The OpenMI Association

Annual Report 2015

LIST OF CONTENTS

A MESSAGE FROM THE CHAIRMAN

I was at a workshop this year, concerning among other things, coupling of numerical models. I was told by one of the participants that for coupling models together there is this standard called OpenMI. It allows numerical models to be more easily joined together in a standardised way and represents a recommended way forwards.

I like it when that happens: independent confirmation that OpenMI is making an impact in this area and that specialists are drawn towards it. It seems that 'OpenMI' and 'model coupling' are phrases increasingly being used together in the same sentence. The statistics confirm this anecdotal evidence. In 2015 alone, OpenMI was downloaded over 750 times across 61 countries, the FluidEarth implementation is not far behind with interest registered in 33 countries; our challenge is to engage more with these communities to find out how the standard is being used and in what contexts it is contributing. Academia is a little easier to track with articles and citations continuing at well over 100 each year.

As OpenMI moves into its eleventh year we can feel understandably pleased that we have created a standard that is used across the world to meet the needs of numerical modelling communities such as our own. The challenge remains to continue to guide OpenMI on what is often a long journey from a research output into something commonly established in industry and general practice. I am very much hoping that I will attend workshops in years to come where participants will be pleased to inform me of the existence of OpenMI.

Once again, it has been a pleasure working with you all throughout 2015.

Quillon Harpham

Chairman

TECHNICAL COMMITTEE

Deltares, HR Wallingford and DHI have all been working on improving the standard and its implementation. They have been responding to various queries put to the OA TC in later Autumn and work is planned in early 2016 to support potential new avenues for OpenMI.

DISSEMINATION COMMITTEE

After many years of hard work, it was agreed that the most efficient and effective way forward for OpenMI dissemination was to formally enable those who have committed significant time and effort into this activity to continue doing so without any administration overheads. Our continuing thanks go to Johan van Assel, Michiel Blind, Jan Gregerson, Roger Moore and Ria Safiolea for their hard work and enthusiastic input. The OA EC is eagerly anticipating its extended role in this regard.

REVIEW OF 2015

2015 was the tenth year of OpenMI, following its inception through the Harmon-IT and OpenMI-LIFE projects. Considerable work has been done within members of the association which has not required the same level of coordination as in the past. Commercial organisations have continued to build OpenMI into their product ranges and research outputs such as those from the DRIHM project have demonstrated new use cases. A number of academic publications have also been registered; watch out for “Using OpenMI and a Model MAP to integrate WaterML2 and NetCDF data sources into flood modelling of Genoa, Italy”, soon to appear in the Journal of the American Water Resources Association.

A highlight of the year was the OGC Technical Committee meeting in September hosted by British Geological Survey. It featured OpenMI in particular as sponsor of one of the events during the week, which also included a reception at Trent Bridge cricket ground and a pub quiz which seemed to favour OGC historians who were also meteorologists…

OPENMI CASE STUDY: THE NETHERLANDS COUNTRY-WIDE SOBEK MODEL (LSM)

The Netherlands country-wide Sobek Model (LSM) as an integrated 1D model for all primary and secondary open water bodies of the country is available as a single large schematisation in Sobek version 2.13.

This LSM model has been used as a component for national planning studies using the Deltamodel (Dutch National Water Model); it was constructed by merging the various schematizations of the Dutch Rijkswaterstaat (national water authority) and the regional water authorities. However, in the meantime Rijkswaterstaat has upgraded their schematizations of the Rhine, Meuse and other water systems managed by Rijkswaterstaat to Sobek version 3; furthermore, various regional water authorities have updated their models (typically still in Sobek 2).

This causes the merged overall model to lag behind the regional models and poses challenges as to which Sobek version to use. From the point of view of maintenance of the LSM it is preferable to stay closer to the original models of the individual water management authorities by linking these models using OpenMI (instead of merging them into one large model schematisation). That however, means that a large number of models would need to be linked using OpenMI. In 2015 the OpenMI coupling has been tested for various numbers of models ranging from 3 to 14 (using mixed compositions consisting of both Sobek 2 and Sobek 3 schematizations).

The conclusions are that OpenMI also works for a large number of models. The composition gives results which are comparable to the results of the original models, and this modular approach only leads to a small and acceptable increase in computation time.

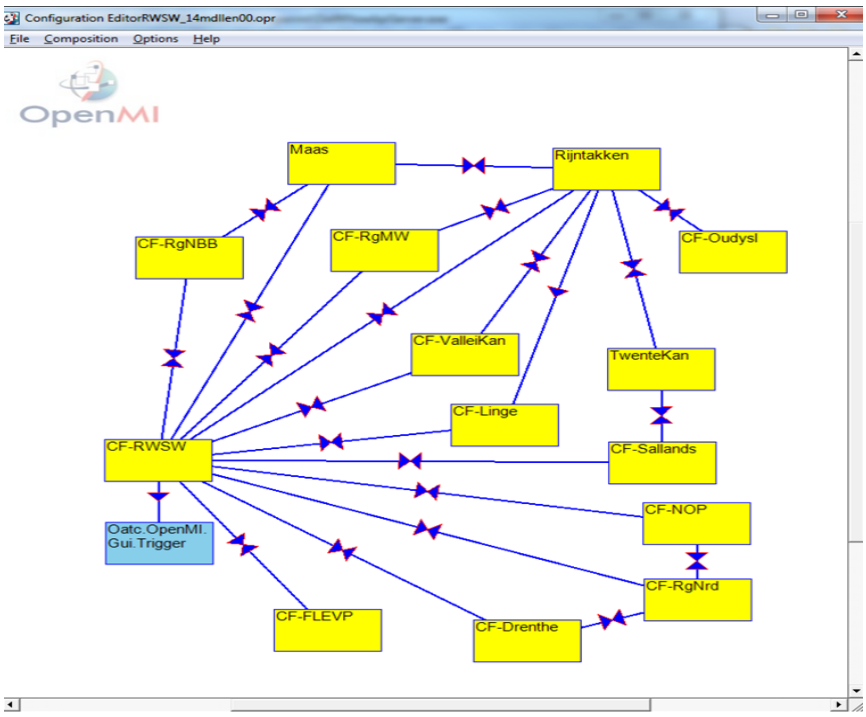

Diagram showing country-wide OpenMI composition linking 14 separate Sobek models.

Reference to the Deltamodel and LSM:

GF Prinsen, F Sperna Weiland, EFW Ruijgh, *The Delta Model for Fresh Water Policy Analysis in the Netherlands*, Water Resources Management Volume 29, Issue 2 (2015). pp. 645-661. doi:10.1007/s11269-014-0880-z

Reference to OpenMI testing:

Q. Gao, GF Prinsen. OpenMI testen LSM. Deltares report 1220072-015-ZWS-0005-r (in Dutch), Delft, The Netherlands, December 2015.

OPENMI RELATED PUBLICATIONS

Appendix 4 lists papers and publications known to the OpenMI Association which reference the OpenMI. If you know of others, please let us know and we will be very happy to add them to the list.

The new crop of publications for 2015 demonstrates that the OpenMI is being taken up and used for a variety of different applications; from linking climate models to river hydraulic models. This is highly encouraging and shows the maturity of the standard. The use of OpenMI in academic or related studies is demonstrated by the table below. The table shows the number of citations found in Google Scholar featuring OpenMI.

Citations for OpenMI via Google Scholar (up to end of 2015)

Year	Articles	Citations
2015	122	14
2014	179	
2013	148	
2012	126	
2011	128	
2010	169	11
2009	139	5
2008	97	8

FINANCIAL REPORT

At the end of 2014, we reviewed our invoicing procedures and requested the payment of outstanding invoices for 2014 and 2015. This resulted in the payment of a significant number of membership fees at the beginning of 2015.

At last year's AGM we decided not to pursue outstanding invoices from 2013 and agreed to implement a new invoicing procedure for future years. In line with these new procedures, we requested the invoices for 2016 much earlier than in previous years. This allowed members to pay the invoice before January 1st as required by our charter and enable the membership list to be updated before the AGM. Although we did not succeed in receiving all membership fee payments for 2016 before the end of 2015, this is a move in the right direction.

The main expenses in 2015 related to hiring the venue for the AGM and along with a small budget to support individuals to travel to the AGM and the OGC TC, which was co-hosted by the British Geological Survey and the OpenMI Association.

The net result of all transactions is positive. If we include the list of outstanding invoices, we have a negative result because we cleaned up the list of members and associated list of invoices still likely to be paid.

We thank Stanislav Vanecek and Sally Stone for checking the accounts.

APPENDIX 1 OPENMI ASSOCIATION MEMBERS

Table 1 and Table 2 show the OpenMI Association's membership at 31-12-2015.

Table 1 OpenMI Association Institutional members

ID	Organisation name	Role	Represented by:				
			Organisation	Last name	First names	Title	Gender
0003	Bundesanstalt für Gewässerbau	OATC	Bundesanstalt für Gewässerbau	Schade	Peter	Mr.	M
0006	Halcrow	Member	Halcrow	Wicks	Jon	Mr	M
0008	DHI Water • Environment • Health	OAEC	DHI Water • Environment • Health	Grooss	Jesper	Prof.	M
0009	Alterra	OAEC	Alterra	Wien	Jan-Erik	Mr	M.
0010	AquaFin	Member	AquaFin	van Assel	Johan	Mr	M
0011	UNESCO-IHE	OAEC	VUB	van Griensven	Ann	Dr.	F
0012	RWTH Aachen, Institute for Hydraulic Engineering and Water Resources	Member	RWTH Aachen, Institute for Hydraulic Engineering and Water Resources	Schüttrumpf	Holger	Prof. Dr.-Ing.	M
0013	Deltares	OAMC OAEC Treasurer	Deltares	Jagers	Bert	Dr.	M
0015	Consortium of Universities for the Advancement of Hydrologic Sciences, Inc.	Member	Consortium of Universities for the Advancement of Hydrologic Sciences, Inc.	Hooper	Richard	Dr.	M
0019	Bureau of Meteorology	Member	Bureau of Meteorology	Argent	Robert	Dr.	M
0021	British Geological Survey	Member	British Geological Survey	Hughes	Andrew	Dr.	M
0022	HR Wallingford	OAMC OAEC Chair	HR Wallingford	Harpham	Quillon	Mr.	M
0023	IDSIA	Member	IDSIA	Rizzoli	Andreas Emilio	Prof	M
0024	Waterbouwkundig Laoboratorium	Member	Waterbouwkundig Laoboratorium	Vanderkimpen	Paul	Ir	M
0026	VUB	Member	VUB	Bauwens	Willy	Dr	M
0030	Open Geospatial Consortium	member	Open Geospatial Consortium	Simmons	Scott	Dr	M

Table 2 OpenMI Association Individual members

ID	Last name	First names	Title	Affiliation	Role	Gender
0002	Blind	Michiel Willem	Mr.	Deltares	OAEC OADC	M
0007	Mimikou	Maria	Prof.	National Technical University of Athens	OAEC OADC	F
0025	Fortune	David	Mr	XP Solutions	OAMC OAEC - Deputy Chairman	M
0004	Moore	Roger Vernon	Mr.	British Geological Survey	OAMC OAEC - Chairman OADC	M

APPENDIX 2 COMMITTEE MEMBERSHIP 2015

Executive Committee

• Chairman:	Quillon Harpham	HR Wallingford, UK
• Vice Chairman:	David Fortune	Individual member, UK
• Secretary:	Andrew Hughes	British Geological Survey, UK
• Treasurer:	Bert Jagers	Deltares, NL
• Members:	Michiel Blind	Individual member, NL
	Roger Moore	Individual member, UK
	Jesper Grooss	DHI, DK
	Maria Mimikou	Individual member, GR (represented by Yiannis Panagopoulos, National Technical University of Athens, GR)
	Ann van Griensven	VUB
	Stanislav Vaneçek[1]	DHI Water and Environment
	Johan van Assel	Aquafin, BE

[1] Represents the OpenMI Association Technical Committee.

Management Committee

• Chairman:	Quillon Harpham	HR Wallingford, UK
• Vice Chairman:	David Fortune	Individual member, UK
• Secretary:	Andrew Hughes	British Geological Survey, UK
• Treasurer:	Bert Jagers	Deltares, NL

Technical Committee

• Chairman:	Stanislav Vanecek	DHI, CZ
• Members:	Adrian Harper	Innovyze, UK
	Stef Hummel	Deltares, NL
	Gennadii Donchyts	Deltares, NL
	Peter Gijsbers	Deltares, NL
	Johan Hartnack	DHI, DK
	Jesper Gross	DHI, DK
	Onno Roosenschoon	Alterra, NL
	Rob Knapen	Alterra, NL
	Jon Goodall	USC, USA
	Andrea Antonello	Univita Trento/Hydrologis, IT
	Peter Schade	Bundesanstalt fuer Wasserbau (BAW), DE
	Paul Cleverley	HR Wallingford (SeaZone Group), UK
	Robert Szczepanek	Cracow University of Technology / NT, PL

APPENDIX 3 ASSOCIATION CONTACT DETAILS 2015

For all questions regarding Association membership, meetings or any general enquiries and feedback, please contact the Secretariat. For technical questions, please contact the Technical Committee or visit the technical pages on the Technical Committee's wiki or use the SourceForge forum.

N.B. when following these links please remember to **remove the 'nospam'** element, e.g. to contact the Dissemination Committee change oadc@nospam.openmi.org to oadc@openmi.org

APPENDIX 4 PUBLICATIONS

The table below lists papers and publications known to the OpenMI Association which reference the OpenMI. For the most up to date information please go to:https://sites.google.com/a/openmi.org/home/openmi-around-the-world/publications-and-presentations. For a wider search follow the link to: http://scholar.google.co.uk/scholar?hl=en&q=openmi&btnG=&as_sdt=1%2C5&as_sdtp= .

Authors	Date	Title	Event	Reference	Type
Year 2015					
Buahin, C.A. and J.S. Horsburgh	2015	Evaluating the simulation times and mass balance errors of component-based models: An application of OpenMI 2.0 to an urban stormwater system		Environmental Modelling & Software 72 (2015) 92-109. Available at: http://www.sciencedirect.com/science/article/pii/S1364815215300086	
Hamilton, S.H. et al	2015	Integrated assessment and modelling: Overview and synthesis of salient dimensions		Environmental Modelling & Software, 64, pp.215–229. Available at:http://www.sciencedirect.com/science/article/pii/S1364815214003600.	
Harpham, Q,	2015	Using a Model MAP to prepare hydro-meteorological models for generic use. Environmental Modelling & Software		Environmental Modelling & Software, 73, 260-271	
Klug, H., & Kmoch, A	2015	Operationalizing environmental indicators for real time multi-purpose decision making and action support		Ecological Modelling, 295, 66-74	
Kokkinos, K., N Samaras, C Laspidou, A Loukas	2015	Modeling of Hydrological and Environmental Processes through OPENMI and web services.		European Scientific Journal November 2015 /SPECIAL/ edition ISSN: 1857 – 7881 (Print) e - ISSN 1857-7431. http://eujournal.org/index.php/esj/article/view/6520	

Royse, K.R. et al	2015	The Development of Linked Databases and Environmental Modelling Systems for Decision-Making in London.		n G. Lollino et al., eds. Engineering Geology for Society and Territory - Volume 5. Springer International Publishing, pp. 1195–1199. Available at:http://link.springer.com/chapter/10.1007/978-3-319-09048-1_228
Yue, P., Zhang, M., & Tan, Z	2015	A geoprocessing workflow system for environmental monitoring and integrated modelling.		Environmental Modelling & Software, 69, 128-140
Year 2014				
Bugaets, A. N.	2014	Using the OpenMI standard for developing integrated systems of hydrological modeling		Russian Meteorology and Hydrology, 39(7), 498-506.
Bugaets, A., and L. Gonchukov	2014	Application of WRF - SWAT OpenMI 2.0 based models integration for real time hydrological modelling and forecasting	paper presented at EGU General Assembly Vienna, Austria, 27 April - 2 May 2014	
Bulatewicz, T., and D. Andresen	2014	Accessible Parallelization for the Open Modeling Interface	paper presented at Proceedings of the 2014 Annual Conference on Extreme Science and Engineering Discovery Environment, ACM New York, NY, USA, New York, NY, USA, 13 July 2014	
Butts, M., M. Drews, A. D. Larsen, S. Lerer, S. H. Rasmussen, J. Grooss, J. Overgaard, J. C. Refsgaard, O. B. Christensen, and J. H.	2014	Embedding complex hydrology in the regional climate system – Dynamic coupling across different modelling domains	Advances in Water Resources, 74, 166-184	

Christensen				
Chen, Z., H. Lin, M. Chen, D. Liu, Y. Bao, and Y. Ding	2014	A Framework for Sharing and Integrating Remote Sensing and GIS Models Based on Web Service		The Scientific World Journal 2014, 354919
Cheng, C., F. Sheng, and Z. M. Xin'anjiang	2014	Model Development and Integration Based on OpenMI		Journal of China Three Gorges University(Natural Sciences)(2), 24-27
D'Agostino, D., et al.	2014	The DRIHM Project: A Flexible Approach to Integrate HPC, Grid and Cloud Resources for Hydro-meteorological Research		Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis edited, IEEE Press Piscataway, Nj, USA.
Harpham, Q., P. Cleverley, and D. Kelly	2014	The FluidEarth 2 Implementation of OpenMI 2.0		Journal of HydroInformatics, 16.4, 890-906
Kingdon, A., R. A. G. Giles, and J. P. Lowndes	2014	Future of technology in NERC data models and informatics		outputs from InformaTEC, edited, London.
Kumar, S. N., O. T. Leta, B. De Fraine, N. Brionc, A. Van Griensven, and W. Bauwens	2014	Integrated RWQM1 based water quality modelling using OpenMI, a case study of the river Zenne, Belgium	paper presented at International Environmental Modelling and Software Society (iEMSs), 7th Intl. Congress on Env. Modelling and Software, San Diego, CA, USA, 2014	
Leta, O. T., N. K. Shrestha, B. de Fraine, A. van Griensven, and	2014	Integrated Water Quality Modelling of the River Zenne (Belgium) Using OpenMI		in Advances in Hydroinformatics, edited by P. Gourbesville, J. Cunge

W. Bauwens				and G. Gaignaert, pp. 259–274, Springer Hydrogeology, Singapore
Mair, M., C. Mikovits, M. Sengthaler, M. Schöpf, H. Kinzel, C. Urich, M. Kleidorfer, R. Sitzenfrei, and W. Rauch	2014	The application of Web-geographic information system for improving urban water cycle modelling		Water Science & Technology In Press
Maurer, T., A. Schneider, and H. H. Gerke	2014	Modelling the initial structure dynamics of soil and sediment exemplified for a constructed hydrological catchment	paper presented at EGU General Assembly 2014, Vienna, Austria, 27 April - 2 May 2014.	
Ridler, M. E., N. v. Velzen, S. Hummel, I. Sandholt, A. K. Falk, A. Heemink, and H. Madsen	2014	Data assimilation framework: Linking an open data assimilation library (OpenDA) to a widely adopted model interface (OpenMI)		Environmental Modelling & Software, 57, 76-89.
Ridler, M. E., N. v. Velzen, S. Hummel, I. Sandholt, A. K. Falk, A. Heemink, and H. Madsen	2014	Data assimilation framework: Linking an open data assimilation library (OpenDA) to a widely adopted model interface (OpenMI)		Environmental Modelling & Software, 57, 76-89.
Royse, K. R., J. K. Hillier, L. Wang, T. F. Lee, J. O'Niel, A. Kingdon, and A. G. Hughes	2014	The application of componentised modelling techniques to catastrophe model generation		Environmental Modelling & Software, 61, 65-77.

Shrestha, N. K., O. B. Tolessa Leta, B. De Fraine, T. Garcia-Armisen, N. K. Ouattara, P. Servais, A. van Griensven, and W. Bauwens	2014	Modelling Escherichia coli dynamics in the river Zenne (Belgium) using an OpenMI based integrated model		Journal of Hydroinformatics, 16(2), 354-374.
Steward, D. R., T. Bulatewicz, J. A. Aistrup, D. Andresen, E. A. Bernard, L. Kulcsar, J. M. Peterson, S. A. Staggenborg, and S. M. Welch	2014	A modeling paradigm for interdisciplinary water resources modeling: Simple Script Wrappers (SSW)	paper presented at EGU General Assembly 2014.	
van Velzen, N., M. E. Ridler, U. Altaf, H. Madsen, and A. Heemink	2014	A flexible open data assimilation framework for hydrological modelling	paper presented at EGU General Assembly 2014, Vienna, Austria, 27 April - 2 May 2014.	

APPENDIX 5 FINANCIAL STATE

Prepared by Bert Jagers, Treasurer 2015

Profit / Loss year 2015

	Category										
	IN						OUT				
	Admission fee	Contribution	Donations	Subsidies	Interest	Other	T&S	Consumables	Purchases	Administration costs	Other
Yearly total per category (€)				2,000.00 €			1,254.51 €			228.71 €	
Total IN/OUT	2,000.00 €						1,483.22 €				
Profit / Loss excluding outstanding invoices	516.78 €										

Balance 31 December 2015

	1 Jan 2015		31 Dec 2015	
	Debit	Credit	Debit	Credit
OA assets Deltares account bank account	7,340.72 €		7,564.04 €	
Outstanding invoices	2,700.00 €		900.00 €	
Outstanding debits		303.45 €		9.99 €
Equity		9,737.27 €		8,454.05 €
Total balance	10,040.72 €	10,040.72 €	8,464.04 €	8,464.04 €

Profit / Loss excluding outstanding invoices	516.78 €
Profit / Loss including outstanding invoices	-1,283.22 €

Remarks

This financial statement is composed of a profit/loss section and a balance section. This account is based on the cost/benefit realisation at the moment of invoicing.