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of forward and backward source-receptor sensitivities for atmospheric inverse modeling using the HYSPLIT model with the Cross-Appalachian Tracer Experiment (CAPTEX) field experiment measurements

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Based on observations from monitoring stations or other platforms, unknown atmospheric pollutant emission sources, including source location, strength, and temporal variations, can be estimated using inverse modeling techniques. In such applications, 3D-particle Lagrangian dispersion models are usually employed, and the source-receptor sensitivities are calculated in either forward or backward modes for the source term estimation. While specifics of a given application may suggest a preference for one mode over the other, both forward and backward approaches can generally be applied for the inverse modeling. However, differences are often found in the inversion results between analyses based on forward and backward methodologies. In this study, we use the Cross-Appalachian Tracer Experiment (CAPTEX) field experiment as a test case to compute the source-receptor sensitivities between the known sources and air samples collected at 84 measurement sites. The differences between the forward and backward sensitivities calculated using the HYSPLIT model will be presented. The impact of the differences between the two approaches on the source term estimation results will be discussed. In addition, the underlying causes of the sensitivity discrepancies between the forward and backward approaches will be investigated and discussed.

Promotional text

The atmospheric radionuclide observations from CTBTO IMS network are often used to estimate the sources using inverse modeling techniques. In this study, we compare forward and backward source-receptor sensitivities for atmospheric inverse modeling using the HYSPLIT model.

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