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Fission product activity measurements in air particulate filters collected after Fukushima accident at Palermo, Italy

Salvatore Rizzo, Elio Tomarchio

Palermo University, Energy Department, Nuclear Engineering Section, Viale delle Scienze, Building No. 6, 90128 Palermo (Italy) - Presenting author, E-mail: elio.tomarchio@unipa.it

1. INTRODUCTION

Measurements of radionuclide air concentration are periodically performed at Energy Department of Palermo University by filtering an high volume of air through paper filters and by using HPGe gamma-ray spectrometry. After Fukushima accident, a series of samplings was carried out with a daily frequency so to detect the possible arrival of air radioactive contamination and to follow its evolution.

2. MATERIALS AND METHODS

The sampling of air particulates was carried out from March 21, 2001 until the first ten days of May 2011. The suctions were made with a high volume sampler (9,000 14,000 m^3 of filtered air per sample), located about 20 m above ground-level on the roof of the Department, and using a cellulose filter Sofiltra Poelman HYN-75 (Bleu type) of size 45cm x 45cm. The sampling time was set at 14 h, from 6 pm to 8 am the next day (with timer), with the exception of longer time sampling during holiday periods. At the end of sampling, the filter was cut, packed and pressed so to obtain a size 6 cm × 6 cm × 0.7 cm, a measurement geometry called "packet-sample" and used for gamma-ray spectrometry analysis with HPGe detectors.

3. RESULTS AND CONCLUSIONS

Fig. 1 shows the time dependence of airborne concentrations of ^{131}I (only particulate matter), ^{134}Cs and ^{137}Cs measured from March 24, 2011 (daylight sampling), in which there was the first detection of ^{131}I, until the first days of May 2011. Fig. 2 shows the gamma-ray spectrum of the sample in which maximum values of airborne concentrations of ^{131}I, ^{134}Cs, ^{136}Cs and ^{137}Cs were evaluated (sampling of March 28-29). $^{131}I/^{137}Cs$, $^{136}Cs/^{137}Cs$ and $^{134}Cs/^{137}Cs$ activity ratio values are 9.56, 0.079 and 0.807, respectively. Dose values were very low, 8 × 10^{-4} µSv for the ^{131}I (considering only the particulates), 2 × 10^{-4} µSv for ^{134}Cs and 4 × 10^{-4} µSv for ^{137}Cs. The measured maximum concentrations are of the order of 1/1000 to 1/100000 of those recorded immediately after the Chernobyl accident and are comparable with those highlighted after the accident at Acerinox (Spain) plant. Airborne concentration values are no significant from dose to population assessment point of view.

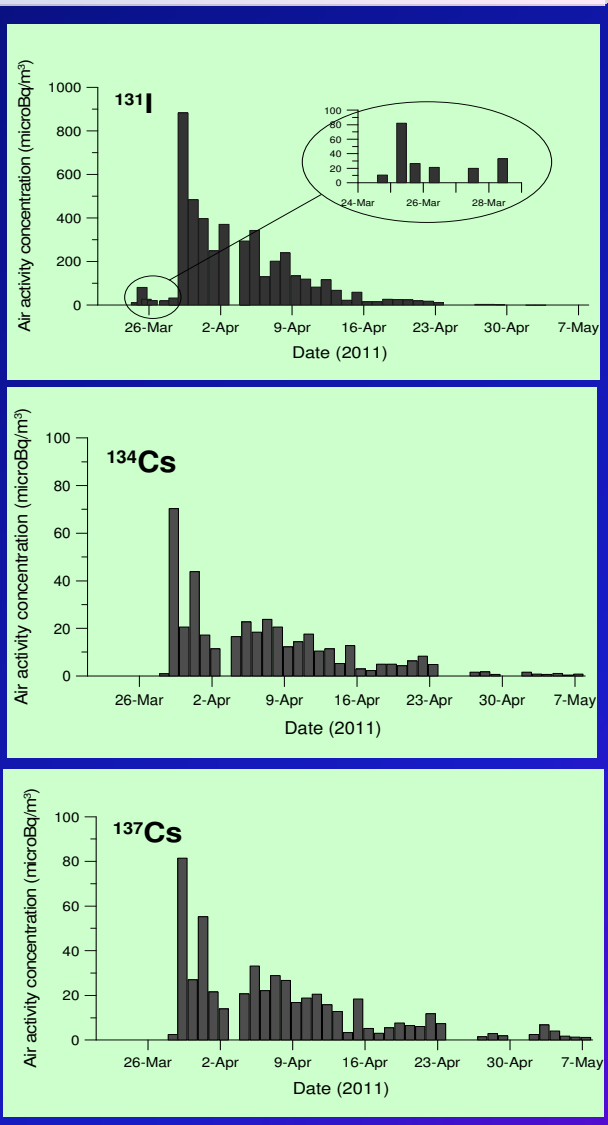

Fig. 1 – *Time dependence of ^{131}I, ^{134}Cs and ^{137}Cs airborne concentrations.*

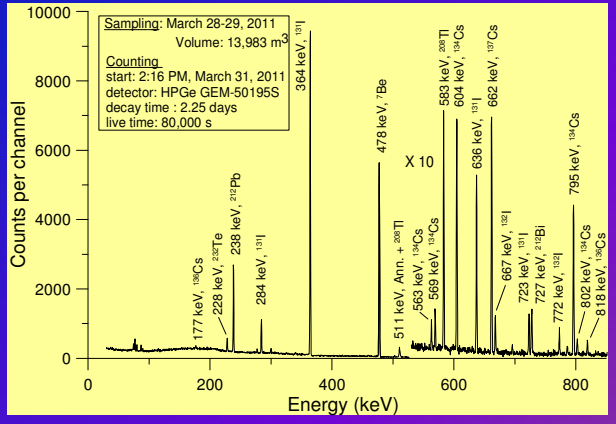

Fig. 2 – *Gamma-ray spectrum detected on the sample with the maximum activity values.*