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# Sensitivity analysis of a short distance atmospheric dispersion model applied to the Fukushima disaster

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In a previous study, the sensitivity of a long distance model was analyzed on the Fukushima Daiichi disaster case with the Morris screening method. It showed that a few variables, such as horizontal diffusion coefficient or clouds thickness, have a weak influence on most of the chosen outputs. The purpose of the present study is to apply a similar methodology on the IRSN's operational short distance atmospheric dispersion model, called pX.

Atmospheric dispersion models are very useful in case of accidental releases of pollutant to minimize the population exposure during the accident and to obtain an accurate assessment of short and long term environmental and sanitary impact. Long range models are mostly used for consequences assessment while short range models are more adapted to the early phases of the crisis and are used to make prognosis.

The Morris screening method was used to estimate the sensitivity of a set of outputs and to rank the inputs by their influences. The input ranking is highly dependent on the considered output, but a few variables seem to have a weak influence on most of them. This first step revealed that interactions and non-linearity are much more pronounced with the short range model than with the long range one.

Afterward, the Sobol screening method was used to obtain more quantitative results on the same set of outputs. Using this method was possible for the short range model because it is far less computationally demanding than the long range model.

The study also confronts two parameterizations, Doury's and Pasquill's models, to contrast their behavior. The Doury's model seems to excessively inflate the influence of some inputs compared to the Pasquill's model, such as the altitude of emission and the air stability which do not have the same role in the two models.

The outputs of the long range model were dominated by only a few inputs. On the contrary, in this study the influence is shared more evenly between the inputs.