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flexCloud: Deployment of the FLEXPART Atmospheric Transport Model as a Cloud SaaS Environment

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FLEXPART (FLEXible PARTicle dispersion model) is a Lagrangian transport and dispersion model used by a growing international community. We have used it to simulate and forecast the atmospheric transport of wildfire smoke, volcanic ash and radionuclides. Additionally, FLEXPART may be run in backwards mode to provide information for the determination of emission sources such as nuclear emissions and greenhouse gases. This open source software is distributed in source code form, and has several compiler and library dependencies that users need to address. Although well-documented, getting it compiled, set up, running, and post-processed is often tedious, making it difficult for the inexperienced user.

Our interest is in moving scientific modeling and simulation activities from site-specific clusters and supercomputers to a cloud model as a service paradigm. Choosing FLEXPART for our prototyping, our vision is to construct customised IaaS images containing fully-compiled and configured FLEXPART codes, including pre-processing, execution and postprocessing components. In addition, with the inclusion of a small web server in the image, we introduce a web-accessible graphical user interface that drives the system. A further initiative being pursued is the deployment of multiple, simultaneous FLEXPART ensembles in the cloud. A single front-end web interface is used to define the ensemble members, and separate cloud instances are launched, on-demand, to run the individual models and to conglomerate the outputs into a unified display.

The outcome of this work is a Software as a Service (Saas) deployment whereby the details of the underlying modeling systems are hidden, allowing modelers to perform their science activities without the burden of considering implementation details.