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Nudging: Making Background Predictions with Atmospheric Transport Modelling Sensitive to IMS Observations

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Radioxenon emissions originating from a variety of nuclear facilities (e.g. nuclear power plants) induce a variable and observable background that poses a challenge for the global monitoring of nuclear explosions since it may conceal signals resulting from a nuclear test explosion. More precision is required to accurately model civilian facilities so that noble gas detections can be screened out as a civilian source. Improved screening can be attained by iteratively adjusting emission values of these sources in the atmospheric transport modelling (ATM) runs. For a regional domain and a timeframe of a few weeks, IMS observational data are compared with ATM estimations using annual release averages from regional nuclear power plants (NPPs). The activity concentrations at IMS stations are estimated by combining the activity (Becquerel) from the sources with the modelled source-receptor sensitivity between the IMS radionuclide stations (receptors) and the nuclear powerplants (sources) as a dilution from ATM. NPP releases, linked to those estimations, that deviate significantly from the detections are identified and are adjusted for an updated ATM estimation in all stations. This basic approach results in a better match between moderately known source releases and IMS observations while extrapolation to seasonal timeframes might be appropriate.

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