1.08	1.07	1.17	
29	2.09	2.14	2.08	1.68	1.94	1.98	
30	2.16	2.08	2.16	1.85	2.10	2.07	
31	2.48	2.30	2.32	1.87	2.10	2.21	
Av. value	1.62	1.58	1.64	1.47	1.57	1.55	
Min. value	0.05	0.01	0.20	0.26	0.26	0.03	
Max. value	4.08	3.95	3.90	3.82	3.95	3.94	
Total precipit.							60.0

MONTHLY AVERAGE CONCENTRATIONS OF RADIONUCLIDES IN AIR (pc/m^3)

1963

Month	Gross beta	Sr^{89}	Sr^{90}	Cs^{137}	$Zr^{95} + Nb^{95}$	Ce^{141}	Ce^{144}	Ru^{103}	Ru^{106}
January	8.7	0.47	0.022	0.043	2.9	0.55	0.70	0.70	0.58
February	7.6	0.77	0.037	0.065	3.2	0.52	0.90	0.57	0.70
March	8.1	0.76	0.051	0.091	3.6	0.33	1.2	0.39	1.1
April	7.3	0.64	0.061	0.11	3.4	0.20	1.2	0.31	1.1
May	8.2	0.56	0.077	0.14	3.6	0.16	1.5	0.22	1.2
June	7.1	0.38	0.079	0.14	3.0	0.10	1.5	0.13	1.2
July	8.9	0.21	0.096	0.14	2.2	0.05	1.3	0.07	0.73
August	5.2	0.11	0.070	0.090	1.1	0.02	1.4	0.04	0.50
September	2.5	0.031	0.033	0.045	0.45	u.	0.67	u.	0.22
October	2.2	0.026	0.031	0.047	0.28	u.	0.55	u.	0.22
November	0.96	0.008	0.017	0.022	0.11	u.	0.32	u.	0.11
December	1.5	0.009	0.033	0.045	0.14	u.	0.53	u.	0.18

u. = Undetectable.

GROSS BETA RADIOACTIVITY, STRONTIUM-90, CESIUM-137 IN FALLOUT

1963

Month	Gross beta K^{40} equivalent			Strontium-90		Cesium-137		Precipitation	Days with
	$mc/Km^{2(x)}$	$mc/Km^{2(xx)}$	$pc/l^{(x)}$	mc/Km^2	pc/l	mc/Km^2	pc/l	mm	precipitation
January	49	41	690	0.36	5.1	0.48	6.8	70.6	10
February	25	21	690	0.22	6.1	0.37	10.2	36.2	5
March	160	140	1 420	1.9	16.9	3.2	28.5	112.4	7
April	370	340	1 620	6.5	28.5	9.7	42.5	228.4	15
May	420	390	2 470	7.8	45.9	12	70.6	170.0	14
June	390	350	1 450	8.3	30.9	15	55.9	268.4	22
July	310	300	1 470	8.5	40.2	14	66.2	211.4	13
August	180	170	1 720	3.4	32.5	6.1	58.3	104.6	12
September	130	120	620	3.5	16.8	6.0	28.8	208.4	12
October	26	25	260	0.72	7.2	1.1	11.0	99.6	5
November	140	130	380	4.1	11.1	6.2	16.7	371.0	16
December	13	12	220	0.35	5.8	0.6	10.0	60.0	6
Total				45.65		74.75		1941.0	

(x) = Values in this column are extrapolated to last day of collection month.

(xx) = Values in this column are extrapolated to midpoint of next month.

RADIONUCLIDES IN FALLOUT

(mc/Km^2)*

1963

Month	Sr^{89}	$Zr^{95} + Nb^{95}$	Ru^{103}	Ru^{106}	Ce^{141}	Ce^{144}	Mn^{54}	Sb^{125}
January	7.9	38	7.5	7.5	6.6	9.1	0.8	-
February	3.8	17	2.7	5.0	2.6	6.4	0.5	-
March	23	110	14	39	11	44	4.5	-
April	54	310	24	96	15	110	16	-
May	45	290	15	106	11	130	18	-
June	34	260	7.3	105	5.7	134	22	-
July	19	156	4.8	85	2.8	130	20	2.2
August	5.5	54	1.1	34	0.6	64	8.6	1.0
September	3.3	44	0.5	30	0.2	58	7.0	1.0
October	0.6	7.1	u.	5.4	u.	10	1.3	0.2
November	2.0	22	0.1	22	u.	50	6.5	1.2
December	0.1	2.0	u.	2.8	u.	6.5	0.6	0.1

* = Values are extrapolated to last day of collection month.
u. = Undetectable.
- = Measurement not performed.

STRONTIUM-90, STRONTIUM-89 AND CESIUM-137 IN HERBAGE(*)

1963

Sampling site	Sampling date	R(**)	Sr^{89} pc/g	Sr^{90} pc/g	Ca mg/g	Sr^{90} pc/g Ca	Cs^{137} pc/g	K mg/g	Cs^{137} pc/g K
Barza	20-5	4.68	33	6.5	16.7	390	4.8	28.0	170
Ispra	20-5	6.22	34	8.4	14.1	600	7.6	36.5	210
Brebbia	20-5	3.14	19	3.8	4.6	820	4.3	30.0	140
Osmate	20-5	4.66	28	6.1	8.9	680	4.9	31.0	160
Monvalle	20-5	5.17	22	5.1	9.9	510	6.6	24.3	270
Taino	20-5	4.94	17	3.4	11.9	280	3.8	28.5	130
Roccolo	20-5	5.26	13	2.8	9.3	300	5.5	38.0	140
Barza	20-6	7.66	13	4.1	14.8	280	3.1	24.4	130
Brebbia	20-6	7.60	25	6.7	13.0	520	4.5	40.0	110
Ispra	20-6	6.62	8	2.5	10.6	240	9.8	28.0	350
Monvalle	20-6	6.50	19	5.3	11.4	470	5.6	31.5	180
Osmate	20-6	6.42	10	2.6	8.8	300	4.5	34.0	130
Taino	20-6	7.80	4.8	1.5	8.3	180	5.8	31.2	190
Roccolo	20-6	5.72	26	7.4	11.7	630	5.5	29.5	190

(*) = Values are given per weight unity of dry matter.

(**) = Weight ratio of fresh matter to dry matter.

STRONTIUM-90, STRONTIUM-89 AND CESIUM-137

IN HERBAGE(*)

1963

Sampling site	Sampling date	R(**)	Sr^{89} pc/g	Sr^{90} pc/g	Ca mg/g	Sr^{90} pc/g Ca	Cs^{137} pc/g	K mg/g	Cs^{137} pc/g K
Barza	29-7	4.84	22.4	11.5	15.2	760	7.8	22.0	350
Brebbia	29-7	5.22	19.5	10.0	17.3	580	6.5	33.5	190
Ispra	29-7	4.44	19.4	10.1	12.5	810	9.7	20.8	470
Monvalle	29-7	4.40	28.2	11.1	14.2	780	9.1	15.8	580
Osmate	29-7	4.30	26.1	12.6	12.0	1050	6.7	29.0	230
Taino	29-7	4.97	21.6	10.3	14.7	700	7.3	25.0	290
Roccolo	31-7	4.76	28.4	13.3	17.8	750	6.6	25.0	260
Roccolo	20-8	4.30	23.0	13.5	16.9	800	6.7	24.5	270
Brebbia	20-8	5.53	7.5	5.8	12.8	450	5.5	32.0	170
Barza	20-8	4.75	11.8	7.8	10.0	780	4.7	35.0	130
Ispra	20-8	5.73	11.1	7.4	9.5	780	8.0	33.0	240
Osmate	20-8	6.20	12.4	6.9	11.5	600	5.6	30.0	190

(*) = Values are given per weight unity of dry matter.
(**) = Weight ratio of fresh matter to dry matter.

STRONTIUM-90, STRONTIUM-89 AND CESIUM-137 IN HERBAGE (*)

1963

Sampling site	Sampling date	R (**)	Sr^{89} pc/g	Sr^{90} pc/g	Ca mg/g	Sr^{90} pc/g Ca	Cs^{137} pc/g	K mg/g	Cs^{137} pc/g K
Barza	26- 9	7.10	6.8	8.7	14.0	620	4.5	35.0	130
Brebbia	26- 9	5.90	3.8	3.9	10.0	390	4.0	30.0	130
Ispra	26- 9	6.02	2.6	3.6	9.9	360	7.8	23.0	340
Osmate	26- 9	4.63	8.9	7.1	10.8	660	6.0	24.0	250
Taino	26- 9	7.07	9.4	8.5	12.5	680	5.7	50.3	110
Monvalle	26- 9	5.75	3.2	3.1	9.3	330	3.5	33.5	110
Roccolo	30- 9	5.70	8.0	7.7	15.0	510	8.0	30.8	270
Monvalle	21-10	5.20	1.9	2.1	7.6	280	2.1	23.4	90
Osmate	21-10	5.33	2.3	4.0	12.8	310	2.5	29.7	84
Brebbia	21-10	5.00	2.6	3.6	6.5	550	3.1	27.2	110
Barza	21-10	4.43	3.7	5.7	14.0	410	12.5	14.4	870
Taino	21-10	4.30	3.2	3.9	10.4	370	4.2	20.6	200
Ispra	21-10	5.50	1.8	2.9	8.5	340	4.0	27.5	150
Roccolo	21-10	4.60	7.5	9.7	16.4	590	5.3	23.0	230

(*) = Values are given per weight unity of dry matter.

(**) = Weight ratio of fresh matter to dry matter.

STRONTIUM-90, STRONTIUM-89 AND CESIUM-137 IN MILK - BARZA

1963

Month	Sr^{89} pc/l (±)	Sr^{90} pc/l	Ca g/l	Sr^{90} pc/g Ca	Cs^{137} pc/l	K g/l	Cs^{137} pc/g K	$\frac{\text{pc } Sr^{90}/\text{g Ca}}{\text{pc } Cs^{137}/\text{g K}}$
January	-	27	1.15	23	160	1.60	100	0.230
February	-	29	0.92	32	220	1.74	130	0.246
March	-	24	1.05	23	230	1.74	130	0.177
April	13	25	1.23	20	200	1.67	120	0.167
May	200	47	1.17	40	230	1.67	140	0.286
June	280	96	1.15	83	460	1.75	260	0.319
July	270	106	1.10	96	420	1.71	250	0.384
August	220	118	1.12	105	410	1.84	220	0.477
September	120	103	1.09	94	360	1.72	210	0.448
October	62	93	1.24	75	700	1.68	420	0.179
November	50	110	1.18	93	500	1.70	290	0.320
December	45	147	1.18	125	470	1.79	260	0.481

(±) = Values in this column are extrapolated to midpoint of sampling month.
- = Measurement not performed.

STRONTIUM-90, STRONTIUM-89 AND CESIUM-137 IN MILK - BREBBIA

1963

Month	Sr^{89} pc/l (*)	Sr^{90} pc/l	Ca g/l	Sr^{90} pc/g Ca	Cs^{137} pc/l	K g/l	Cs^{137} pc/g K	$\frac{\text{pc } Sr^{90}/\text{g Ca}}{\text{pc } Cs^{137}/\text{g K}}$
January	14	27	1.22	22	190	1.47	130	0.169
February	17	29	1.16	25	250	1.50	170	0.147
March	13	26	1.28	20	270	1.59	170	0.118
April	7	31	1.30	24	260	1.57	170	0.141
May	120	39	1.20	33	300	1.52	200	0.165
June	220	63	1.18	53	430	1.62	270	0.196
July	260	105	1.15	91	530	1.55	340	0.268
August	200	108	1.17	92	680	1.62	420	0.219
September	130	105	1.15	91	660	1.69	390	0.233
October	80	108	1.33	81	730	1.61	450	0.180
November	70	130	1.20	108	850	1.57	540	0.200
December	30	110	1.20	92	840	1.60	530	0.174

(*) = Values in this column are extrapolated to midpoint of sampling month.

STRONTIUM-90, STRONTIUM-89 AND CESIUM-137 IN MILK - ISPRA

1963

Month	Sr^{89} pc/l (*)	Sr^{90} pc/l	Ca g/l	Sr^{90} pc/g Ca	Cs^{137} pc/l	K g/l	Cs^{137} pc/g K	$\frac{pc\ Sr^{90}/g\ Ca}{pc\ Cs^{137}/g\ K}$
January	19	28	1.17	24	300	1.35	220	0.109
February	15	26	1.20	22	300	1.47	200	0.110
March	11	25	1.25	20	300	1.49	200	0.100
April	7	25	1.28	20	320	1.54	210	0.095
May	160	52	1.25	42	350	1.46	240	0.175
June	310	80	1.25	64	660	1.56	420	0.152
July	330	130	1.20	108	770	1.55	500	0.216
August	170	93	1.15	81	700	1.73	400	0.202
September	120	100	1.15	87	670	1.58	420	0.207
October	60	90	1.20	75	550	1.45	380	0.197
November	48	92	1.23	75	580	1.58	370	0.203
December	30	91	1.03	88	730	1.60	460	0.191

(*) = Values in this column are extrapolated to midpoint of sampling month.

STRONTIUM-90, STRONTIUM-89 AND CESIUM-137 IN MILK - OSMATE

1963

Month	Sr^{89}(±) pc/l	Sr^{90} pc/l	Ca g/l	Sr^{90} pc/g Ca	Cs^{137} pc/l	K g/l	Cs^{137} pc/g K	$\frac{\text{pc } Sr^{90}/\text{g Ca}}{\text{pc } Cs^{137}/\text{g K}}$
January	10	25	1.12	22	240	1.50	160	0.137
February	8	28	1.18	24	290	1.50	180	0.133
March	5	33	1.26	26	330	1.61	200	0.130
April	-	30	1.26	24	320	1.56	210	0.114
May	64	46	1.20	38	330	1.57	210	0.181
June	220	75	1.11	68	470	1.58	300	0.227
July	350	142	1.17	121	710	1.64	430	0.281
August	250	140	1.20	117	620	1.81	340	0.344
September	150	126	1.10	114	580	1.59	360	0.317
October	80	115	1.19	97	550	1.67	330	0.294
November	65	130	1.05	124	520	1.68	310	0.400
December	30	106	0.95	111	550	1.56	350	0.317

(±) = Values in this column are extrapolated to midpoint of sampling month.

- = Measurement not performed.

STRONTIUM-90, STRONTIUM-89 AND CESIUM-137 IN MILK - MILANO

1963

Month	Sr^{89} pc/l (*)	Sr^{90} pc/l	Ca g/l	Sr^{90} pc/g Ca	Cs^{137} pc/l	K g/l	Cs^{137} pc/g K	pc Sr^{90}/g Ca / pc Cs^{137}/g K
January	7	9.2	1.25	7.4	65	1.48	44	0.168
February	4	9.1	1.25	7.3	71	1.58	45	0.162
March	24	10	1.23	8.1	82	1.64	50	0.162
April	60	15	1.25	12	110	1.51	73	0.164
May	130	25	1.19	21	180	1.63	110	0.191
June	200	41	1.17	35	300	1.58	190	0.184
July	130	51	1.16	44	280	1.58	180	0.244
August	80	44	1.13	39	230	1.62	140	0.279
September	50	42	1.20	35	210	1.64	130	0.269
October	30	43	1.26	34	180	1.63	110	0.309
November	23	45	1.18	38	190	1.63	120	0.317
December	10	43	1.16	37	200	1.66	120	0.308

(*) = Values in this column are extrapolated to midpoint of sampling month.

STRONTIUM-90, STRONTIUM-89 AND CESIUM-137 IN MILK - VARESE

1963

Month	Sr^{89} pc/l (*)	Sr^{90} pc/l	Ca g/l	Sr^{90} pc/g Ca	Cs^{137} pc/l	K g/l	Cs^{137} pc/g K	pc Sr^{90}/g Ca / pc Cs^{137}/g K
January	7	18	1.27	14	120	1.47	82	0.171
February	7	18	1.27	14	140	1.59	88	0.159
March	3	16	1.25	13	120	1.66	72	0.180
April	29	18	1.35	13	140	1.64	85	0.153
May	160	37	1.26	29	200	1.54	130	0.223
June	180	47	1.18	40	280	1.66	170	0.235
July	140	55	1.22	45	270	1.63	170	0.265
August	100	57	1.13	50	320	1.61	200	0.250
September	90	75	1.18	64	400	1.76	230	0.278
October	35	47	1.26	37	220	1.68	130	0.285
November	30	63	1.23	51	310	1.68	180	0.283
December	20	56	1.20	47	320	1.86	170	0.276

(*) = Values in this column are extrapolated to midpoint of sampling month.

STRONTIUM-90 AND CESIUM-137 IN CHEESE

1963

Quality and origin	Sampling date	Sr^{90} pc/Kg	Ca g/Kg	Sr^{90} pc/g Ca	Cs^{137} pc/Kg	K g/Kg	Cs^{137} pc/g K
Caciotta toscana (Toscana)	Luglio	547	9.6	57	-	-	-
Bel Paese (Lombardia)	"	265	3.9	68	-	-	-
Fontina V. d'Aosta (Piemonte)	"	192	9.4	20	-	-	-
Grana (Emilia)	"	41	8.8	4.7	-	-	-
Gruviera (Switzerland)	"	230	9.7	24	-	-	-
Olandese (Holland)	"	325	8.6	38	-	-	-
Caciotta toscana (Toscana)	Dicembre	450	7.6	59	220	1.5	150
Bel Paese (Lombardia)	"	162	6.2	26	340	1.7	200
Fontina V. d'Aosta (Piemonte)	"	1 190	7.7	154	390	1.2	325
Grana (Emilia)	"	35	10.9	3.2	200	1.3	150
Caciotta romana (Lazio)	"	713	10.0	71	320	1.3	250
Gruviera (Switzerland)	"	370	11.1	33	170	1.5	110
Olandese (Holland)	"	325	8.6	38	300	1.2	250

- = Measurement not performed.

GEOGRAPHIC COORDINATES OF WATER SAMPLING POINTS

	Name of site	Latitude N	Longitude E (Greenwich)	Altitude a. s. l. (m)
P 1	Lago Maggiore Centro	45° 54' 26"	8° 34' 31"	193
P 2	Lago Maggiore Zenna	46° 06' 00"	8° 44' 10"	193
P 3	Lago Maggiore Sasso Galletto	45° 55' 40"	8° 37' 53"	193
P 4	Lago Maggiore Laveno	45° 54' 26"	8° 37' 00"	193
P 5	Lago Maggiore Ispra	45° 48' 50"	8° 36' 25"	193
P 6	Lago Maggiore Sesto Calende	45° 43' 22"	8° 37' 36"	193
P 7	Lago Maggiore Foce Acque Nere	45° 49' 33"	8° 37' 23"	193
P 8	Lago Maggiore Ranco	45° 48' 06"	8° 33' 08"	193
P 9	Lago Maggiore Baveno	45° 54' 30"	8° 30' 30"	193
P10	Lago di Monate	45° 48' 07"	8° 38' 55"	266
P11	Lago di Varese	45° 49' 00"	8° 43' 08"	238
P12	Lago di Comabbio	45° 46' 48"	8° 41' 38"	243
P13	Acque Nere I	45° 49' 30"	8° 37' 23"	194
P14	Acque Nere 2	45° 48' 50"	8° 38' 28"	207
P15	Fiume Tresa	45° 59' 40"	8° 44' 00"	200
P16	Fiume Boesio	45° 54' 20"	8° 37' 30"	200
P17	Fiume Toce	45° 55' 58"	8° 29' 39"	433
P18	Novellino	45° 49' 00"	8° 37' 25"	200
P19	Cascina Vicina	45° 48' 35"	8° 37' 13"	213
P20	Cascina Casello	45° 48' 40"	8° 37' 10"	213
P21	Cascina Gabriella	45° 48' 10"	8° 36' 30"	216
P22	Fontanone	45° 48' 06"	8° 37' 40"	230
P23	Roccolo	45° 48' 11"	8° 37' 36"	247

BETA RADIOACTIVITY SUBTRACTED POTASSIUM-40 IN THE WATER OF THE LAKE "MAGGIORE"

pc/l

1963

Sampling point			Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Yearly average
F1	Centro Lago	(surface)	8.1	4.5	4.4	18	17	28	33	26	25	15	11	8.2	16.5
P1	Centro Lago	m 25	4.8	3.0	4.2	12	13	16	17	6.2	13	11	10	5.5	9.6
P1	Centro Lago	m 50	4.7	3.8	3.4	9.3	7.8	12	13	9.3	6.5	5.9	6.9	10	7.7
P2	Zenna	(surface)	6.8	4.3	3.7	1.4	15	28	39	32	28	15	11	11	16.3
P3	Sasso Galletto	"	6.8	4.3	3.6	31	23	18	23	25	24	16	14	10	16.5
P4	Laveno	"	8.2	5.2	3.4	20	15	28	33	27	25	15	13	2.8	16.3
P5	Porto Ispra	"	7.3	3.6	2.9	19	14	24	43	28	22	16	15	11	17.2
P6	Sesto Calende	"	8.6	4.6	6.5	25	17	28	39	33	25	17	15	7.5	18.8
P7	Foce Acque Nere	"	7.4	4.5	4.9	25	16	26	29	30	44	18	19	8.9	19.4
P8	Ranco	(surface)	7.1	3.3	6.7	26	22	21	48	31	25	16	13	6.4	18.8
P8	Ranco	m 25	7.2	4.3	4.0	17	19	13	10	12	12	8.4	7.8	4.9	9.9
P8	Ranco	m 50	3.4	4.5	3.5	9.5	9.8	9.7	11	13	7.7	4.8	3.1	5.0	7.1
P9	Baveno	(surface)	7.1	6.6	5.2	13	21	34	60	31	27	17	14	7.9	20.3
Average value			6.7	4.3	4.3	17.4	16.1	22.0	30.6	23.3	21.8	13.5	11.7	7.6	

BETA RADIOACTIVITY SUBTRACTED POTASSIUM-40 IN LAKES, STREAMS AND WELLS

NEAR TO THE ISPRA ESTABLISHMENT pc/l

1963

	Sampling point	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Yearly average
P10	Lago di Monate	24	25	13	39	80	75	88	68	62	46	43	30	49.4
P11	Lago di Varese	29	58	20	55	53	65	86	77	55	40	34	27	49.9
P12	Lago di Comabbio	180	69	36	59	61	65	84	67	66	47	46	29	67.4
P13	Fiume Acque Nere 1	3.7	18	40	14	22	25	22	26	22	15	14	8.9	19.2
P14	Fiume Acque Nere 2	19	4.7	5.3	17	23	27	29	42	25	18	19	11	20.0
P15	Fiume Tresa	7.0	5.4	33	32	27	56	40	47	35	21	19	11	27.8
P16	Fiume Boesio	11	0.6	5.6	13	7.0	35	10	8.9	13	2.5	3.9	3.1	9.4
P17	Fiume Toce	6.2	5.5	6.6	9.9	18	9.6	22	28	8.4	3.6	5.4	3.4	10.6
P18	Fiume Novellino	5.8	76	8.1	11	28	17	12	19	12	4.8	9.5	4.2	17.3
P19	Pozzo Cascina Vicina	7.6	5.9	0.2	5.5	23	14	10	10	13	7.2	17	8.0	10.1
P20	Pozzo Cascina Casello	4.4	3.6	5.3	4.5	3.6	4.2	3.7	3.5	4.5	1.6	5.4	0.1	3.7
P21	Pozzo Cascina Gabriella	2.2	2.9	1.8	0.5	4.7	4.8	3.9	2.6	3.0	0.3	0.9	0.1	2.3
P22	Acqua Potabile Fontanone	3.2	3.7	3.4	2.9	3.9	2.7	3.2	3.2	2.1	1.7	0.6	1.0	2.6
P23	Acqua Potabile Roccolo	8.1	3.0	4.1	4.1	5.5	6.6	6.2	5.9	4.0	3.8	4.2	2.8	4.8

STRONTIUM-90 AND CESIUM-137 IN LAKE WATERS

1963

Name of the lake	Sampling date	Sr^{90} pc/l	Ca mg/l	Sr^{90} pc/g Ca	Cs^{137} pc/l	K mg/l	Cs^{137} pc/g K
"Maggiore"	22- 3	0.5	23.6	21	0.8	1.80	440
"	26- 6	1.2	21.2	57	1.3	1.80	720
"	11- 9	2.0	17.6	110	1.6	1.65	970
"	29-11	1.3	16.5	79	0.7	1.75	400
"Monate"	26- 3	2.0	10.8	185	1.0	1.00	1 000
"	10- 6	4.4	10.2	450	2.8	1.05	1 710
"	16- 9	6.9	10.0	690	4.8	0.85	5 650
"	28-11	5.6	7.4	760	2.7	0.98	2 760
"Comabbio"	21- 3	3.2	23.6	136	1.9	1.45	1 310
"	28- 6	5.7	25.6	220	4.2	1.42	2 960
"	3- 9	8.6	32.0	270	2.6	1.37	1 900
"	28-11	7.8	22.0	360	1.8	1.48	1 220
"Varese"	25- 3	2.0	35.2	57	1.3	1.85	700
"	12- 6	4.3	32.8	130	2.6	1.70	1 530
"	5- 9	7.3	35.8	200	2.5	1.77	1 410
"	29-11	4.9	37.0	130	1.5	2.00	750

CONCENTRATIONS OF RADIONUCLIDES IN LAKE WATERS

1963

pc/l

Name of the lake	Sampling date	$Zr^{95} + Nb^{95}$	Ru^{103}	Ru^{106}	Ce^{141}	Ce^{144}	Mn^{54}	Sb^{125}	Sr^{90}
"Maggiore"	22- 3	2.6	0.5	1.0	0.1	0.3	0.15	-	0.9
"	26- 6	7	0.5	5.2	0.1	2.1	0.60	-	3.7
"	11- 9	5.0	0.2	8.3	0.1	3.2	0.55	0.5	2.0
"	29-11	1.0	u.	4.0	u.	1.1	0.14	0.3	0.3
"Monate"	26- 3	6.0	1.5	3.8	0.2	0.7	-	-	2.9
"	10- 6	19	1.8	20	0.3	6.0	-	-	13
"	16- 9	4.0	0.4	17	0.1	3.0	0.41	1.0	5.8
"	28-11	1.2	u.	10	u.	2.1	0.36	0.8	1.6
"Comabbio"	21- 3	20	3.8	9.8	2.3	7.3	-	-	6.2
"	28- 6	19	2.6	29	0.4	8.0	-	-	16
"	3- 9	4.3	0.2	17	0.1	5.9	1.30	0.9	6.9
"	28-11	1.2	u.	11	u.	3.8	0.80	0.7	2.1
"Varese"	25- 3	12	2.7	5.4	0.7	2.2	-	-	5.4
"	12- 6	29	2.4	27	0.6	11	-	-	16
"	5- 9	4.7	0.3	18	0.1	4.2	0.49	1.2	9.7
"	29-11	1.8	u.	11	u.	2.3	0.64	0.6	1.6

u. = Undetectable.

- = Measurement not performed.

STRONTIUM-90, STRONTIUM-89 AND CESIUM-137 IN LAKE FISHES

LAKE "MAGGIORE"

1963

Biological species	Sampling date	Sr^{90} pc/g	Ca mg/g	Sr^{90} pc/g Ca	Sr^{89} pc/g	Cs^{137} pc/g	K mg/g	Cs^{137} pc/g K
Scardinius erith.	28- 3	0.097	9.42	10	0.005	0.38	3.26	120
Perca fluviatilis	28- 3	0.070	8.23	8.5	0.005	1.1	3.00	370
Gobio gobio	2- 5	0.11	15.1	7.3	0.005	0.42	3.60	110
Perca fluviatilis	25- 6	0.071	12.2	5.8	0.026	1.1	2.90	380
Gobio gobio	25- 6	0.11	12.2	9.0	0.15	0.42	2.77	150
Scardinius erith.	25- 6	0.12	12.2	8.9	0.07	0.88	3.09	290
Perca fluviatilis	16- 9	0.24	13.8	17	0.28	1.9	3.84	500
Scardinius erith.	16- 9	0.28	15.6	18	0.23	1.6	3.24	490
Gobio gobio	16- 9	0.33	13.1	25	0.24	0.70	3.25	220
Perca fluviatilis	20-11	0.22	12.6	17	0.09	1.9	3.34	570
Scardinius erith.	20-11	0.28	14.6	19	0.14	1.4	3.05	460

STRONTIUM-90, STRONTIUM-89 AND CESIUM-137 IN LAKE FISHES

LAKE "VARESE"

1963

Biological species	Sampling date	Sr^{90} pc/g	Ca mg/g	Sr^{90} pc/g Ca	Sr^{89} pc/g	Cs^{137} pc/g	K mg/g	Cs^{137} pc/g K
Perca fluviatilis	27- 3	0.14	9.20	15	0.005	1.0	3.40	300
Scardinius erith.	27- 3	0.24	9.64	25	0.023	0.50	3.32	150
Gobio gobio	28- 3	0.16	9.77	16	0.022	0.38	2.93	130
Perca fluviatilis	20- 6	0.19	15.1	13	0.14	1.2	3.38	350
Gobio gobio	20- 6	0.27	11.8	23	0.43	0.88	3.15	280
Scardinius erith.	20- 6	0.36	14.4	25	0.33	1.5	3.72	400
Perca fluviatilis	13- 9	0.64	14.7	44	0.57	3.3	3.47	950
Scardinius erith.	13- 9	0.66	18.5	36	0.58	1.7	3.64	470
Gobio gobio	13- 9	0.62	14.5	43	0.40	1.4	3.07	460
Perca fluviatilis	20-11	0.66	13.3	50	0.24	3.3	3.30	1 000
Scardinius erith.	20-11	0.54	14.4	38	0.10	1.3	2.92	450
Gobio gobio	20-11	0.58	14.9	39	0.23	0.94	2.98	320

STRONTIUM-90, STRONTIUM-89 AND CESIUM-137 IN LAKE FISHES

LAKE "COMABBIO"

1963

Biological species	Sampling date	Sr^{90} pc/g	Ca mg/g	Sr^{90} pc/g Ca	Sr^{89} pc/g	Cs^{137} pc/g	K mg/g	Cs^{137} pc/g K
Perca fluviatilis	27- 3	0.40	10.6	38	0.063	2.0	3.22	620
Scardinius erith.	27- 3	0.43	11.8	36	0.005	0.68	3.08	220
Gobio gobio	29- 3	0.33	11.6	28	0.094	1.0	3.16	320
Perca fluviatilis	22- 6	0.41	12.1	34	0.37	2.8	3.27	860
Gobio gobio	22- 6	0.47	12.0	39	0.60	1.2	3.22	370
Scardinius erith.	22- 6	0.54	15.2	36	0.26	1.5	3.42	440
Perca fluviatilis	17- 9	1.4	18.5	76	-	5.2	3.26	1 600
Scardinius erith.	17- 9	0.99	15.0	66	-	2.3	3.18	720
Gobio gobio	17- 9	0.86	13.2	65	0.41	2.4	3.25	740
Perca fluviatilis	19-11	1.1	15.4	71	0.18	5.8	3.44	1 690
Scardinius erith.	19-11	1.1	14.2	78	0.20	2.2	3.30	680
Gobio gobio	19-11	1.0	11.6	86	0.36	1.8	2.32	780

- = Measurement not performed.

STRONTIUM-90, STRONTIUM-89 AND CESIUM-137 IN LAKE FISHES

LAKE "MONATE"

1963

Biological species	Sampling date	Sr^{90} pc/g	Ca mg/g	Sr^{90} pc/g Ca	Sr^{89} pc/g	Cs^{137} pc/g	K mg/g	Cs^{137} pc/g K
Perca fluviatilis	27- 3	0.52	12.6	41	0.041	7.2	3.20	2 200
Scardinius erith.	27- 3	1.1	14.8	74	0.005	1.0	3.20	310
Gobio gobio	27- 3	0.46	14.1	33	0.005	1.8	3.01	600
Perca fluviatilis	12- 6	0.74	17.5	42	0.11	7.4	3.79	2 000
Gobio gobio	12- 6	1.0	15.4	65	0.57	2.7	3.49	770
Scardinius erith.	12- 6	1.2	15.3	79	0.35	1.9	3.47	550
Perca fluviatilis	15- 9	1.3	14.2	92	0.40	6.3	3.78	1 670
Scardinius erith.	15- 9	1.6	13.3	120	0.63	2.1	3.22	650
Gobio gobio	15- 9	2.8	13.6	210	1.1	1.9	3.73	510
Perca fluviatilis	19-11	1.2	16.4	73	-	11	3.43	3 200
Scardinius erith.	19-11	2.1	15.7	130	0.26	3.1	3.22	960
Gobio gobio	19-11	2.6	15.3	170	0.90	5.3	3.25	1 630

- = Measurement not performed.

STRONTIUM-90 AND STRONTIUM-89 IN CALF BONES

1963

Sampling site	Sampling date	Age	Sr^{89} pc/g	Sr^{90} pc/g	Ca mg/g	Sr^{90} pc/g Ca
Cadrezzate	14-3	2 months	0.2	1.2	137	8.8
Cadrezzate	14-3	2 years	1.8	4.1	212	19
Osmate	14-3	2 "	0.4	3.0	154	20
Angera	15-3	2 months	1.0	5.4	142	38
Taino	15-3	2 "	0.2	4.6	160	29
Ispra	15-3	2 "	0.1	3.7	158	23
Ispra	26-3	2 "	0.9	3.8	110	35
Angera	27-3	2 "	1.2	4.7	143	33
Ispra	27-3	2 "	3.2	5.2	147	35
Ispra	1-4	2 "	0.6	3.4	148	23
Besozzo	1-4	2 "	1.8	6.3	181	35
Ispra	20-6	2 "	1.7	6.7	155	43
Angera	20-6	2 "	1.5	2.6	189	14
Angera	20-6	2 years	0.4	2.5	128	20
Brebbia	21-6	2 months	23	5.8	139	42
Cadrezzate	21-6	2 "	0.1	3.7	138	27
Capronno	21-6	2 "	5.6	7.4	157	47
Angera	25-6	2 "	3.2	8.6	135	64

STRONTIUM-90 AND STRONTIUM-89 IN CALF BONES

1963

Sampling site	Sampling date	Age	Sr^{89} pc/g	Sr^{90} pc/g	Ca mg/g	Sr^{90} pc/g Ca
Angera	28- 9	2 months	4.8	13.3	162	82
Capronno	28- 9	2 "	-	10.3	145	71
Quassa	28- 9	2 "	-	14.2	166	85
Ispra	28- 9	2 "	3.8	10.7	132	81
Taino	28- 9	2 "	2.5	5.9	195	30
Brebbia	28- 9	2 "	9.5	15.9	140	113
Cadrezzate	28- 9	2 "	4.3	12.2	118	104
Ispra	13-12	2 "	2.6	10.1	139	72
Chivasso	13-12	2 "	1.8	6.6	105	63
Ispra	13-12	2 "	2.0	7.5	140	53

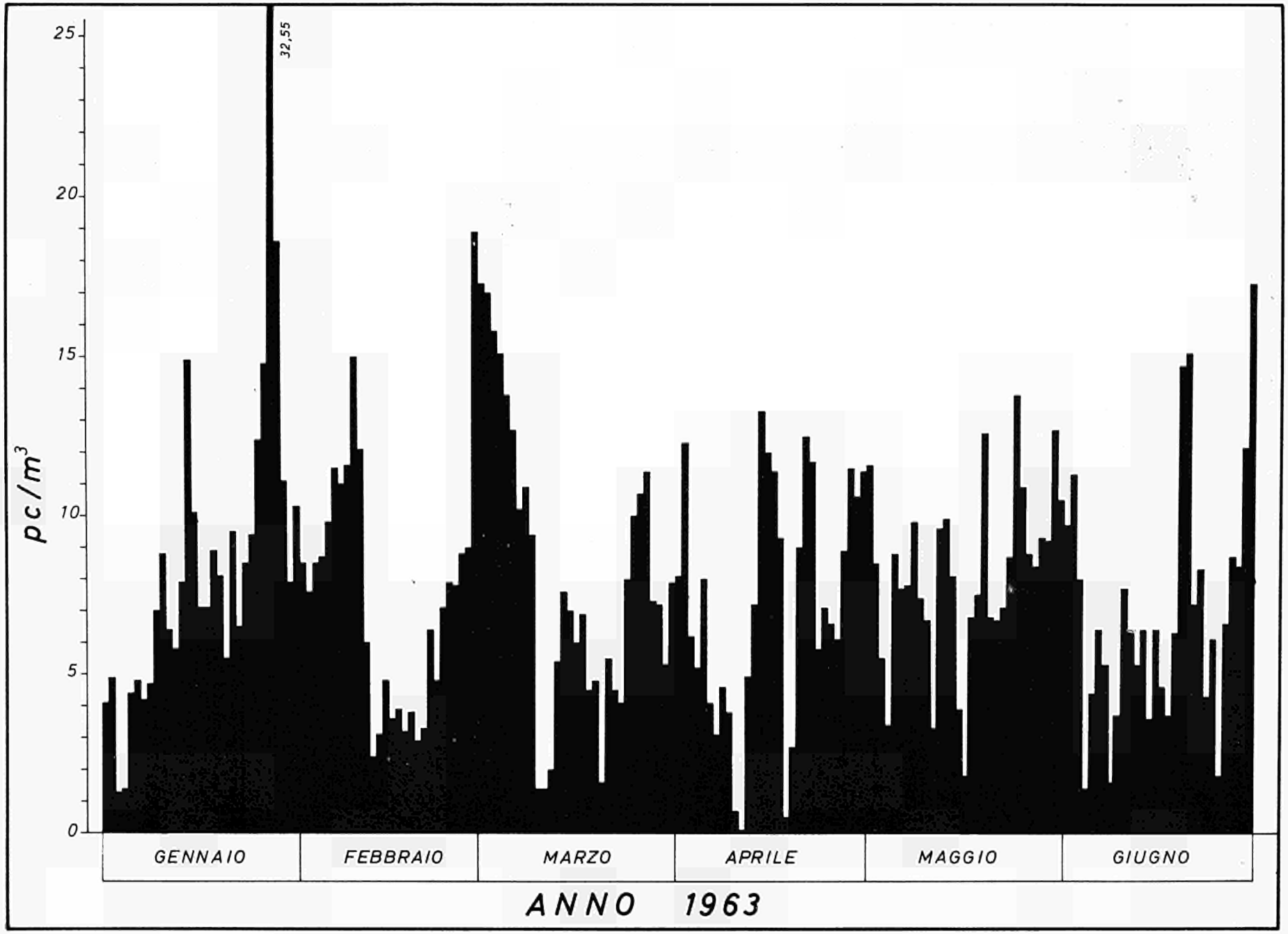
- = Measurement not performed.

STRONTIUM-90 AND CESIUM-137 IN VEGETABLES (*)

1963

Species	Sr^{90} pc/Kg	Ca g/Kg	Sr^{90} pc/g Ca	Cs^{137} pc/Kg	K g/Kg	Cs^{137} pc/g K
Endive	24	0.34	71	63	2.73	23
"Lactuca scariola"	23	0.31	74	49	2.23	22
Turnip leaves	75	1.53	49	110	5.50	20
Lettuce	48	0.36	135	87	2.95	29
Catalogna (local name)	80	0.69	115	96	4.06	24
Chicory	50	0.46	110	92	3.53	26
"Beta vulgaris"	90	0.85	105	140	3.54	40
Erbette (local name)	97	0.96	100	120	4.58	26
Spinach	93	1.21	77	160	6.60	24

(*) = All the values are referred to fresh matter and are obtained from pooled samples made up, for each species, with about 20 samples collected during the year.



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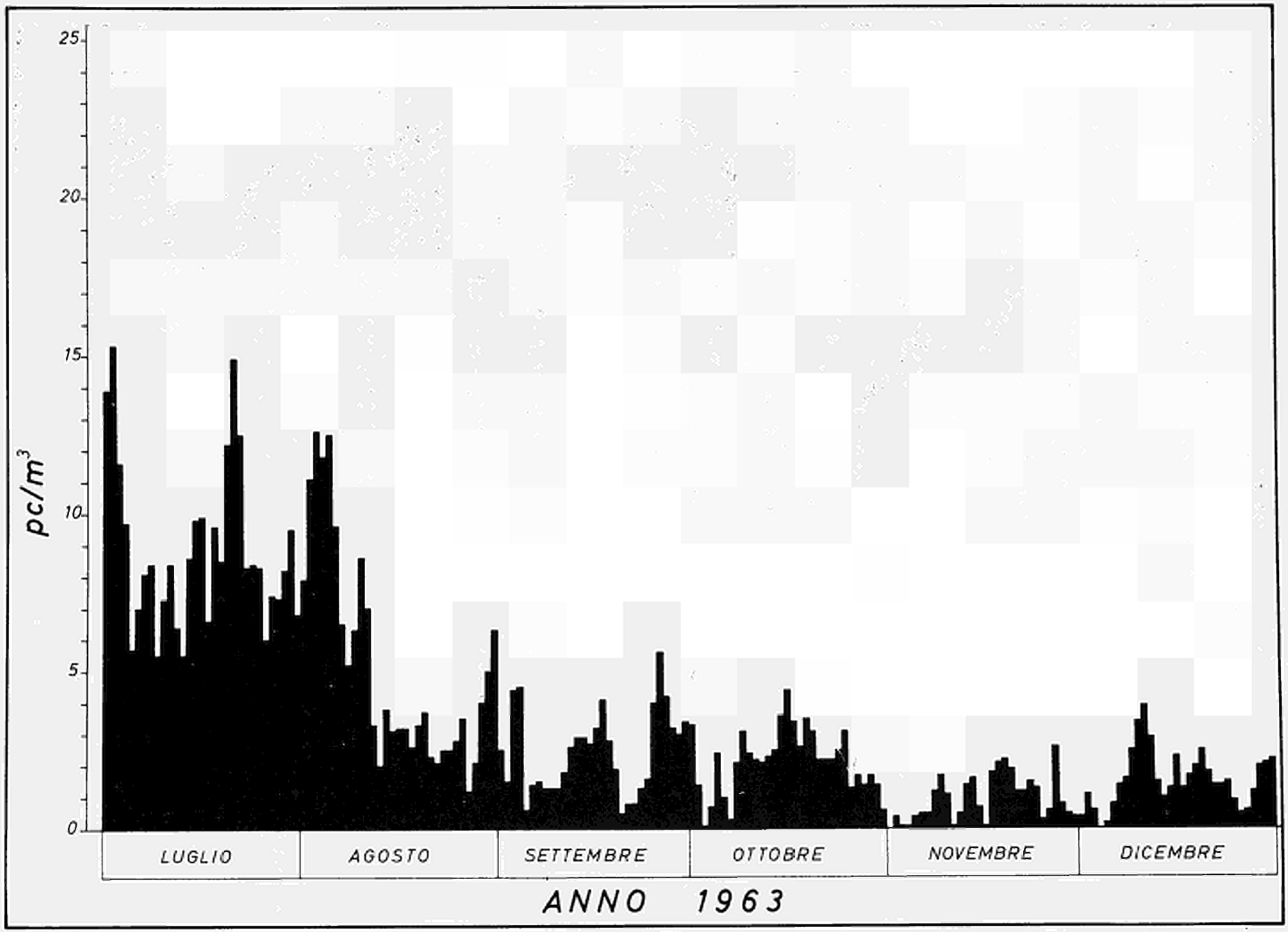

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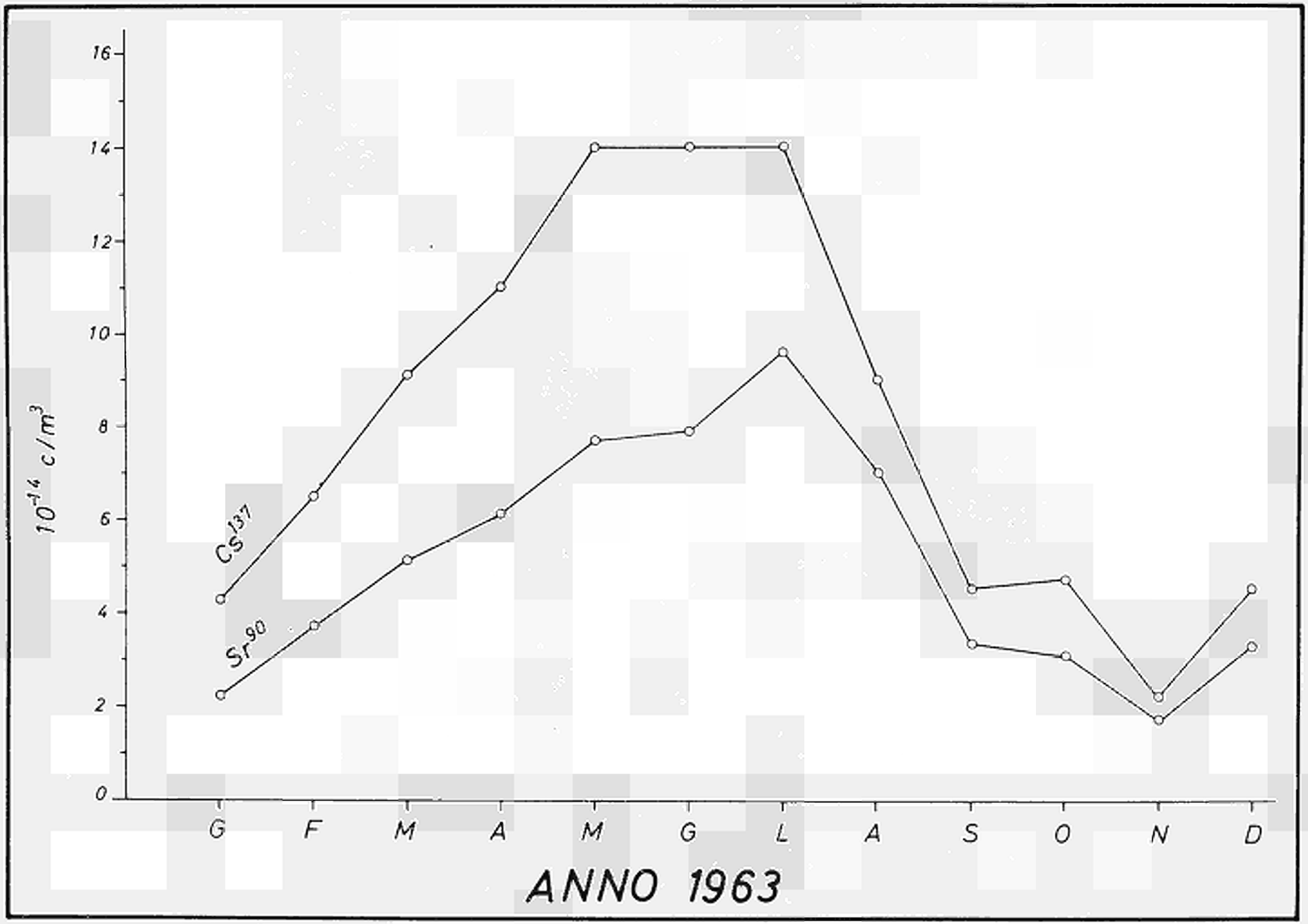

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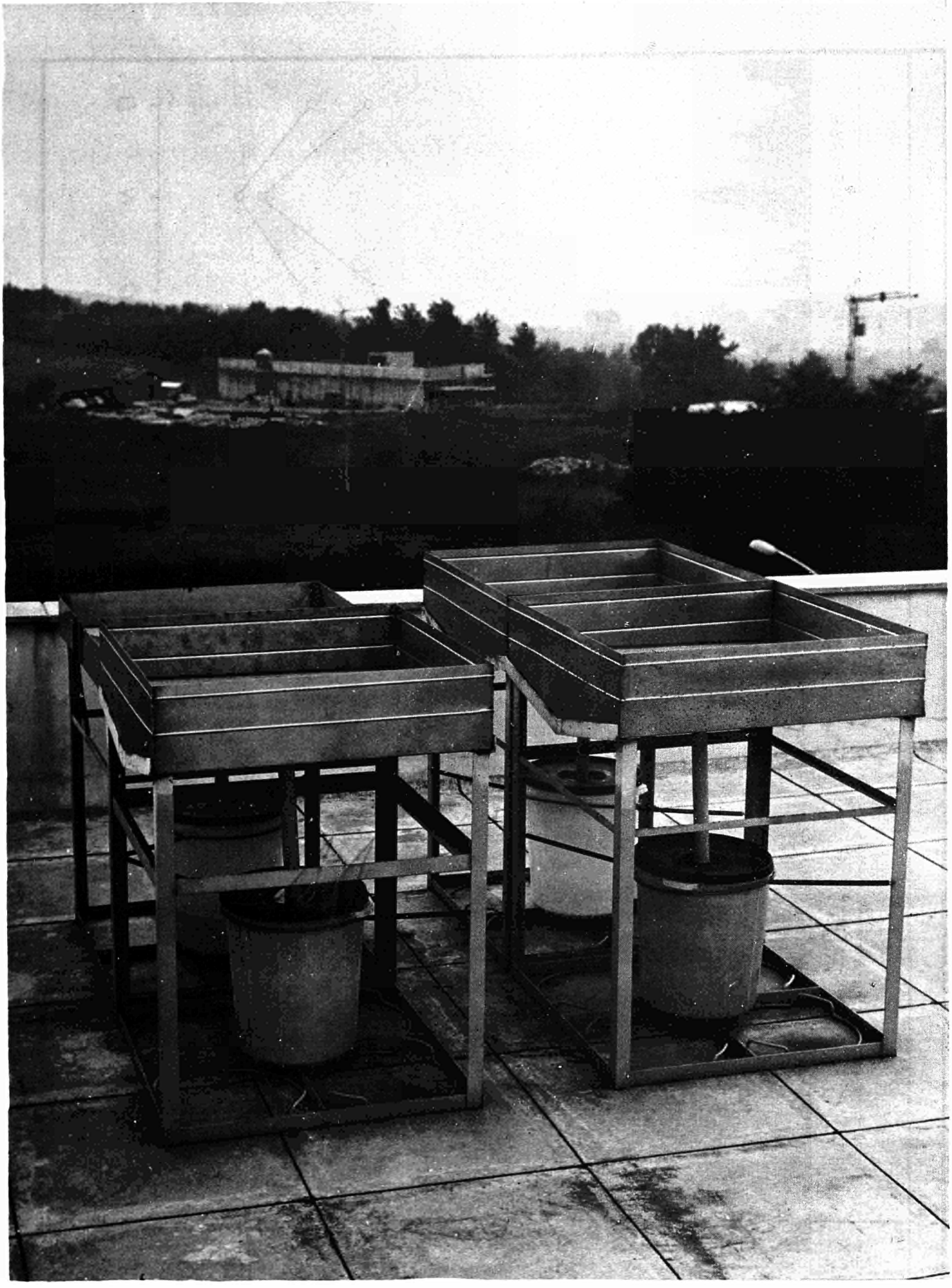

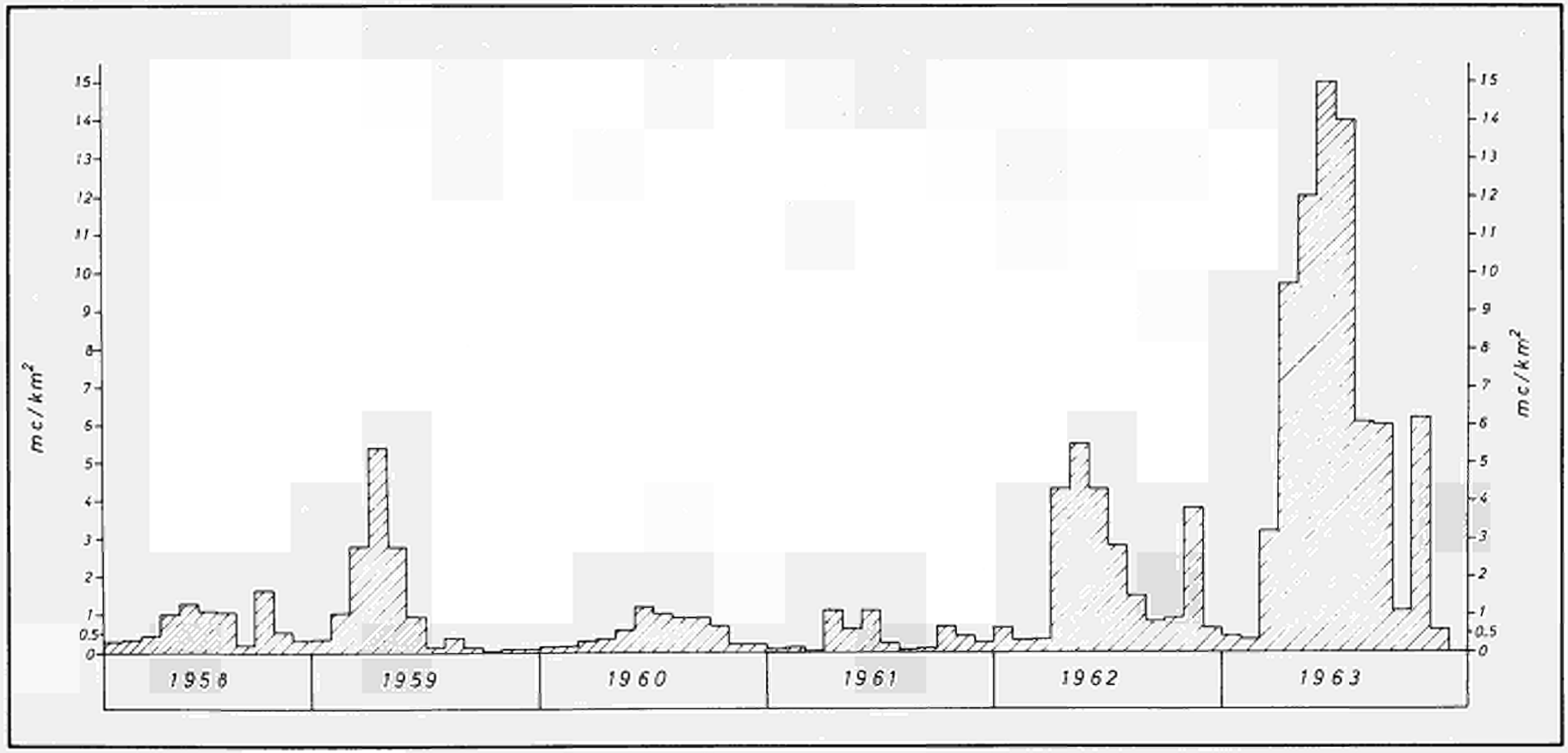

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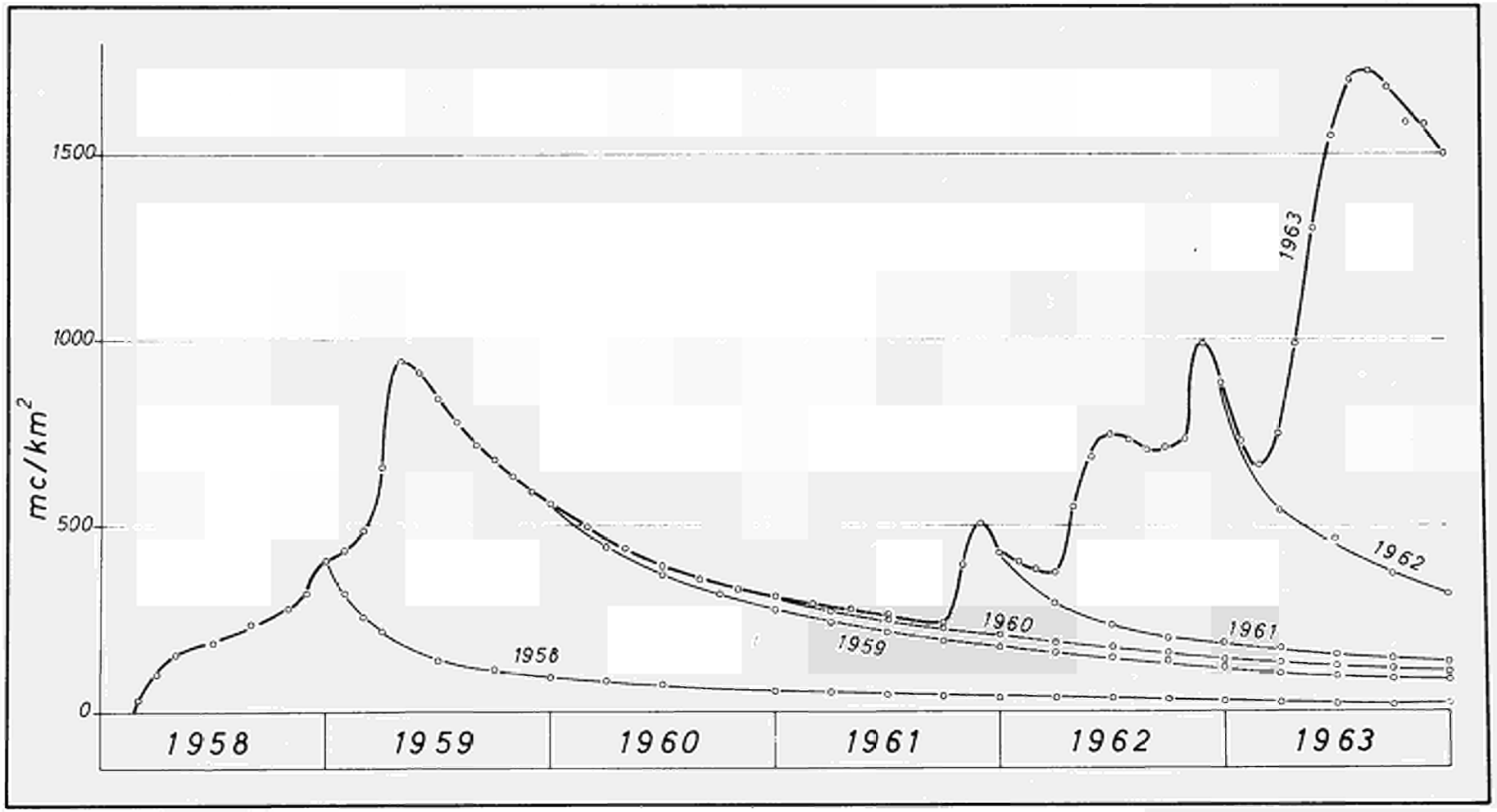

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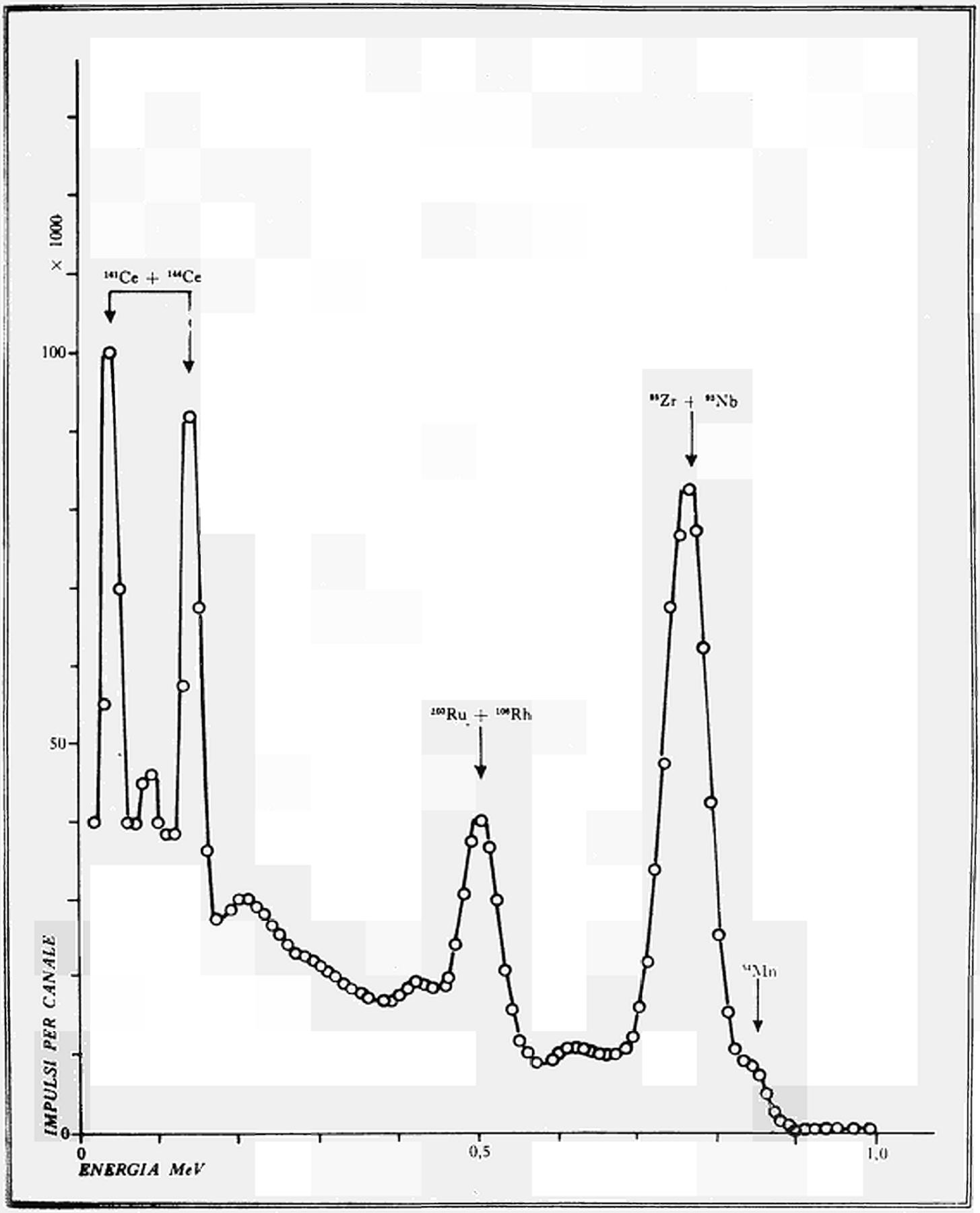
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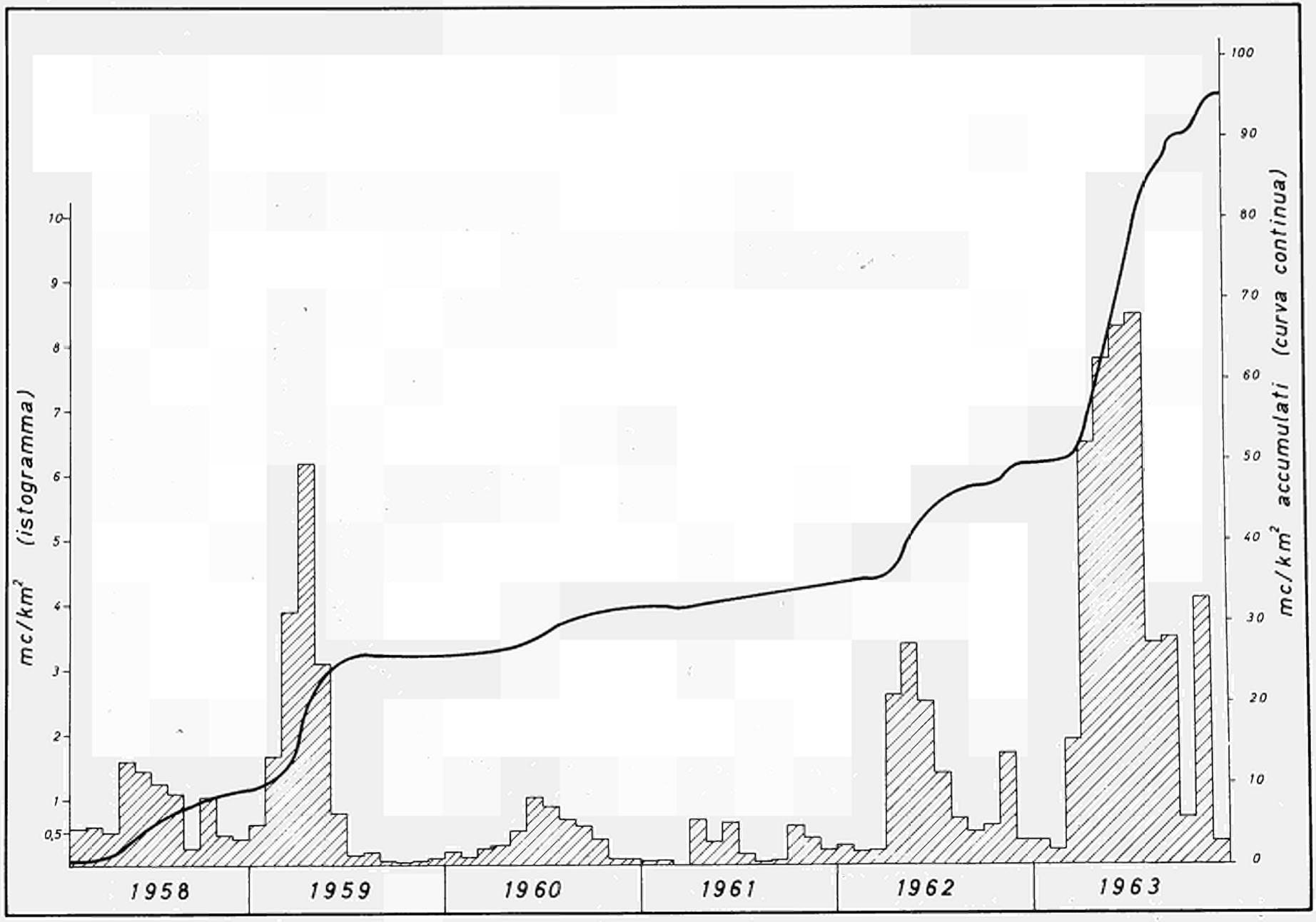
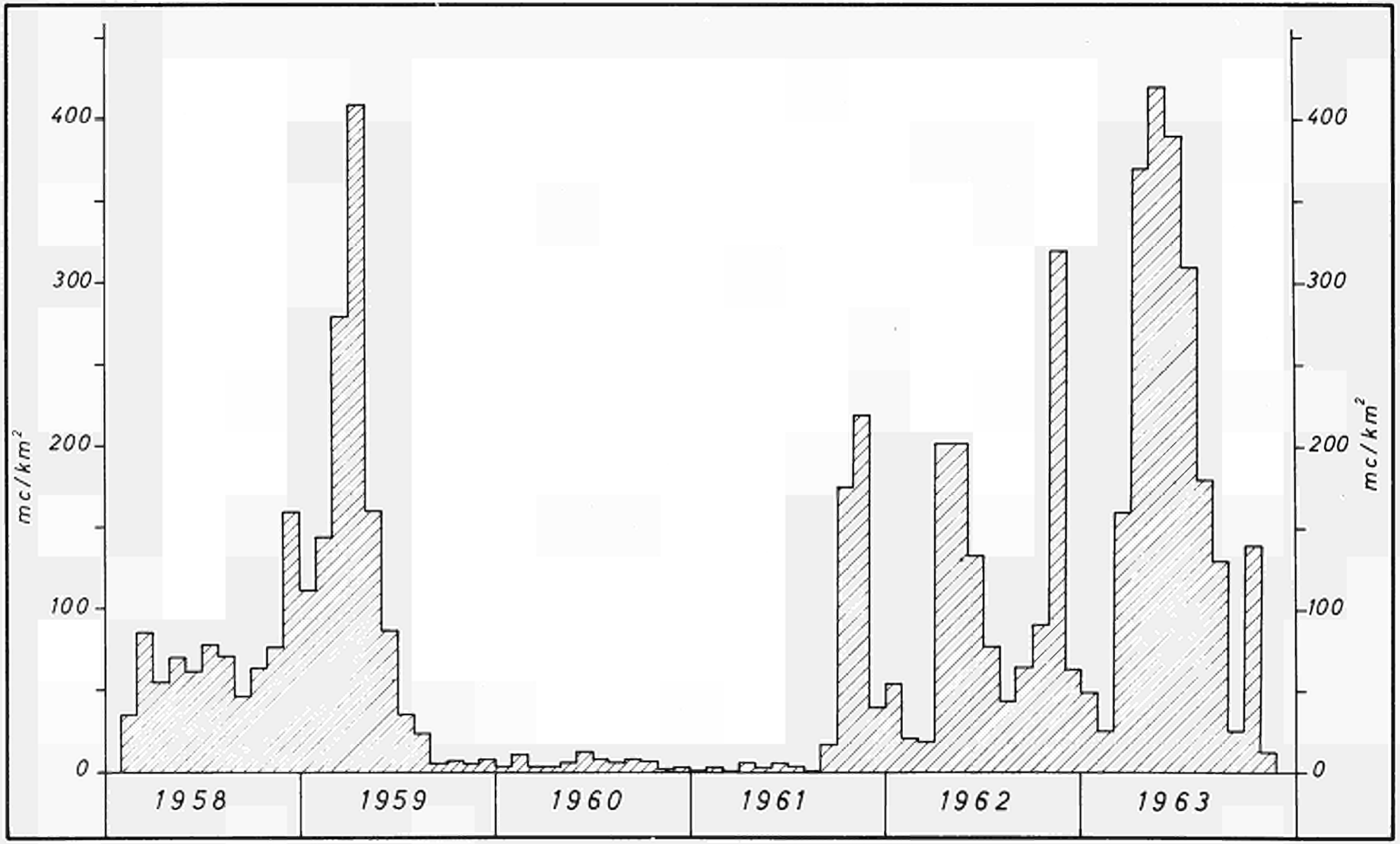
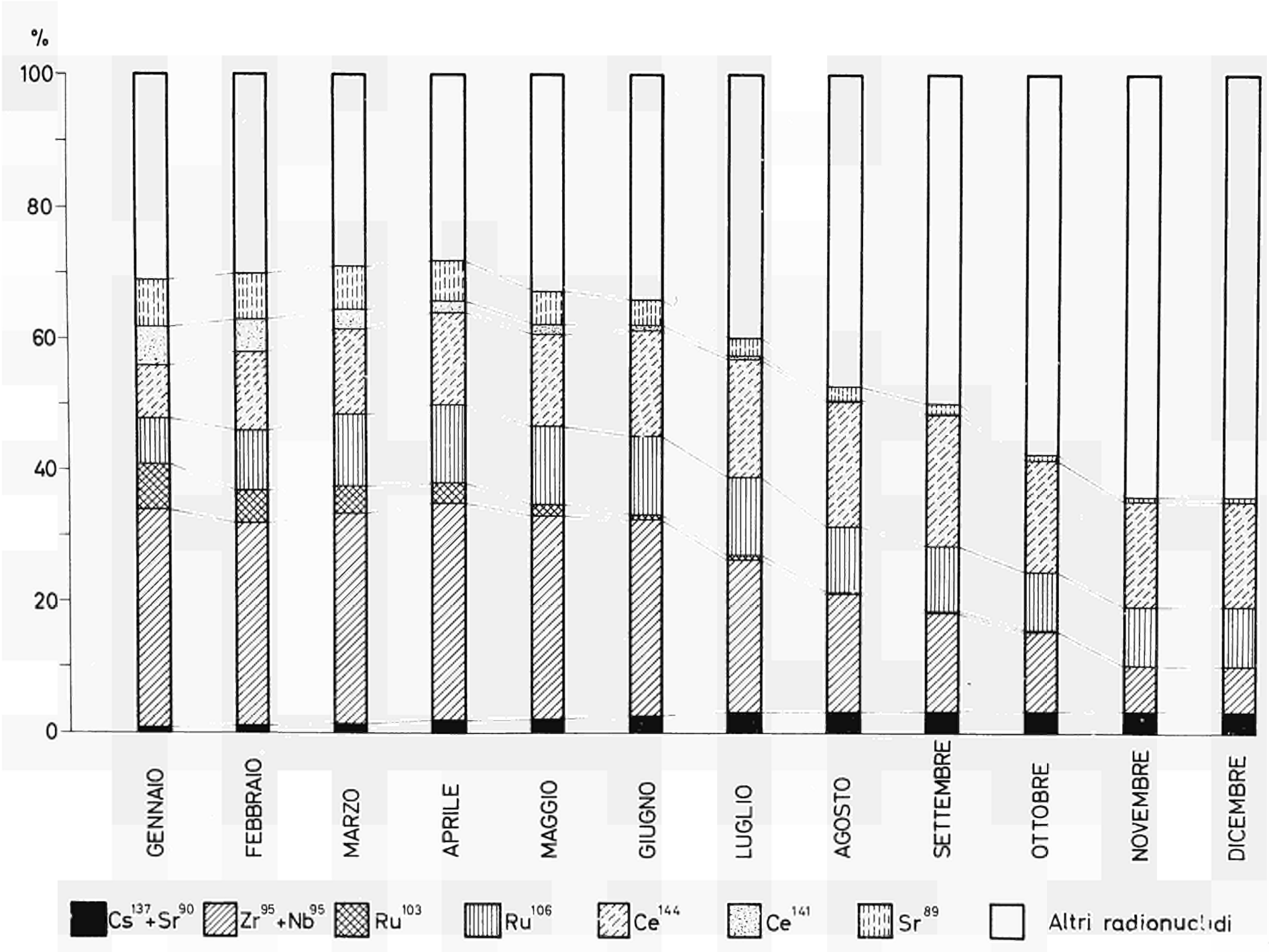
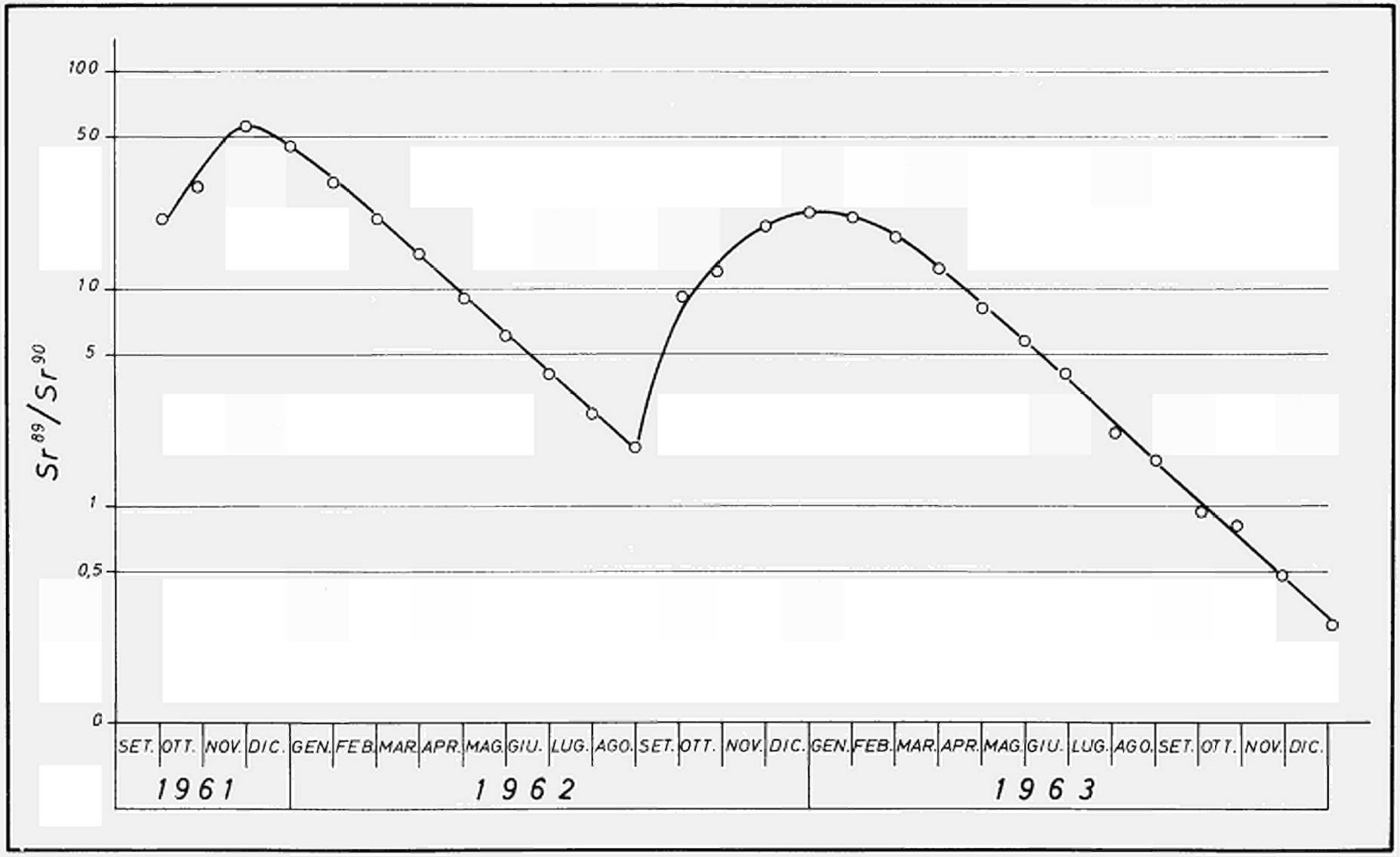


C.C.R. EURATOM ISPRA - SERVIZIO PROTEZIONE

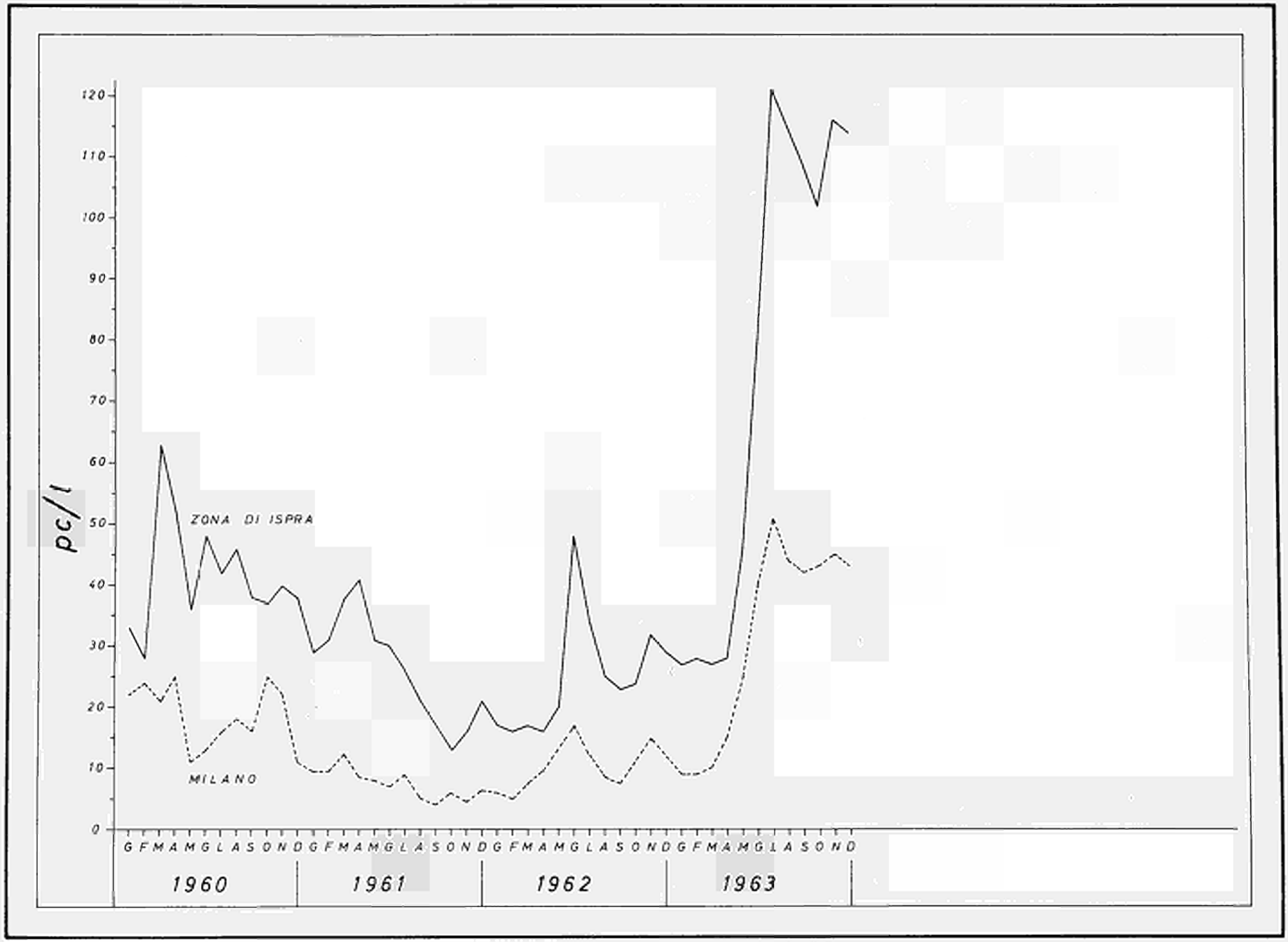


C.C.R. EURATOM – SERVIZIO PROTEZIONE
Sez. Sito e Meteorologia - dsey Gallini 27.9.64

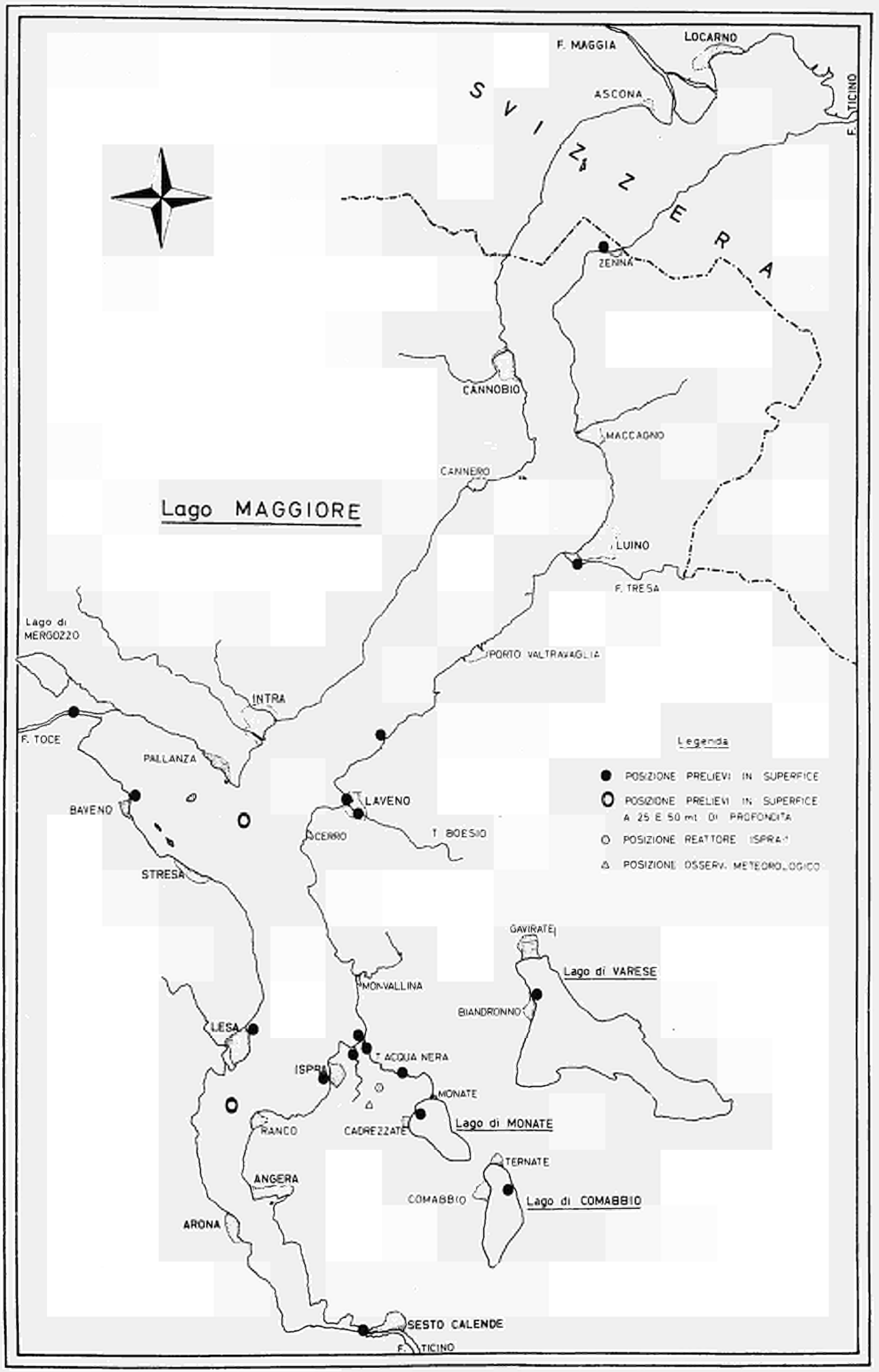

%
100
80
60
40
20
0
GENNAIO
FEBBRAIO
MARZO
APRILE
MAGGIO
GIUGNO
LUGLIO
AGOSTO
SETTEMBRE
OTTOBRE
NOVEMBRE
DICEMBRE
Cs137+Sr90
Zr95+Nb95
Ru103
Ru106
Ce144
Ce141
Sr89
Altri radionuclidi

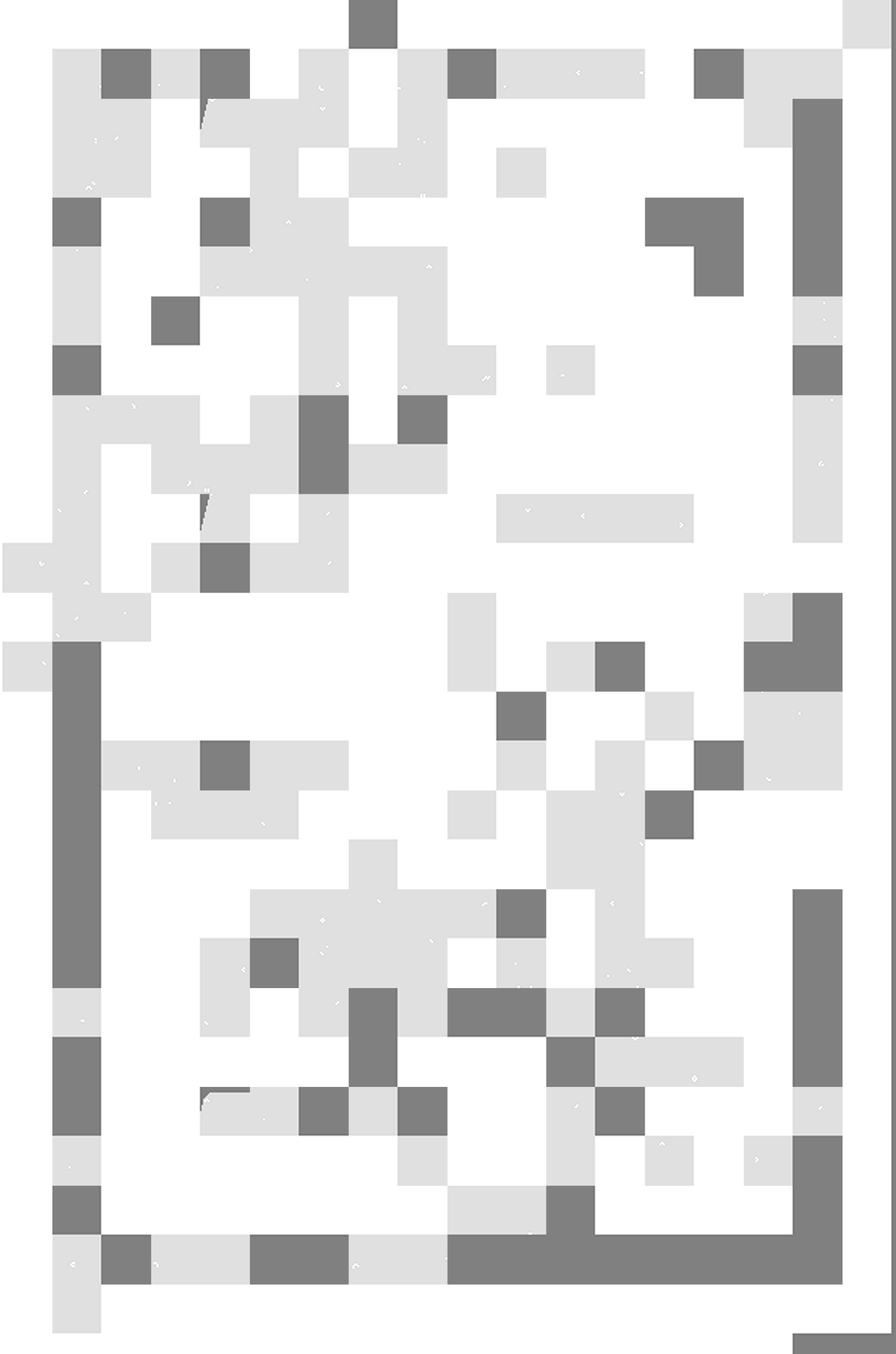


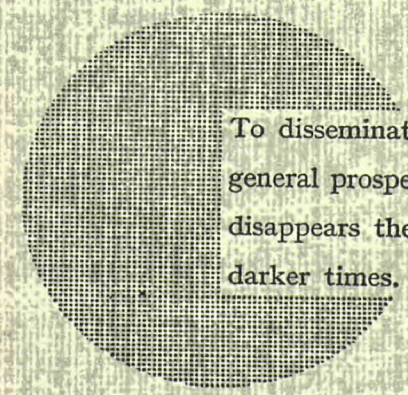
C.C.R. EURATOM ISPRA – SERVIZIO PROTEZIONE
Sez. Sito e Meteorologia – diseg. G.Bollini 4.10.1964



C.C.R. EURATOM ISPRA - SERV. PROTEZIONE
Sez. Sorv. e Meteorologia - Disegno 20.584


F. MAGGIA
LOCARNO
ASCONA
F. TICINO
S V I Z Z E R A
ZENNA
CANNOBIO
MACCAGNO
CANNERO
Lago MAGGIORE
LUINO
F. TRESA
Lago di MERGOZZO
PORTO VALTRAVAGLIA
INTRA
F. TOCE
PALLANZA
BAVENO
LAVENO
CERRO
T. BOESIO
STRESA
Legenda
POSIZIONE PRELIEVI IN SUPERFICE
POSIZIONE PRELIEVI IN SUPERFICE A 25 E 50 mt DI PROFONDITA
POSIZIONE REATTORE ISPRA
POSIZIONE OSSERV. METEOROLOGICO
GAVIRATE
Lago di VARESE
MONVALLINA
BIANDRONNO
LESA
T. ACQUA NERA
ISPRA
MONATE
Lago di MONATE
RANCO
CADREZZATE
TERNATE
ANGERA
COMABBIO
Lago di COMABBIO
ARONA
SESTO CALENDE
F. TICINO





To disseminate knowledge is to disseminate prosperity — I mean general prosperity and not individual riches — and with prosperity disappears the greater part of the evil which is our heritage from darker times.

Alfred Nobel

EURATOM — C.I.D.
51-53, rue Belliard
Bruxelles (Belgique)