

The OpenDA Association

Annual Report 2013



Annual report 2013 of the OpenDA Association

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Version	Date	Author	Description	Review
0.1	Nov 10, 2014	NV	Concept	

1. Introduction

According to its charter, the OpenDA Association has the purpose to organize the product management, coordinate product development, and promote the OpenDA software toolbox for model calibration and data assimilation. This report gives an overview of the events and activities in 2013, gives the current status and provides an outlook on next year.

2. Overview of 2013

The year 2013 has been a successful year for the OpenDA association. We have seen many important activities. We have been able to release OpenDA 2.1 including many significant improvements. We had a number of courses. Again we see a growing interest in and usage of OpenDA.

Product management

Meetings

The association has met on October 28 2014 (annual meeting 2013).

Cooperation and projects

The OpenDA team is participating in SANGOMA, a European-funded project that aims at the development of advanced tools for oceanographic data-assimilation. This year we have worked together with the other SANGOMA partners to identify and specify the interface to tools we are going to share or develop together. Besides the shared tools a medium size NEMO ocean benchmark is defined which will be added to OpenDA.

The Flood Control 2015 subproject "Data Assimilation for Operational wave forecasting" uses OpenDA to develop an operational wave forecasting system for the North Sea. Within this project, we have extended the support for parallel computing in OpenDA.

In 2012 the MyWave EU-project started. The focus of Workpackage 2 of this project is on data-assimilation for wave models. The functionality of OpenDA for wave data-assimilation will be developed further. The first goals are to extend the application to bigger models and move from idealized to more realistic experiments.

In 2012 the development of the Kalman filter for the new operational storm-surge model in the Netherlands DCSM-v6 was finalized. It is expected that the system will become fully operational in the summer of 2013. During the development of the model several parameters such as friction at the seabed were calibrated with OpenDA. In total there were over 200 parameters and over 80 time series with observations. Each run was performed in parallel. There is a paper available about these developments [Zijl et. al. 2013]. The Kalman filter for the DCSM-v6 posed a significant challenge. An Ensemble Kalman Filter with 100 members resulted in a significant computation for this model with almost 1000000 gridcells. Several memory leaks were resolved and the parallel performance was investigated in great detail. The resulting Kalman filter uses a steady-state filter and combines a high efficiency with accurate results. The errors at small lead-times are reduced by almost 50% with an impact lasting up to 18 hours.

In addition, TU Delft participates in an OpenDA project with the engineering firm Witteveen&Bosch for modeling city waters.

The Dutch research institute TNO is actively cooperating with the three current OpenDA association members for further implementing OpenDA for their applications, such as air-pollution with Lotos-Euros.

We have had various internships and MSc graduation projects in which OpenDA was involved. These projects included the coupling of Sobek to OpenDA for experimenting with calibration and data assimilation for sewer system of the city of Delft.

Product development

Release version 2.1

In May 2013 we have released OpenDA 2.1. The previous official release of OpenDA dated from January 2012. The 2.1 release contains new functionalities, improvements and bug fixes.

OpenDA applications

The following models are known to be coupled to OpenDA.

Model	Description	Calibration		Kalman Filtering		platforms
		Black box	In memory	Black box	In memory	
Lotos-Euros	Air quality model				X	Linux
Eclipse	Oil reservoir model			X		windows
OpenFOAM	Open source finite volume modeling system			X		Linux
Chimere	Air quality model				X	Linux
Delft3D Flow	2D and 3D hydrodynamics	X			X	windows and linux
Sobek RE & River/Rural	1D hydrodynamics	X	X ¹		X	windows
WAQUA/TRIWAQ in SIMONA	2D and 3D hydrodynamics	X			X	windows and linux
SWAN	spectral wave model	X		X		windows and linux
HBV	rainfall run-off	X				windows and linux
Modflow	groundwater flow			X		windows
HSPF	watershed hydrology and water quality	X ²				windows
EFDC	1D, 2D and 3D hydrodynamics and water quality	X ²			X	Windows, linux and IBM AIX
Delft3D-Delwaq	Water quality model				X	windows and linux
MSettle	soil consolidation				X	windows
PC-raster	PCRaster dll for GIS based (hydrological) models	X ²				windows and linux
OpenStreams	Open Source Distributed Deltares Hydrological Model Instrument		X		X	windows and linux
MCRM	Midlands Catchment Rainfall-Runoff Mode		X			windows and linux
Sacramento	Sacramento Soil Moisture Accounting Model		X			windows and linux
DFlow-FM	Finite-volume hydrodynamics for unstructured grids	X				

NEMO	Ocean circulation model			X		
Mike-She	Hydrodynamical modelling	X			X	Windows 3)

- 1) .Net assembly.
- 2) Currently only for running models.
- 3) Using a .Net OpenMI coupling

3. Current status

We see a significant growth of the use of OpenDA. There were 1363 downloads of OpenDA (2.1) in 2013. During this year we also have had quite some contacts with potential users of OpenDA.

The last OpenDA release is stable and the number of installation issues has been reduced dramatically. OpenDA now includes sufficient basic functionality for most people to get started quickly.

Product management

Deltares has appointed a product manager. The task of the product manager is to have an overview of the various known OpenDA developments and to help coordinate the incorporation of new developments in OpenDA within Deltares. The partners are now able to free sufficient budget and resources to create one stable release a year.

Product development

Version 2.1 turned out to be a feature-rich and stable version. As the use of OpenDA increased in both volume and scope, more requests for expanded and new functionality were made.

Promotion

The partners of OpenDA have been actively promoting OpenDA. Many of these activities are announced on the OpenDA website and by e-mail. The main activities of the past year were:

OpenDA course at the 3rd data assimilation summerschool in Cluj Roemania (22nd July- 2nd Augustus 2014).

Delft Software days 2013, OpenDA basic course, an introductory course on OpenDA

Conferences/workshops/papers:

- Workshop on OpenDA at TNO Groningen (march 2013)
- OpenDA exhibitor stand at Sensors 4 Water, September 9/10 2013
- OpenDA exhibitor stand at Intelligent Sensor Networks, November 12 2013

Scientific publications in peer reviewed Journals:

- None

4. Outlook

Product development

The core of OpenDA is becoming more and more mature. Both calibration methods and Kalman filtering are now used on a routine basis for some applications. The product development will focus on making OpenDa even more user friendly, thus further improving this strength of openda. Some examples are: an update of the documentation, improved filtering of output, and more noise models or uncertainty models. On the other hand further improvements to parallel processing will be made for high-end applications. Another important goal is to increase the number of applications. It is likely that in numbers many of these applications will be relatively simple to medium complexity, because this is where OpenDA excels.

Product management

The main goals for the product management in 2014 are:

- Release of OpenDA 2.2 adding more functionality and improved documentation.
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Promotion

The main goals for the promotion of OpenDA in 2014 are:

- Attract more users of OpenDA, both in an academic context, for building operational systems and improving model performance for consultancy.
- Motivate existing users, who rely heavily on OpenDA to join the OpenDA association
- Organize a number of OpenDA courses
- Present OpenDA at various international conferences
- Support a number of Msc graduation projects with OpenDA.

5. Financial report

Assets		Liabilities & Equity	
31-12-13		31-12-13	
€	€	€	€
Fixed assets	-	Equity	14.608
Current assets	19.417	Current Liabilities	1.205
Cash & bank balances ¹⁾	18.040	Accounts payable	1.205
Accounts receivable	1.331	Profit 2013	3.604
	46		
	<u>19.417</u>		<u>19.417</u>

Income statement for the year ended on December 31, 2013

	Debit €	Credit €
Revenues		
Gross revenues ²⁾		9.000
Expenses		
flyers printing	367	
USB sticks + data	993	
flyers/banner design	1.258	
conferences	1.410	
website	97	
travel	1.087	
bank fees/interest	50	
accountant	134	
Total expenses	<u>5.396</u>	<u>9.000</u>
Net income		<u>3.604</u>

Notes on the accounts

1. Bank account 1138.79.792.

2. Contribution of three partners, based on an annual contribution of € 3.000,-.