Sébastien BLAISE

Numerical Model Development for the Earth Sciences

Contact Information

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Education and experience

Senior Project Engineer in Geotechnics 2016-now

Numerical Simulation for Geotechnical Consultancy
Fugro GeoConsulting, Brussels, BELGIUM

Postdoctoral Researcher 2012-2015

Funded by the Belgian Fund for Scientific Research (FNRS) → Oct 2015
Université catholique de Louvain, Louvain-la-Neuve, BELGIUM

University Lecturer (Maître de Conférences) Sept-Dec 2011

Institut de Mathématiques de Bordeaux
Université Bordeaux 1, Bordeaux, FRANCE

Postdoctoral Fellow 2009-2011

Advanced Study Program Postdoctoral Fellow
National Center for Atmospheric Research, Boulder, USA

PhD in Applied Sciences 2005-2009

Researcher for the SLIM project since October 2005
(ARC contract, `http://www.climate.be/SLIM`)
Research Fellow with the FRIA since October 2006
Université catholique de Louvain (UCL), Louvain-la-Neuve, BELGIUM

Master degree in Civil Engineering, *Magna Cum Laude* 2000-2005

Focus: Building, Geotechnics
Université catholique de Louvain, Louvain-la-Neuve, BELGIUM
Exchange student at the Universitat Politècnica de Catalunya, SPAIN (2004)

Courses

High Performance Computations for Engineering March 18-23, 2007

University of Pécs (B.H.V. Topping, P. Ivany and P.K. Jimack), Pécs, HUNGARY

Sun Application Tuning Seminar October 18-21, 2005

Sun Microsystems (Ruud van der Pas and Jonas Edberg), Namur, BELGIUM

Awards and fellowships

FNRS/FRIA Doctoral Fellowship October 2006 - October 2009

Belgian National Fund for Research in Industry and Agriculture

NCAR/ASP Postdoctoral Fellowship November 2009 - November 2011

Advanced Study Program of the US National Center for Atmospheric Research

SIAM Travel Award for Post-doc Attendees February 28 - March 4, 2011

**1065$** (free 515$ registration plus 550$)
Society for Industrial and Applied Mathematics
SIAM Conference on Computational Science and Engineering

Invitations (funded by hosts)

Climate Modeling workshop, Napa (USA) August 30 - September 1, 2010

Lawrence Livermore National Laboratory
Current Challenges in Computing 2010: Climate Modeling

Ecole Centrale de Nantes, Nantes (France) December 5-11, 2010

Research visit
Seminar: Eléments finis pour la modélisation des fluides géophysiques

Université du Québec à Montréal, Montréal (Canada) March 10-13, 2011

Seminar: Eléments finis pour la modélisation des fluides géophysiques

Ecole Centrale de Nantes, Nantes (France) March 21-23, 2011

Research visit

National Center for Atmospheric Research, Boulder (USA) Nov 25 - Dec 22, 2012

Research visit
Seminar: Progress in modeling the atmosphere with Gmsh-DG

INRIA Bordeaux Sud-Ouest, Bordeaux (France) May 11 - 16, 2014

Research visit

Impact of Waves Along Coastlines workshop, Minneapolis (USA) Oct 14 - 17, 2014

Intitute for Mathematics and its Applications, University of Minnesota
Invited to deliver a lecture

Publications

H. Zhang, A. Sandu and **S. Blaise**. High order implicit-explicit general linear methods with optimized stability regions. *SIAM Journal on Scientific Computing*, 38(3):A1430–A1453, 2016.

S. Blaise, J. Lambrechts and E. Deleersnijder. A stabilization for three-dimensional discontinuous Galerkin discretizations applied to nonhydrostatic atmospheric simulations. *International Journal for Numerical Methods in Fluids*, 81(9):558–585, 2016.

S. Blaise, J. Lambrechts and E. Deleersnijder. Stereographic projection for three-dimensional global discontinuous Galerkin atmospheric modeling. *Journal of Advances in Modeling the Earth System*, 7(3):1026–1050, 2015.

H. Zhang, A. Sandu and **S. Blaise**. Partitioned and implicit-explicit general linear methods for ordinary differential equations. *Journal of Scientific Computing*, 61(1):119–144, 2014.

S. Blaise, A. St-Cyr, D. Mavriplis and B. Lockwood. Discontinuous Galerkin unsteady discrete adjoint method for real-time efficient tsunami simulations. *Journal of Computational Physics*, 232:416–430, 2013.

N. Flyer, E. Lehto, **S. Blaise**, G. B. Wright and A. St-Cyr. A guide to RBF-generated finite differences for nonlinear transport: Shallow water simulations on a sphere. *Journal of Computational Physics*, 231(11):4078–4095, 2012.

S. Blaise and A. St-Cyr. A dynamic *hp*-adaptive discontinuous Galerkin method for shallow water flows on the sphere with application to a global tsunami simulation. *Monthly Weather Review*, 140(3):978–996, 2012.

A. de Brauwere, B. de Brye, **S. Blaise** and E. Deleersnijder. Residence time, exposure time and connectivity in the Scheldt Estuary. *Journal of Marine Systems*, 84(3-4):85–95, 2011.

R. Comblen, **S. Blaise**, V. Legat, J.-F. Remacle, E. Deleersnijder and J. Lambrechts. A discontinuous finite element baroclinic marine model on unstructured prismatic meshes. Part II: implicit/explicit time discretization. *Ocean Dynamics*, 60(6):1395–1414, 2010.

S. Blaise, R. Comblen, V. Legat, J.-F. Remacle, E. Deleersnijder and J. Lambrechts. A discontinuous finite element baroclinic marine model on unstructured prismatic meshes. Part I: space discretization. *Ocean Dynamics*, 60(6):1371–1393, 2010.

S. Blaise, B. de Brye, A. de Brauwere, E. Deleersnijder, E. J.M. Delhez and R. Comblen. Capturing the residence time boundary layer - application to the Scheldt Estuary. *Ocean Dynamics*, 60(3):535–554, 2010.

S. Blaise and E. Deleersnijder. Improving the parameterisation of horizontal density gradient in one-dimensional water column models for estuarine circulation. *Ocean Science*, 4:239–246, 2008.

S. Blaise, E. Deleersnijder, L. White and J-F. Remacle. Influence of the turbulence closure scheme on the finite-element simulation of the upwelling in the wake of a shallow-water island. *Continental Shelf Research*, 27:2329–2345, 2007.

E. Hanert, E. Deleersnijder, **S. Blaise** and J.-F. Remacle. Capturing the bottom boundary layer in finite element ocean models. *Ocean Modelling*, 17:153–162, 2007.

Conference Presentations

S. Blaise, E. Deleersnijder and J. Lambrechts. A three-dimensional discontinuous Galerkin dynamical core for nonhydrostatic atmospheric simulations on the sphere. *The 18th International Conference on Finite Elements in Flow Problems.* Taipei (Taiwan), March 16-18, 2015.

S. Blaise. Discontinuous Galerkin Method with Parallel Dynamic Adaptation and Discrete Adjoint for Tsunami Simulations. *IMA Workshop - Impact of Waves Along Coastlines.* Minneapolis (USA), October 14-17, 2014.

S. Blaise and V. Legat. Simuler les tsunamis en temps réel dans le cadre d'un système d'alerte. *Made in Japan UCL event, Academic session.* Louvain-la-Neuve (Belgium), January 26, 2014.

S. Blaise, A. St-Cyr, D. Mavriplis and B. Lockwood. Discontinuous Galerkin unsteady discrete adjoint method for real-time efficient tsunami simulations. *Grantham Institute workshop on Numerical Methods for Geophysical Fluid Dynamics.* London (UK), October 8-9, 2013.

S. Blaise, A. St-Cyr, D. Mavriplis and B. Lockwood. Discontinuous Galerkin unsteady discrete adjoint method for real-time efficient tsunami simulations. *SIAM Conference on Mathematical and Computational Issues in the Geosciences.* Padua (Italy), June 17-20, 2013.

S. Blaise, A. St-Cyr, D. Mavriplis and B. Lockwood. A dynamic hp-adaptive discontinuous Galerkin model for shallow water flows on the sphere with adjoint capabilities. *10th World Congress on Computational Mechanics.* São Paulo (Brazil), July 8-13, 2012.

S. Blaise, A. St-Cyr and D. Hall. A Two-dimensional hp-adaptive Discontinuous Galerkin Model for the Shallow Water Equations. *SIAM Conference on Computational Science and Engineering.* Reno (USA), February 28-March 4, 2011.

S. Blaise, A. St-Cyr and D. Hall. A High-order Adaptive Global Shallow Water Model. *SIAM Conference on Mathematical and Computational Issues in the Geosciences.* Long Beach

(USA), March 21-24, 2011.

S. Blaise and A. St-Cyr. A two-dimensional hp-adaptive discontinuous Galerkin model solving the shallow water equations on the sphere. *The 2010 Workshop on the Solution of Partial Differential Equations on the Sphere.* Potsdam (Germany), August 24-27, 2010.

S. Blaise, R. Comblen, J. Lambrechts, V. Legat, E. Deleersnijder and J-F. Remacle. Design and preliminary validation of a three-dimensional, baroclinic, unstructured-mesh, finite-element ocean model. *8th World Congress on Computational Mechanics and 5th European Congress on Computational Methods in Applied Science and Engineering.* Venice (Italy), June 30-July 5, 2008.

S. Blaise, R. Comblen, J. Lambrechts, V. Legat, E. Deleersnijder and J-F. Remacle. Design and preliminary validation of a three-dimensional, baroclinic, unstructured-mesh, finite-element ocean model. *EGU General Assembly 2008.* Vienna (Austria), April 13-18, 2008.

J. Lambrechts, E. Deleersnijder, V. Legat, J-F. Remacle, R. Comblen, O. Gourgue, **S. Blaise** and L. White. Toward a Multi-Purpose, Unstructured Mesh, Finite Element, Marine Model Slim. *13th SIAM Conference on Parallel Processing for Scientific Computing.* Atlanta (USA), March 12-14, 2008.

S. Blaise, E. Deleersnijder, J-F. Remacle and L. White. Finite-Element Tridimensional Modeling of the Circulation in the Mururoa Atoll Lagoon. *9th US National Congress on Computational Mechanics.* San Francisco (USA), July 22-26, 2007.

S. Blaise, L. White, J-F. Remacle and E. Deleersnijder. Influence of the turbulence closure scheme on the finite-element simulation of the tidal flow around a shallow-water island. *5th International Workshop On Unstructured Grid Numerical Modeling of Coastal, Shelf and Ocean Flows.* Miami (USA), November 13-15, 2006.

Conference Posters

A. St-Cyr, **S. Blaise** and D. Hall. MUSE: A Multiscale Unified Simulation Environment. *Current Challenges in Computing 2010: Climate Modeling.* Napa (USA), August 30-September 1, 2010.

S. Blaise and A. St-Cyr. MUSE: A two-dimensional hp-adaptive shallow-water model. *SIAM Conference on Parallel Processing for Scientific Computing.* Seattle (USA), February 24-26, 2010.

S. Blaise and E. Deleersnijder. A Finite Element Model Study of the Importance of the Advection of Turbulence Closure Variables. *39th International Liège Colloquium on Ocean Dynamics and 3rd Warnemünde Turbulence Days.* Liège (Belgium), May 7-11, 2007.

E. Hanert, E. Deleersnijder, **S. Blaise** and J-F. Remacle. Capturing the bottom boundary layer in finite element ocean models. *European Geosciences Union General Assembly 2007.* Vienna (Austria), April 15-20, 2007.

S. Blaise, L. White, R. Comblen, V. Legat and E. Deleersnijder. Three-dimensional finite element modeling of the flow around a shallow-water island: impact of the turbulence closure scheme on vertical transport. *European Geosciences Union General Assembly 2007.* Vienna (Austria), April 15-20, 2007.

L. White, **S. Blaise**, R. Comblen, V. Legat and E. Deleersnijder. Application of a Three-Dimensional Finite Element Marine Model to the Flow Around a Shallow-Water Island. *5th International Workshop On Unstructured Grid Numerical Modeling of Coastal, Shelf and Ocean Flows.* Miami (USA), November 13-15, 2006.

Various notes

S. Blaise and L. White. Development of a marine modelling benchmark: tidal circulation around Rattray Island. *Second-generation Louvain-la-Neuve Ice-ocean Model, Université catholique de Louvain*, 2006.

Theses

S. Blaise and G. Gecer. Etudes numérique et expérimentale de la propagation de fissures dans les murs en maçonnerie. Approches macroscopique et microscopique. *Final year Mémoire, Université catholique de Louvain*, 2005.

S. Blaise. Development of a finite element marine model. *PhD Dissertation, Université catholique de Louvain*, 2009.

Other academic activities

Journal reviewer for *Ocean Dynamics*, *Ocean Modelling*, *Journal of Geophysical Research*, *Marine Environmental Research*, *Quarterly Journal of the Royal Meteorological Society*, *Geoscientific Model Development*, *Journal of Computational Physics* and *International Journal for Numerical Methods in Fluids*.

Proposal evaluation panels: Member of a *US National Science fundation (NSF)* proposal review panel (grants from 300,000$ to 3,000,000$). Referee for proposals submitted to the *Mardsen Fund* from the *Royal Society of New Zealand* (grants from 300,000$ to 800,000$).

Member of the **Consortium for Mathematics in the Geosciences (CMG++)**.

Courses taught: introduction to mechanics (substitute), resolution of sparse linear sytems, introduction to Fortran 90 and data structures.

Supervised exercises and labs for engineering students (introduction to finite element methods, introduction to mechanics, resolution of partial differential equations, project of structure, physics).

Skills

Computer: C, C++, Python, Java, Fortran, Matlab, HTML, PHP, Linux (use/administration), LaTeX, QGIS

Languages: French: native language; English: good skills, both written and oral; Spanish: good knowledge

Sports/Hobbies: Badminton, snowboard, hiking