Title

PySDM: Pythonic particle-based cloud microphysics package

List of Authors

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Abstract

In the poster, we will present a new open-source cloud microphysics simulation package PySDM (https://github.com/atmos-cloud-sim-uj/PySDM). The package core is a Pythonic implementation of the Super-Droplet Method (SDM) Monte-Carlo algorithm for representing aerosol/cloud/rain collisional growth.

PySDM design features separation of a backend layer responsible for number-crunching tasks. The developed backend implementations based on Numba, Pythran and ThrustRTC leverage three different Python acceleration techniques dubbed just-in-time, ahead-of-time and runtime compilation, respectively. As a result, PySDM offers high performance with little trade-offs with respect to such advantages of the Python language as succinct and readable source code and portability (seamless interoperability between Windows, OSX and Linux). We will exemplify further advantages that result from embracement of the Jupyter platform which allowed us to equip PySDM with interactive examples and tutorials swiftly executable via web browser through cloud-computing platforms.

Example simulations of the warm-rain process in a kinematic two-dimensional framework mimicking stratoculumus deck will be presented and used as a basis for scalability analysis and discussion of parallelisation nuances of the SDM algorithm.

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