ID: **P2.4-499** Type: **E-poster**

Inverse Atmospheric Dispersion Modelling and Realistic Training for Assessment of Releases of Radioactivity

Thursday, June 22, 2023 11:34 AM (1 minute)

This work describes a method for estimating the location, moment and the amount of an unknown atmospheric release of radioactivity, based on detections. First, the source location is estimated by a probability density function based on the time-integrated correlation coefficient between model calculations and measurements of radioactivity concentrations. Model results are calculated with the adjoint transport equation, thereby reducing the number of atmospheric transport simulations to the number of detections. Next, the moment of release is defined as the moment when the correlation coefficient reaches its highest value. Finally, the released quantity is estimated by a least-squares method in which the residual is defined as the difference between observed and modelled concentrations. The method is validated with the ETEX-1 experiment and applied to the case of Ru-106 detections in Europe in September 2017.

In addition, apart from accurate models, proper training to use these models is a prerequisite for adequate radiological assessment. Therefore, a methodology is presented to perform realistic exercises for emergency response that can be used for scenarios with both unknown and known release locations. The method allows for real-time simulation of measurements of several operational detectors and measurement teams, thereby improving realism to training exercises.

References:
https://doi.org/10.1016/j.jenvrad.2021.106643

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Promotional text

The CTBTO community can benefit from the experience and expertise in the community of radiological emergency preparedness and response and vice versa.

Oral preference format

in-person

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Session Classification: Lightning talks: P2.4

Track Classification: Theme 2. Events and Nuclear Test Sites: T2.4 Atmospheric and Subsurface Radionuclide Background and Dispersion