



Analysis of elevated I-131 samples observed in 2011 over Europe

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We are concerned with analysis of elevated I-131 samples observed in October and November 2011 across Europe. Later on these samples were connected with I-131 emissions from the Hungarian Institute of Isotopes in Budapest. Using the data from multiple European countries we attempt to estimate the source term using two methods.

Firstly, we use a standard source inversion approach based on minimization of an objective function. This function has two quadratic terms: mismatch between model and measurements weighted by an observation error covariance matrix and the deviation of the solution from a first guess weighted by the first-guess error covariance matrix. For simplicity, both error covariance matrices are approximated as diagonal. Analytical minimization of the cost function leads to a linear system of equations.

Secondly, we use a more advanced method based on Variational Bayes approximation. Here, all uncertainties are formulated as a prior probabilistic model which is capable of introducing some additional assumptions on the solution like sparsity or smoothness. Since the inference of the model is intractable, we follow Variational Bayes approximation yielding an iterative algorithm for estimation of all model parameters. Thus, the source term and elements of covariance matrices are estimated from the data automatically.

Flexpart forced with GFS meteorological fields is used as an atmospheric transport model in both experiments.

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