



Putting FLEXPART to REST: The Provision of Atmospheric Transport Modeling Services

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We are developing a RESTful set of modeling services for the FLEXPART modeling system. FLEXPART (FLEXible PARTicle dispersion model) is a Lagrangian transport and dispersion model used by a growing international community. It has been used to simulate and forecast the atmospheric transport of wildfire smoke, volcanic ash and radionuclides and 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 or casual user.

Well-designed modeling services lower the entry barrier for scientists to perform simulations, allowing them to create and execute their models from a variety of devices and programming environments. This world of Service Oriented Architectures (SOA) has progressed to a REpresentational State Transfer (REST) paradigm, in which the pervasive and mature HTTP environment is used as a foundation for providing access to model services. With such an approach, sound software engineering practises are adhered to in order to deploy service modules exhibiting very loose coupling with the clients. In short, services are accessed and controlled through the formation of properly-constructed Uniform Resource Identifiers (URI's), processed in an HTTP environment. In this way, any client or combination of clients - whether a bash script, Python program, web GUI, or even Unix command line - that can interact with an HTTP server, can run the modeling environment. This loose coupling allows for the deployment of a variety of front ends, all accessing a common modeling backend system. Furthermore, it is generally accepted in the cloud computing community that RESTful approaches constitute a sound approach towards successful deployment of services.

Through the design of a RESTful, cloud-based modeling system, we provide the ubiquitous access to FLEXPART that allows scientists to focus on modeling processes instead of tedious computational details. In this work, we describe the modeling services environment, and provide examples of access via command-line, Python programs, and web GUI interfaces.