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Estimation of spatio-temporal source of microplastics using Bayesian Neural networks

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Estimation of the source of airborne microplastics is a challenging inverse problem since the number of measurements is very small compared to the number of potential sources. The source is spatio-temporal and thus its estimation from a few measurements is severely ill-posed. Recent studies [1] solve this issue using Bayesian methods that introduce prior on the source term using additional assumptions of sparsity and smoothness. Here, deposition measurements of airborne microplastics and microfibers from the Western USA are combined with the FLEXPART atmospheric dispersion model to construct and solve the linear inverse problem. However, the posterior is obtained only approximately, with an underestimated variance of the estimate.

In this contribution, we solve the same inverse problem as in [1] using a source term estimator in the form of a spatial Bayesian neural network [2]. We compare the obtained results with those obtained by the conventional methods. Since the ground truth for the microplastics is not available, the accuracy of the estimation cannot be assessed quantitatively. Therefore, we focus on qualitative comparison and sensitivity study with respect to initial conditions and hyper-parameters of the methods.

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