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Environmental radioactivity monitoring in Greece

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Abstract

Greek Atomic Energy Commission (GAEC) is the national organization responsible for the environmental radioactivity measurements in Greece. In order to monitor the radioactivity, 12 stations were placed all over Greece. Each station is equiped with NaI detector, measuring daily the total gamma dose rates.
After the Chernobyl experience many countries have installed dense automatic networks, for measuring environmental radioactivity and serving as an early warning system.
In Greece a small telemetric network of two stations was installed in Athens area as a pilot project. Each station consists of two GM detectors (for low and high dose rate respectively). Data are collected for every ten minutes sampling time. Regration time of one hour is obtained. In case of level one and level two alarm states, the sampling time intervals are ten and one minutes respectively. The measurements are obtained by the above stations using the lines of the telephone network, and stored in the central station.
Financial support to upgrade the existing telemetric system was assured by the addition of 25 new telemetric stations which will cover mainly the northern part boardering to other states with nuclear power plants. In order to complete the network, we plan to add more stations to measure the gamma dose rates spread all over Greece, and also monitor river water.

Introduction

GAEC is the national organization responsible for the environmental radioactivity measurements in Greece. GAEC has the responsibility to inform the Greek Goverment, IAEA and EU about the levels of radioactivity around Greece, during normal situation or during emergency.
The international responsibility of GAEC is derived from the following agreements:

1. Two conventions with IAEA on the early notification of a nuclear accident and on assistance in the case of a nuclear accident or radiological emergency.
2. European Union concil decision on community arrangements for the early exchange of information in the event of a radiological emergency.
3. Establishment of a measuring network of environmental radioactivity according to articles 35 and 36 of Euratom Treaty.

GAEC already collaborates with eight periphenal laboratories dispersed around Greece in order to monitor the radioactivity in normal as well as emergency situations. The preparedness of the above laboratories are tested once or twice a year. Intercallibration tests are organized by GAEC to assess and to guarantee the precision and the accuracy of the measurements of the periphenal laboratories.
Some of the above laboratories have extensive experience in environmental radioactivity measurements. For example the environmental radioactivity laboratory of NRCPS Democritos which operates for more than thirty years measures gross beta and gamma radioactivity in air filters and solid and liquid samples. An other laboratory worth of mentioning is the Nuclear Engineering Section of NTUA, has done an extensive collection of soil samples and created maps that represent the distribution of various radionuclides in Greece.

Radioactivity monitoring system in Greece

Since the early sixties, the nessesity of systematic environmental radioactivity measurements was recognized due to weapon testings. In this context the GAEC desided to install, in collaboration with Hellenic National Meteorological Service, total gamma field counters and aerosol samplers around Greece. The Environmental Radioactivity Laboratory of NRCPS Demokritos which at that time belong to GAEC had the responsibility for the operation of this network. The following map presents the measuring positions. There are 12 positions where were placed NaI counters, giving one measurement per day. Additionally there are four positions where we get water samples from rivers originating from neighbouring countries.

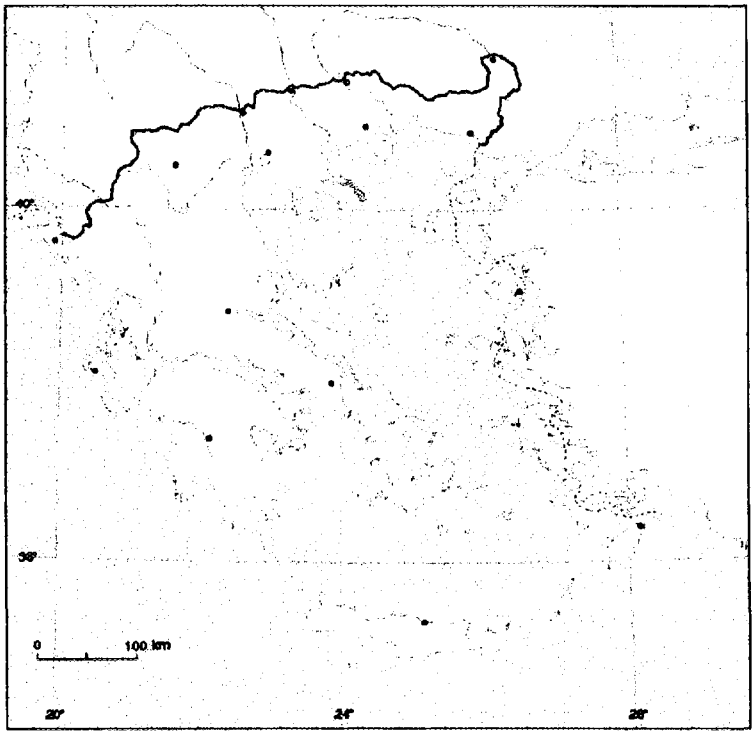

Fig. 1: Air and water total gamma measuring points.

These data are collected daily and presented in graphs monthly and yearly. In the following graph there is a presentation of such data covering three different places for the period of one month.

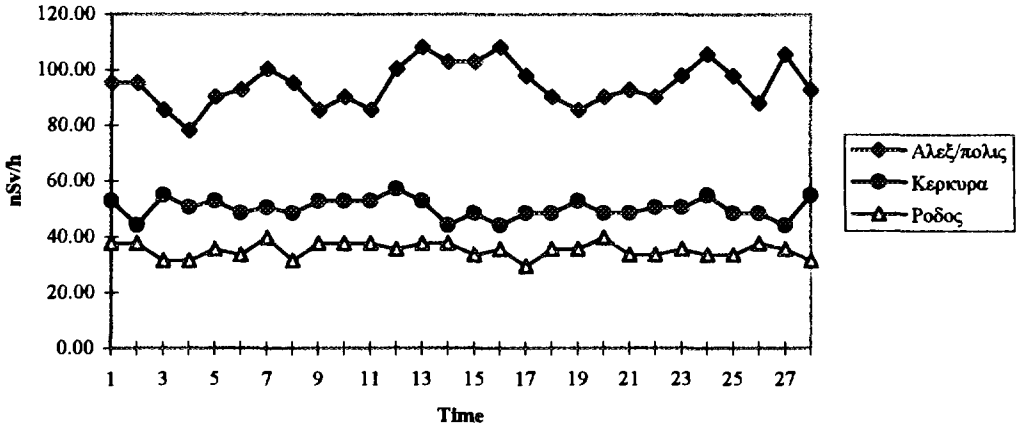

Fig 2: Total gamma measurements for period of one month, in Alexandroupolis, Corfu and Rhodes.

Telemetric system - Present situation

During the last two years a small telemetric system consisting of two stations operates in the region of Athens. The detector of each station has two energy compensated GMs and associated electronics. The digital pulses proporsional to the ambient radioactivity are fed into the micrologger. In normal conditions the system calculates the dose rate continuously and checks it against preprogrammed threshold. If the threshold is not exceeded, the result of the measurement is stored in the data buffer. The contents of this buffer can be transfered to the central system at regular intervals, upon request by the later. In alarm conditions the dose rate is higher than the preprogrammed thresholds. In this case the station will initiate a priority call to the central system. In this case the system acts as an early warning system.

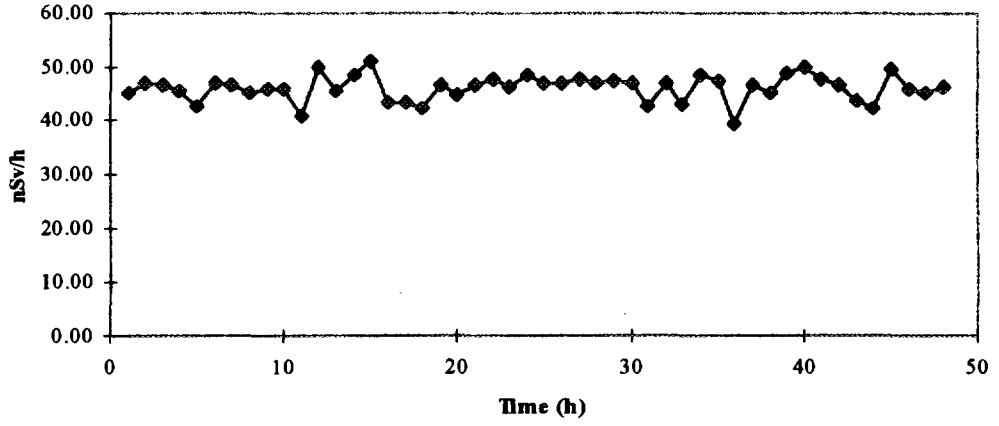

Fig 3: Gamma dose rate from telemetric station in N. Philadelphia (Athens area).

Planning a new telemetric system

The main objective of the planned tlemetric system is to cover the whole Greek territory in order to monitor continuously and automatically the radiation levels in the environment.
The total Greek Network of Telemetric Detectors will consist of:

- 25 gamma dose rate station
- 2 already existing Gamma Dose Rate Station
- 4 gamma water monitor
- 1 primary central control station
- 2 aditional data monitors

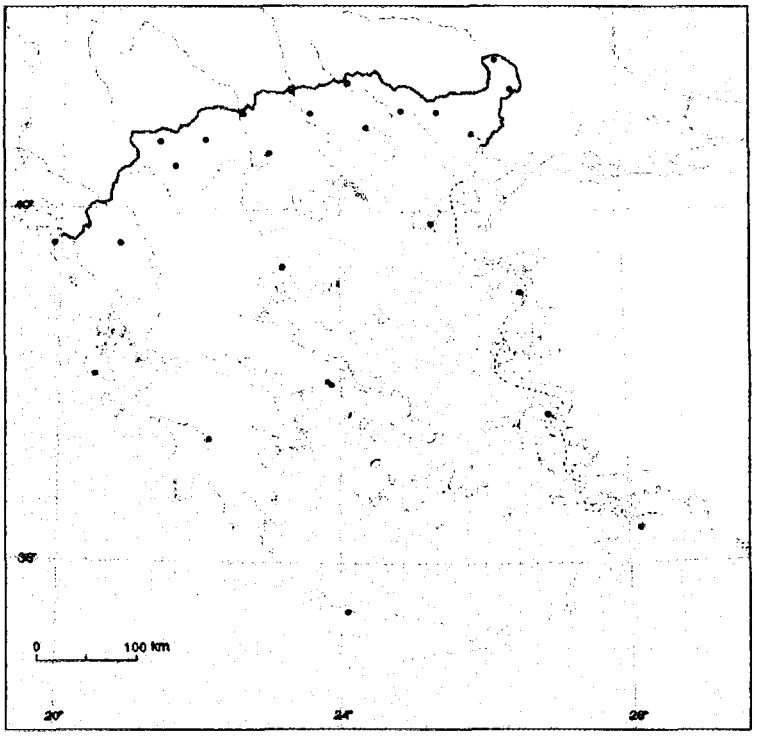

Fig 4: Greek gamma dose telemetric network

Environmental Radioactivity Laboratory

Following a nuclear accident, a large amount of radionuclides were released into the atmosphere contaminating the environment (i.e. Chernobyl accident). There is preparation to overcome such emergencies. GAEC is equiped with a certain number of laboratory detectors covering the field of gamma spectroscopy (HPGe, NaI, etc), to analyse samples of soil, water and air filters. In the near feature is planned to add more detectors for gamma spectroscopy and to extend also to beta and alpha measurements.
The GAEC is also planning to collect and measure the level of radioactivity in Greek seas. The water see samples will be collected Aegean and Ionian sea. It is planned to measure the concentrations of Cs - 134, Cs - 137, K - 40, U - 235, Ra - 228 e.t.c. by using spectroscopic gamma analysis. A low background high purity Ge detector will be employed.