EGU26-10867, updated on 07 Oct 2026
https://doi.org/10.5194/egusphere-egu26-10867
EGU General Assembly 2026
© Author(s) 2026. This work is distributed under
the Creative Commons Attribution 4.0 License.

Global Atmospheric Microplastics Emissions Estimated Using Constrained Bayesian Inverse Modeling

Ondřej Tichý[1], Michal Uliáš[1], Ioanna Evangelou[2], Václav Šmídl[1], and Nikolaos Evangeliou[3]
[1]Institute of Information Theory and Automation, Czech Academy of Sciences, Prague, Czechia (otichy@utia.cas.cz)
[2]Department of Meteorology and Geophysics, University of Vienna, Universitätsring 1, Vienna 1010, Austria
[3]Stiftelsen NILU (former Norwegian Institute for Air Research), Department of Atmospheric and Climate Research (ATMOS), Kjeller 2007, Norway

We present an analysis of global atmospheric microplastics (MPs) concentration and deposition measurements using constrained Bayesian inverse modeling to estimate global MPs emissions. The proposed Bayesian framework explicitly accounts for unknown ratios between size fractions inherent to MPs measurements and incorporates prior emission information to stabilize the inversion. The coupling between observations and unknown emissions is established using the atmospheric transport model FLEXPART version 11 operated in backward mode for each measurement. Model parameters are inferred using a variational Bayes approach, resulting in an iterative estimation scheme that updates both model parameters and the effective spatial structure of the computational domain. This methodology reduces the need for manual intervention during the inversion process and limits potential bias in the results. The resulting global MPs emission estimates are evaluated against previously published ones.

Acknowledgment:

This research has been supported by the Czech Science Foundation (grant no. GA24-10400S). N.E. was funded by the Norwegian Research Council (NFR) project MAGIC (No.: 334086). FLEXPART model simulations are cross-atmospheric research infrastructure services provided by ATMO-ACCESS (EU grant agreement No 101008004). The computations were performed on resources provided by Sigma2 - the National Infrastructure for High Performance Computing and Data Storage in Norway.