P4 Sensitivity of a Bayesian atmospheric-transport inversion model to spatio-temporal sensor resolution.

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Atmospheric source reconstruction allows for the probabilistic estimate of source characteristics of an atmospheric release given concentration observations; the confidence in the inversion depends on the time and space scales of the observations. The objective of this study is to quantify the robustness of the source reconstruction in the presence of sparse spatial and temporal observations. To this end, data denial techniques are used to progressively coarsen the temporal and spatial resolution of the concentration observations. To allow for a more comprehensive data denial study, the observations are constructed synthetically by extracting concentration time series from the FLEXPART dispersion model. The reconstruction model seeks to recover the true input parameters from the synthetic observations. The reconstructed parameters considered are source location, source timing and source quantity. The reconstruction is achieved by running an ensemble of thousands of FLEXPART dispersion model runs that sample from a uniform distribution of the input parameters. The meteorological input for the FLEXPART runs is simulated with the Weather Research and Forecasting model. Machine learning is used to train a computationally-efficient surrogate model from the ensemble simulations. Monte Carlo sampling and Bayesian inversion are then used in conjunction with the surrogate model to quantify the posterior probability density functions of the FLEXPART input parameters. This research seeks to inform decision makers of the tradeoffs between more expensive, high frequency observations and less expensive, low frequency observations.