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Rapid vulnerability and risk assessments for critical areas regarding substances set free into the atmosphere based on predicted source-receptor sensitivity fields

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The total effect of an accident or incident based on the release of hazardous material into the atmosphere will not depend on the total area of land where a certain threshold exposure is predicted to be exceeded. Instead, it is determined by the number of people living in this area. So, the effect will be determined by an overlay of critical exposure area data with population density data. Therefore, it is evident that rapid vulnerability and risk assessments for regions of high population density are crucial for preparedness purposes. The calculation of Source-Receptor Sensitivity (SRS) fields for monitoring stations and networks has been shown to be very efficient in analysing or predicting measurement scenarios based on known or hypothetical atmospheric releases. If theses fields are available, complex global measurement scenarios can be predicted or reconstructed within seconds. This SRS concept originally developed for measurement points shall now be extended to population density centers. The goal is to predict the total exposure of a population Centre (i.e. the exposure of the population living into the defined boundaries) regarding a hazardous substance for the next 3-5 days, within a few seconds after a particular release gets known. The technical solution for this problem is to calculate SRS fields not for a point, but for a predefined, non-geometrical area. Besides the emergency response aspect, such data can be used for planning purposes, for example for the minimization of risks for the population from fixed and mobile point sources. In this presentation, the calculation of SRS fields for non-geometric areas will be demonstrated, and a few examples of possible applications will be provided.