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AIRBORNE CONCENTRATIONS AND DEPOSITION RATES OF RADIOACTIVITY FROM A HYPOTHETICAL ACCIDENT SCENARIO

1 SCOPE

To examine a number of hypothetical accident scenarios, including the local spread of radioactivity from radioisotopes originating from diagnostic and therapeutical applications at the University Hospital of Alexandroupolis in northern Greece

Fig. 1 Location and topography of the study area

2 METHODS-SIMULATIONS

- The Atmospheric Dispersion Modeling System 5 (ADMS-5) was used to model the levels of radioactivity in the air and the rates of deposition to the ground. Gamma doses were also investigated
- A catastrophic failure at the storage tanks of radioactive waste was considered as the main hypothetical accident scenario
- Two isotopes were considered, namely Iodine-131 (^{131}I), with a radioactive decay half-life of about 8 days, and Technetium-99m (^{99m}Tc), with a half-life of 6 hours
- The isotopes were released as particulates at a rate of 500 Bq/s, from a 2 m point source with a diameter of 1 m. The temperature and the exit velocity were set at 15 °C and 15 m/s, respectively
- Different scenarios corresponding to the prevailing winds and the meteorological conditions standing for the Pasquill-Gifford stability categories A-G were considered

3 RESULTS

- The maximum air concentrations and deposition rates for both isotopes occurred close to the source and were associated with neutral atmospheric conditions (Pasquill-Gifford category D)
- In the case of northeast and southwest winds for neutral conditions, the gamma doses occurred very close to residential and crowded areas

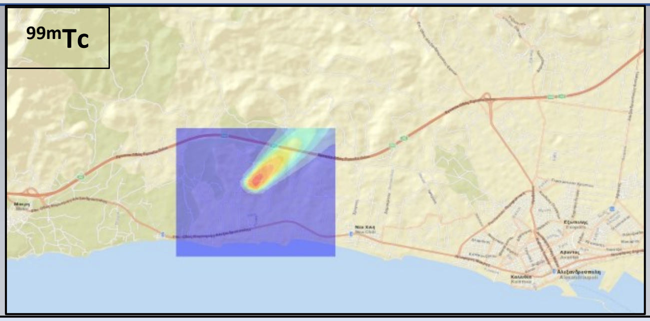
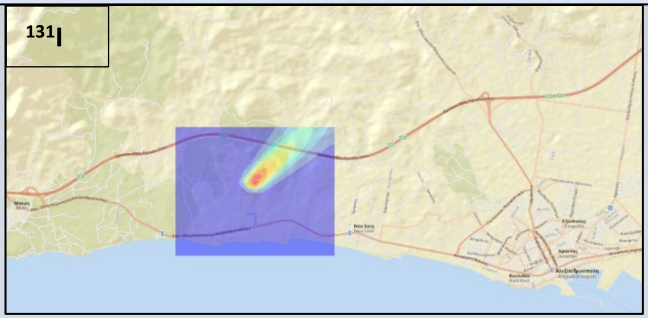


Fig. 2 Contour plots of gamma dose due to emissions of ^{99m}Tc and ^{131}I, in the case of southwest winds and neutral conditions



4 CONCLUSIONS

- The concentrations calculated do not pose an immediate threat to the inhabitants
- However, the ionizing activity may be harmful regardless of the amount of dose received
- In such an unlike event, the functions and activities in the surrounding areas should be stopped and necessary checks should be performed by the competent authorities for safety reasons
- These results highlight the importance of local sources and meteorology during radioactivity accidents and can be used for safety and emergency planning reasons