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Development of a comprehensive testing framework for Lagrangian dispersion models: Application to wet deposition in FLEXPART

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Tasks such as inverse modelling and prediction of transport and dispersion of aerosols and soluble gases are increasingly performed by Lagrangian particle models, e.g. FLEXPART (FLEXible PARTicle dispersion model, http://flexpart.eu). Applications include decision making in situations of crisis. Therefore, the credibility in their results should be established through extensive evaluation. Because of this, we are currently developing a testing environment for FLEXPART. This environment is not only going to test the functionality of the model as a whole but also the functionality of its components such as, for example, wet deposition. Test cases and corresponding evaluation already created by FLEXPART developers in the past shall be brought together in this single environment, allowing for efficient testing of future code additions and modifications. Regression testing is being applied, meaning that the collection of test cases for all parts of the model is used to make sure that a change in one part of the model does not negatively affect the behavior of all the other parts, including overall runtime.
One component of FLEXPART is the deposition scheme. Because particulate or particle-borne trace substances undergo wet as well as dry deposition, it is an important part of atmospheric transport modelling and it is a major influence factor for the atmospheric lifetime of aerosols and soluble gases. Therefore, we are presenting the development of our testing environment based on the example of the implementation of an improved wet deposition scheme in the latest FLEXPART version. Besides the usual software tests for assessing the functionality, performance and the structure-oriented work flow of the code, we have to show that the physical results of the deposition fields are realistic.
The component of the testing environment for a new wet deposition scheme implemented in FLEXPART should compare its results with (i) measured deposition data, (ii) results from previous wet deposition schemes, and (iii) results from other models using a range of suitable metrics.