Running the Met Office NAME dispersion model on the JASMIN computing platform: A new community tool and trajectory service

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The Met Office has traditionally distributed the NAME atmospheric dispersion model and supporting meteorological data to a number of external organisations. CEDA's new JASMIN platform enables consolidation of resources by providing a centralised and supported NAME community service. Wider exploitation of the model is planned along with a web-tool for running historic forward and backward trajectories and a dataset of NAME outputs including trajectory plots. NCAS scientists can exploit this service for large scale batch runs supporting field campaigns as well as individual research applications.

1. What is the NAME model?

The Met Office's Numerical Atmospheric-dispersion Modelling Environment (NAME) is a Lagrangian particle model (Jones et al., 2007) that is used to simulate a wide range of atmospheric dispersion events, including nuclear accidents, volcanic eruptions, chemical accidents, smoke from fires and airborne animal disease vectors. NAME is a sophisticated tool capable of simulating many atmospheric dispersion phenomena and associated physical and chemical processes. NAME can be run in both forward and inverse (source identification) modes. In inverse mode the model is used to investigate emissions of greenhouse gases and other atmospheric pollutants. The model is used for research activities and for emergency response air pollution modelling. It has been used for several NCAS long term measurements and campaigns to interpret atmospheric composition according to air mass types (Fleming *et al.*, 2012). NAME typically uses input Numerical Weather Prediction (NWP) meteorology data from the Met Office Unified Model and archived global and UK met data are available for historic studies.
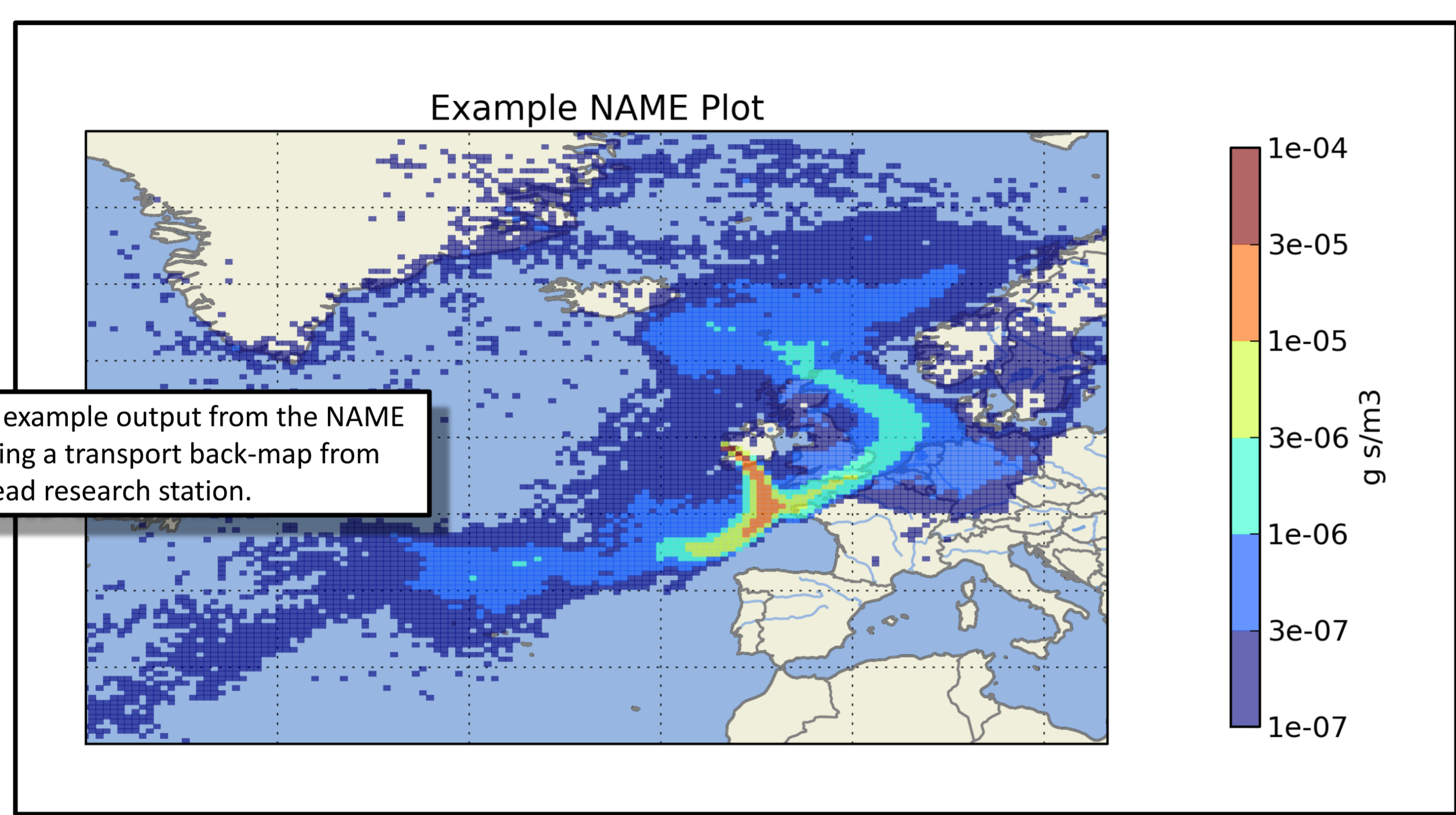

Example NAME Plot

Figure 1. An example output from the NAME model showing a transport back-map from the Mace Head research station.

Would you like to access this service?

The NAME service on JASMIN is intended to support an increasing community of collaborators and scientific applications. Please contact the authors of this poster for more details if you would like to access this service.

Figure 2. A prototype version of the web-tool that will be deployed at NCAS BADC to allow users to run NAME trajectories via the web.

2. What is JASMIN?

JASMIN is storage and computing platform (Lawrence *et al.*, 2012) managed by STFC Centre for Environmental Data Archival (CEDA) and Scientific Computing Department in support of UK research. The primary focus for JASMIN is to cater for the needs of the National Centre for Atmospheric Science (NCAS) community by facilitating access to data archives, group workspaces, analysis servers and specialised virtual servers for specific projects. Please see related posters (Stephens, 2013 and Pascoe, 2013) for further information about the JASMIN capability.

3. Community Requirements & Drivers

The NAME atmospheric dispersion model has been used by many research groups around the UK and in the NCAS community for a number of years. The demand for an accurate tool for assessing the pathways of air masses to atmospheric monitoring stations has been growing as simple trajectory models are now seen as being superseded by dispersion models. However, running dispersion models such as NAME can be intensive in terms of both computing and storage requirements. The Met Office recognises the demand for dispersion model capabilities both within NCAS and wider collaborations within the UK community and it would like to increase collaborations with the community through the use of the model.

4. Current Status and Next Steps

The project milestones and progress are documented in the table below; further details are visible on the Met Office collaboration wiki (see link below). It is hoped that the new NAME-on-JASMIN service will be ready for use in autumn 2013.

Milestone	Description	Progress
1. Port NAME model	Port NAME model on VMs set up on JASMIN	100%
2. Set-up input archive	Copy archive of Met data to support running NAME on JASMIN	80%
3. Expert access	NAME-on-JASMIN service available to expert users	50%
4. Web-interface	User interface access via CEDA Web Processing Service (WPS)	50%
5. Web-trajectory service	Trajectory service provided to NCAS users via web-interface (under WPS)	20%
6. Other developments	Including dataset of NAME outputs/plots, and other web tools	20%

References and links

Jones A.R., Thomson D.J., Hort M. & Devenish B. (2007). The U.K. Met Office's next-generation atmospheric dispersion model, NAME III. In Borrego C. and Norman A.-L. (Eds), Springer, pp. **580-589**, 2007. NAME web site*)* Air Pollution Modeling and its Application XVII (Proceedings of the 27th NATO/CCMS International Technical Meeting on Air Pollution Modelling and its Application).

Z. L Fleming, P. S Monks, A. J Manning: Review: Untangling the influence of air-mass history in interpreting observed atmospheric composition. *Atmospheric Research*, **104-105**, 1-39, 2012.

B. N. Lawrence, V. Bennett, J. Churchill, M. Juckes, P. Kershaw, P. Oliver, M. Pritchard & A. Stephens (2012). *The JASMIN super-data-cluster*. http://arxiv.org/abs/1204.3553

Met Office collaboration wiki (password protected):
http://collab.metoffice.gov.uk/twiki/bin/login/NAME/WebHome

NAME-on-JASMIN wiki page (password protected):
http://collab.metoffice.gov.uk/twiki/bin/view/NAME/NAMEonJASMIN

Pascoe, S. (2013). *Growing a community analysis platform with JASMIN and the Community Intercomparison Suite*. NCAS Staff Meeting 2013. Poster.

Stephens, A. (2013). *Facilitating Effective Collaboration under the JWCRP using the JASMIN Platform*. NCAS Staff Meeting 2013. Poster.

How JASMIN enables collaboration on NAME

Accessibility

The JASMIN platform is available to UK researchers working in a range of fields. This includes login access for analysis, storage and compute. The NAME-on-JASMIN community tool can therefore be opened up to a large user community without the need to port the software and data to new sites. Use of the newly installed high-speed Internet link between JASMIN and the Met Office allows Terabytes of input data to be copied to JASMIN in order to support a full suite of NAME simulations.

Co-location

Once logged into JASMIN, the NCAS BADC and CEMS Academic (NEODC) archives are located on the same infrastructure. Additionally, large shared disks for specific projects, known as "Group Workspaces", are also held on the same high-performance storage platform. Computing and storage resources being co-located allows scientists to work without the hindrance of large data transfer. The NAME service has a 20 Terabyte Group Workspace that is used to hold the Meteorological input data as well as the outputs generated by the model.

Scalability

NAME-on-JASMIN is currently installed on 2 production virtual machines. The resource is controlled by job queues to manage the load and ensure a fair share of access to users. The JASMIN platform's virtualisation technology allows rapid expansion of computing power as required. Furthermore, the LOTUS compute cluster is available should the resource require significantly larger jobs to be managed.

Flexibility

Unlike many providers of computing resource, STFC CEDA has taken the bold decision of providing root access to external trusted users. This allows the Met Office Atmospheric Dispersion Team and other collaborators to select an Operating System of choice, install and configure the software and dependencies with minimum overhead. Documented and scripted software builds allow fast cloning of software environments.

Collaboration and sharing

Since JASMIN logins can be widely available, the Met Office can use this service to support a wider community of NAME users and collaborators. Additionally, some external developments of the NAME model may be undertaken on the JASMIN platform. Users running NAME will be able to generate graphical outputs for the BADC archive to enable dissemination to a much larger community. Plans to develop a web-tool, built on the CEDA Web Processing Service (WPS), will enable fixed configurations of NAME to be run through a browser. Generation of air mass trajectories will be an early candidate for this service.