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Increasing the Reliability of Decision-Support Systems for Nuclear Emergency Management

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Decision support systems for nuclear emergency management (DSNE) are currently used worldwide to assist decision makers in taking emergency response countermeasures in case of accidental releases of radioactive materials from nuclear facilities. The present work has been motivated by the fact that, up until now, DSNE systems have not been regarded as safety critical software systems. The core of any DSNE system is represented by the different simulation codes linked together to form the dispersion simulation workflow. These codes require input emission and meteorological data to produce forecasts of the atmospheric dispersion of radioactive pollutants and other substances. However, the reliability of the system not only depends on the trustworthiness of the measured (or generated) input data but also on the reliability of the simulation codes used. The main goal of this work is to improve the reliability of DSNE systems by adapting current state of the art methods from the domain of software reliability engineering to the case of atmospheric dispersion simulation codes. The current approach is based on the "design by diversity principle" for improving the reliability of simulation codes and the trustworthiness of simulation results. The effectiveness of the approach has been tested using the results of two test versions of the RODOS DSNE system used in several European countries.