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can we determine the origin of radionuclide observations? Presenting the Bayesian source reconstruction algorithm "FREAR"

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Radionuclide observations made by the International Monitoring System are an important part of the CTBT verification regime, as it allows to discriminate between conventional and nuclear explosions. Atmospheric transport and dispersion modelling can link known sources with such observations. However, sometimes observations are made for which the source parameters (such as the release amount, release period and release location) are unknown. In that case, inverse atmospheric transport modelling can be used to determine the source parameters. In this talk, the Bayesian source reconstruction tool FREAR will be presented. The FREAR tool allows to determine source parameters based on radionuclide observations and source-receptor-sensitivities; the latter can be calculated by an atmospheric transport model and are routinely provided by the CTBTO. Detections and instrumental non-detections are taken into account, and the possibility of false alarms and misses is considered too. The Bayesian approach inherently takes into account uncertainties. Furthermore, a method to determine model uncertainties, based on an ensemble, will be presented.

Promotional text

An algorithm will be presented that determines the release location and other source parameters by making use of radionuclide observations (both detections and non-detections can be used) and atmospheric transport modelling. Uncertainties are rigorously taken into account.

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