

EGU24-2652, updated on 28 Mar 2025

<https://doi.org/10.5194/egusphere-egu24-2652>

EGU General Assembly 2024

© Author(s) 2025. This work is distributed under the Creative Commons Attribution 4.0 License.



FLEXPART-11: Advancements in a Lagrangian Atmospheric Model for Enhanced Accuracy, Efficiency, and Flexibility

Lucie Bakels¹, Daria Tatsii¹, Anne Tipka², Marina Dütsch¹, Michael Blaschek¹, Silvia Bucci¹, Andreas Plach¹, Martin Vojta¹, Petra Seibert^{1,3}, Ignacio Pisso⁴, Sabine Eckhardt⁴, Massimo Cassiani⁴, Christine Groot Zwaaftink⁴, Marie Mulder⁵, and Andreas Stohl¹

¹University of Vienna, Meteorology and Geophysics, Vienna, Austria (lucie.bakels@univie.ac.at)

²CTBTO, Comprehensive Nuclear-Test-Ban Treaty Organization, Vienna, Austria

³BOKU, University of Natural Resources and Life Sciences, Institute of Meteorology and Climatology, Vienna, Austria

⁴NILU, Norwegian Institute for Air Research, Kjeller, Norway

⁵Geosphere Austria, Vienna, Austria

Numerical methods and advanced simulation codes play a crucial role in helping us understand complex atmospheric processes. As technology progresses, it's important to develop sophisticated code for accurate and efficient simulations. In this update to FLEXPART, a Lagrangian model used in numerous studies for the past 30 years, we've made significant improvements. This version of FLEXPART shows improvements in accuracy and computational efficiency. By using native ECMWF coordinates, we reduced conservation errors by about 8-10% for semi-conserved quantities like potential vorticity. The shape of aerosol particles are now properly accounted for, greatly improving the accuracy of the deposition of non-spherical particles (e.g. microplastic fibers). Additionally, the incorporation of OpenMP parallelisation makes the model better suited for handling large input data and extended simulation periods. We've also introduced new methods for the input and output of particles in FLEXPART. Users can now run FLEXPART with their own particle input data, making it more adaptable for specific research scenarios.