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Source Term Estimation in the Presence of Nuisance Signals

Many source-term estimation algorithms for atmospheric releases assume the measured concentration data are influenced only by the releases of interest. However, there are situations where identifying a short-term release from an unknown location in the presence of long-term releases from a different location is of interest. One such example is determining if part or all of a typical magnitude concentration of a radioactive isotope in a sampler came from a nuclear explosion, such as the explosion announced by DPRK in 2013, while medical isotope facilities and nuclear power plants were also operating in the region. An estimation algorithm has been developed for the case where a short-duration release is confounded by a long-term nuisance signal associated with one or more additional release locations. The technique is demonstrated using synthetic release data for a hypothetical medical isotope production facility and a hypothetical puff release from a different location. The algorithm successfully determines the location and time-varying release rate from the medical isotope production facility and the location, time, and release magnitude of the puff release.

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