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Two stage inversion method for microplastics emission estimation

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The goal of this contribution is to explore two-stage inversion algorithm for spatio-temporal emission estimation (2D and time) from deposition measurements of microplastics and microfibers from Western USA. We consider the linear inversion model formulated as $\mathbf{y} = \mathbf{M}\,\mathbf{x}$, where $\mathbf{y}$ is the measurement vector, $\mathbf{M}$ is source-receptor-sensitivity matrix computed using Lagrangian particle dispersion model FLEXPART, and $\mathbf{x}$ is the unknown emission vector from given spatial element. The inverse problem is typically ill-conditioned due to the measurements sparsity, hence, we propose two stage algorithm for inversion of this type. First, we run the inversion algorithm for the whole spatial domain, hence, we obtain averaged emission from each spatial element of the considered spatial domain. Second, we use the estimated emission from the first step (common for all spatial elements) as a prior emission in the second step where the inversion problem is considered for each spatial element separately. We demonstrate that this approach regularizes the inversion problem of spatio-temporal emission from sparse measurements, concretely on microplastics and microfibers emission estimation in Western USA.