CURRICULUM VITAE

DACIAN N. DAESCU

Dept. of Mathematics and Statistics	Phone:	(503) 725-3581
Portland State University	Fax:	(503) 725-3661
P.O. Box 751	E-mail:	daescu@pdx.edu
Portland, OR 97207	URL:	http://www.mth.pdx.edu/∼daescu/

Education

Ph.D.	2001	Applied Mathematical and Computational Sciences, University of Iowa
M.S.	2001	Computer Science, University of Iowa
M.S.	1995	Mathematics, University of Craiova
B.S.	1994	Mathematics, University of Craiova

Employment

09/2009 - present	Associate Professor, Dept. of Mathematics and Statistics, Portland State University
09/2003 - 09/2009	Assistant Professor, Dept. of Mathematics and Statistics, Portland State University
09/2001 - 08/2003	Postdoctoral Associate, Inst. for Mathematics & Applications, University of Minnesota
08/1996 - 06/2001	Teaching/Research Assistant, University of Iowa

Dissertation

Ph.D. Thesis (2001) *Theoretical and Practical Aspects of Data Assimilation for Air Pollution Models*
Dissertation Advisor: Prof. Gregory R. Carmichael (gregory-carmichael@uiowa.edu)

Research Interests

Applied and computational mathematics, numerical analysis, large-scale numerical optimization, data assimilation techniques, inverse modeling and sensitivity analysis, methods for model reduction.

Grants

External Funding

1. PI: *Collaborative Research: A Computational Framework for Assesing the Observation Impact in Air Quality Forecasting.* NSF Division of Mathematical Sciences, Program in Computational Mathematics, 2009-2013. Amount awarded: $244,403.

2. PI: *Development of a new methodology for adaptive observations in the framework of four-dimensional variational data assimilation.* NASA - Modeling, Analysis and Prediction Research Program, 2005-2008. Amount awarded: $387,253.

3. PI: *High Performance Computing in Applied Mathematics at PSU.* 2006 Intel Oregon Faculty Fellowship. Amount awarded: $25,000.

4. Co-PI: *Collaborative Research: IPY, the Next Generation: A Community Ice Sheet Model for scientists and educators, with demonstration experiments in the Amundsen Sea Embayment.* NSF International Polar Year Program 2007-2008. Amount awarded to PSU: $145,000 (PI C. Hulbe). Co-PI budget: $26,000.

5. Co-PI: *CMG Collaborative Research: Ensemble data assimilation based on control theory.* NSF Collaborations in Mathematical Geosciences Program, 2003-2006. Amount awarded (Co-PI budget): $24,801.

Internal Funding

Second-year summer stipend to tenure-track faculty. Summer 2005. Amount awarded: $4,000.
Faculty travel award. Winter 2007. Amount awarded: $600.

Honors, Fellowships, Awards

Outstanding Researcher Award: Columbia-Willamette Chapter of Sigma Xi Scientific Research Society, 2007.
Intel Faculty Fellowship Award, 2006.
NASA Center for Computational Sciences - High End Computing resources, 2006-2009.
Who's Who in America: 2004 - 2007.
Research Scholarship 07/2002 - 06/2003: University of Minnesota Supercomputing Institute
Research Scholarship 06/2000-08/2000: NASA Goddard Space Flight Center
Summer Merit Fellowship 1997, 1998, 1999: University of Iowa
TEMPUS Scholarship 1993 - 1994: University of Complutense, Madrid, Spain.

Refereed Publications [1]

Journal Articles

1. D.N. Daescu, 2009: On the deterministic observation impact guidance: a geometrical perspective. *Monthly Weather Review*, DOI: 10.1175/2009MWR2954.1, in press.

2. D.N. Daescu and R. Todling, 2009: Adjoint estimation of the variation in model functional output due to the assimilation of data. *Monthly Weather Review*, **137** (5), 1705–1716.

3. D.N. Daescu, 2008: On the sensitivity equations of 4DVAR data assimilation. *Monthly Weather Review*, **136** (8), 3050–3065.

4. D.N. Daescu and I.M. Navon, 2008: A dual-weighted approach to order reduction in 4D-Var data assimilation. *Monthly Weather Review*, **136**: 1026–1041.

5. G.R. Carmichael, A. Sandu, T. Chai, D.N. Daescu, E.M. Constantinescu, Y. Tang, 2008: Predicting air quality: Improvements through advanced methods to integrate models and measurements. *Journal of Computational Physics*, **227**: 3540–3571.

6. D.N. Daescu and I.M. Navon, 2007: Efficiency of a POD-based reduced second order adjoint model in 4D-Var data assimilation. *International Journal for Numerical Methods in Fluids*, **53**: 985–1004.

7. Zupanski, M; Fletcher, SJ; Navon, IM; Uzunoglu, B; Heikes, RP; Randall, DA; Ringler, TD; Daescu, D, 2006: Initiation of ensemble data assimilation. *Tellus Series A-Dynamic Meteorology and Oceanography* **58** (2): 159–170.

8. Tianfeng Chai, Gregory R. Carmichael, Adrian Sandu, Youhua Tang, Dacian N. Daescu, 2006: Chemical data assimilation of Transport and Chemical Evolution over the Pacific (TRACE-P) aircraft measurements. *Journal of Geophysical Research*, Vol. **111** (D2) D02301, doi: 10.1029/2005JD005883, 18pp.

9. Adrian Sandu, Dacian N. Daescu, Gregory R. Carmichael, Tianfeng Chai, 2005: Adjoint sensitivity analysis of regional air quality models. *Journal of Computational Physics* **204**: 222–252.

10. D.N. Daescu and I.M. Navon, 2004: Adaptive observations in the context of 4D-Var data assimilation. *Meteorology and Atmospheric Physics* **85**: 205–226.

11. Adrian Sandu, Dacian N. Daescu, Gregory R. Carmichael, 2003: Direct and adjoint sensitivity analysis of chemical kinetics systems with KPP: I-Theory and software tools. *Atmospheric Environment* **37**: 5083–5096.

[1] The order of authors as it appears in the published manuscript

12. Dacian N. Daescu, Adrian Sandu, Gregory R. Carmichael, 2003: Direct and adjoint sensitivity analysis of chemical kinetics systems with KPP: II-Numerical validation and applications. *Atmospheric Environment* **37**: 5097–5114.

13. Dacian N. Daescu, I.M. Navon, 2003: An analysis of a hybrid optimization method for variational data assimilation. *International Journal of Computational Fluid Dynamics*, **17** (4): 299–306.

14. Dacian N. Daescu, Gregory R. Carmichael, 2003: An adjoint sensitivity method for the adaptive location of the observations in air quality modeling. *Journal of the Atmospheric Sciences* **60** (2): 434–450.

15. Philipp Miehe, Adrian Sandu, Gregory R. Carmichael, Dacian Daescu, 2002: A communication library for the parallelization of air quality models on structured grids. *Atmospheric Environment* **36** (24): 3917–3930.

16. Francois-Xavier LeDimet, I.M. Navon, Dacian N. Daescu, 2002: Second order information in data assimilation. *Monthly Weather Review* **130** (3): 629–648.

17. Dacian Daescu, Gregory R. Carmichael, Adrian Sandu, 2000: Adjoint implementation of Rosenbrock methods applied to variational data assimilation problems. *Journal of Computational Physics* **165** (2): 496–510.

Refereed Conference Articles

1. H. Godinez and D.N. Daescu, 2009: A second order adjoint method to targeted observations. *Lecture Notes in Computer Science: Computational Science - ICCS 2009 9th International Conference Proceedings.* Springer Berlin/Heidelberg, Volume 5545, 322–331.

2. I. Michael Navon, Dacian N. Daescu, Zhuo Liu, 2005: The impact of background error on incomplete observations for 4D-Var data assimilation with the FSU GSM. *Lecture Notes in Computer Science: Computational Science ICCS 2005 Proceedings, Part II* Vol. 3515: 837–844.

3. Adrian Sandu, Emil M. Constantinescu, Wenyuan Liao, Gregory R. Carmichael, Tianfeng Chai, John H. Seinfeld, Dacian Daescu, 2005: Ensemble-based data assimilation for atmospheric chemical transport models. *Lecture Notes in Computer Science: Computational Science ICCS 2005 Proceedings, Part II* Vol. 3515: 648–655.

4. A. Sandu, W. Liao, G.R. Carmichael, D. Henze, J.H. Seinfeld, T. Chai, D. Daescu, 2004: Computational aspects of data assimilation for aerosol dynamics. *Lecture Notes in Computer Science: Computational Science ICCS 2004 Proceedings, Part III* Vol. 3038: 709–716.

5. Gregory R. Carmichael, Dacian N. Daescu, Adrian Sandu, Tianfeng Chai, 2003: Computational aspects of chemical data assimilation into atmospheric models. *Lecture Notes in Computer Science: Computational Science ICCS 2003 Proceedings, Part IV* Vol. 2660: 269–278.

6. D.N. Daescu, G.R. Carmichael, 2002: Adjoint sensitivity analysis applied to the adaptive location of the observations. *Proceedings of 2nd International Conference on Air Pollution Modeling and Simulation*, April 9-13, 2001 Paris, France. Bruno Sportisse (Ed.), Springer, 476–488.

7. A. Sandu, D.N. Daescu, G.R. Carmichael, 2002: Adjoint data assimilation for aerosol dynamics equations. *Proceedings of 2nd International Conference on Air Pollution Modeling and Simulation*, April 9-13, 2001 Paris, France. Bruno Sportisse (Ed.), Springer, 319–331.

8. Dacian Daescu, Gregory R. Carmichael, Adrian Sandu, 2001: Adjoint implementation of Rosenbrock methods applied to variational data assimilation in air pollution models. *Air Pollution Modeling and its Applications XIV*, Kluwer Academic/Plenum Publishers, 361–368.

9. Dacian N. Daescu, Gregory R. Carmichael, 2000: Coupled transport-chemistry computations in 4D-Var data assimilation for air pollution models. *IMA Volume 130: Atmospheric Modeling*, Springer-Verlag, 153–164.

Book Chapters

D.N. Daescu: Sensitivity Analysis Methods in Air Quality Models. *Modelling of Pollutants in Complex Environmental Systems: Volume I, p. 241–259*. Edited by Grady Hanrahan, ILM Publications 2009.

Presentations at Professional Meetings [2]

1. D.N. Daescu: Sensitivity Analysis in Variational Data Assimilation and Applications. ECMWF Workshop on Diagnostics of data assimilation system performance. European Centre for Medium-Range Weather Forecasts, Reading, U.K., June 15-17, 2009.

2. H. Godinez and D.N. Daescu: A Second Order Adjoint Method to Targeted Observations. The 9th International Conference on Computational Science 2009 (ICCS 2009), Baton Rouge, Louisiana, May 25-27, 2009.

3. D.N. Daescu: Adjoint Estimation to Observing System Experiments Outcomes 8th Workshop on Adjoint Model Applications in Dynamic Meteorology, Tannersville, PA, May 18-22, 2009.

4. D.N. Daescu: A Continuation Approach to Adjoint-based Observation Impact Estimation. 2009 SIAM Conference on Computational Science and Engineering, Miami, FL, March 2-6, 2009.

5. D.N. Daescu: Sensitivity to Observations in Model-Constrained Optimization. 2008 SIAM Conference on Optimization, Boston, MA May 10-13, 2008.

6. D.N. Daescu, I.M. Navon: Reduced-Order Observation Sensitivity in 4D-Var Data Assimilation The 12th Conference on Integrated Observing and Assimilation Systems for Atmosphere, Oceans, and Land Surface (IOAS-AOLS) 88th American Meteorological Society Annual Meeting, New Orleans, LA 20-24 January 2008.

7. D.N. Daescu, I.M. Navon: Toward an Optimal Reduced Order Control Strategy in 4D-Var Data Assimilation. 2007 SIAM Conference on Mathematical and Computational Issues in the Geosciences, Santa Fe, New Mexico, March 19-22, 2007.

8. H. Godinez, D.N. Daescu: The Impact of the Numerical Discretization on Targeted Observations. 2007 SIAM Conference on Mathematical and Computational Issues in the Geosciences, Santa Fe, New Mexico, March 19-22, 2007.

9. D.N. Daescu, I.M. Navon, S. Akella, G. Erlebacher: The Impact of Data Interaction on Targeted Observations with a 4D-Var Data Assimilation System. The 11th Conference on Integrated Observing and Assimilation Systems for Atmosphere, Oceans, and Land Surface (IOAS-AOLS), 87th AMS Annual Meeting, San Antonio, TX 14-18 January 2007.

10. D.N. Daescu and I.M. Navon: Analysis of a POD Approach to Order Reduction in 4D-Var Data Assimilation. 2007 SIAM Conference on Computational Science and Engineering, Costa Mesa, CA, Feb 19-23, 2007.

11. D.N. Daescu, I.M. Navon, G. Erlebacher, S. Akella: Development of a Reduced Order Control Strategy in 4D-Var Data Assimilation. 2006 AGU Fall Meeting, San Francisco, Dec 11-15, 2006.

12. I.M. Navon, D.N. Daescu, Z. Liu: "The impact of background error on incomplete observations for 4D-Var data assimilation with the FSU GSM." 5th International Conference on Computational Science, Atlanta, GA, May 22-25, 2005.

13. D.N. Daescu, A. Sandu: "Time dependent sensitivity analysis and parameter estimation for multiscale systems." 2004 SIAM Annual Meeting, Portland, Oregon, July 12-16, 2004.

14. A. Sandu, G.R. Carmichael, D.N. Daescu, T. Chai: "Adjoint sensitivity analysis and data assimilation for atmospheric chemical models". 2004 SIAM Annual Meeting, Portland, Oregon, July 12-16, 2004.

[2] First author speaker

15. G.R. Carmichael, A. Sandu, D. Daescu, T. Chai, J. Seinfeld, P. Hess, T. Anderson: "Chemical data assimilation in support of air quality forecasting". 84th American Meteorological Society Annual Meeting, Seattle, WA, 11-15 January 2004.

16. Tianfeng Chai, G. R. Carmichael, D. N. Daescu, A. Sandu: "Analysis of TRACE-P observations using a four-dimensional variational data assimilation technique". 84th American Meteorological Society Annual Meeting, Seattle, WA, 11-15 January 2004.

17. D.N. Daescu, I.M. Navon: "New adjoint-based methods for targeted observations in atmospheric modeling" SIAM Conference on Computational Science and Engineering, San Diego, CA, February 10-13, 2003.

18. I.M. Navon, D.N. Daescu: "An analysis of the enriched optimization methods for variational data assimilation". The 16th triennial conference of the International Federation of Operational Research Societies (IFORS), Edinburgh, Scotland, July 8-12, 2002.

19. I.M. Navon, D.N. Daescu: "Adaptive observations in the context of 4D-Var data assimilation". European Geophysical Society XXVII General Essembly, Nice, France, April 22-26, 2002.

20. D.N. Daescu, A. Sandu: "Adjoint modeling for chemical reactions mechanisms: discrete versus continuous". 5th Workshop on Adjoint Applications in Dynamic Meteorology, Pennsylvania, April 21-26, 2002.

21. A. Sandu, D.N. Daescu: "Automatic generation of efficient adjoints for chemical kinetic systems". 5th Workshop on Adjoint Applications in Dynamic Meteorology, Pennsylvania, April 21-26, 2002.

22. D.N. Daescu, G.R. Carmichael: "Adjoint sensitivity analysis applied to the adaptive location of the observations". 2nd International Conference on Air Pollution Modeling and Simulation, Paris, France, April 9-13, 2001

23. A. Sandu, D.N. Daescu, G.R. Carmichael: "Adjoint data assimilation for aerosol dynamics equations". of 2nd International Conference on Air Pollution Modeling and Simulation, Paris, France, April 9-13, 2001.

24. D.N. Daescu and G.R. Carmichael: Coupled transport-chemistry computations in 4D-Var data assimilation for air pollution models". IMA Workshop, Atmospheric Modeling, Minneapolis, MN, March 15-19, 2000.

25. D.N. Daescu, G.R. Carmichael, A.Sandu: "Adjoint implementation of Rosenbrock methods applied to variational data assimilation in air pollution models". Millennium NATO/CCMS International Technical Meeting on Air Pollution Modeling and Its Applications, Boulder, Colorado, May 15-19, 2000.

Invited Seminar Talks

1. Sensitivity analysis and observation impact estimation in variational data assimilation. *Applied Mathematics Colloquium, Oregon State University*, January 2009.

2. A continuation approach to observation impact estimation. *Naval Research Laboratory Seminar*, Monterey CA, September 2008.

3. A note on adjoint-based observation impact measures. *NASA Goddard Space Flight Center Seminar*, Greenbelt MD, July 2008.

4. On the POD approach to reduced-order variational data assimilation. *Applied Mathematics Colloquium, Oregon State University*, January 2007.

Teaching, Mentoring, and Curricular Achievements

Graduate Teaching

Mth 651/652/653: Advanced Numerical Analysis - I, II, III: 2007/2008.
Mth 621/622/623: Advanced Differential Equations: 2004/2005, 2005/2006.
Mth 551/552/553: Numerical Calculus: 2003/2004, 2005/2006, 2006/2007.
Mth 527/528: Partial Differential Equations - I, II: 2005, 2007, 2008/2009.

Mth 510: High-Performance Computing: 2008.

Undergraduate Teaching

Mth 451/452/453: Numerical Calculus: 2003/2004, 2005/2006, 2006/2007.
Mth 427/428: Partial Differential Equations - I, II: 2005, 2007, 2008/2009.
Mth 410: High-Performance Computing: 2008.
Mth 322: Applied Partial Differential Equations: 2009.
Mth 261: Introduction to Linear Algebra: 2006, 2007.
Mth 256: Applied Differential Equations: 2003, 2004.
Mth 254: Calculus IV: 2009.
Mth 253: Calculus III: 2008.

Curriculum Development

New course developed: Mth 410/510: Partial Differential Equations - I, II. Currently a permanent two-term sequence Mth 527/528, Mth 427/428 within the Department of Mathematics and Statistics.
New course developed: Topics Mth 410/510: High-Performance Computing in Applied Mathematics.
New syllabus and course topics (PDEs) for Mth 621/622/623: Advanced Differential Equations.

Graduate Students Advised

Humberto Godinez, Ph.D. Mathematical Sciences: 2004-2009.
Position after graduation: Postdoctoral fellowship, Los Alamos National Laboratory.
Oleg Roderick, Ph.D. Mathematical Sciences: 2005-2009. Advanced to candidacy Fall 2007.
Laurie Vasquez, M.S. Mathematical Literature Project: Fall 2007.

Undergraduate Students Advised

Ken Kennedy, B.S. Mathematical Sciences with honors, 2006/2007.

Service to the University Community

Departamental Committees

2008/2009: Ph.D. Math. Sciences, GTA.
2007/2008: Ph.D. Math. Sciences (Chair), Ph.D. Advisor/Requirements, GTA, Executive Committee
2006/2007: Ph.D. Math. Sciences (Chair), Ph.D. Advisor/Requirements, GTA, Promotion and Tenure
2005/2006: Ph.D. Math. Sciences, Graduate Committee, Promotion and Tenure
2004/2005: Undergraduate, Ph.D. Mth. Sciences, Math. Ed. Search
2003/2004: Graduate, Dept. Webpage

Ph.D. Examination Committee

2008: Andrew Tolland (Systems Science)
2006: Oleg Roderick, Humberto Godinez (Mathematics)

Ph.D. Dissertation Committee (Chair)

2007-: Oleg Roderick, Humberto Godinez (Mathematics)

M.S. Project Committee

Laurie Vasquez (2007), Tom Kurrasch (2006), Hyang-sug Lee (2006)

Graduate Office Representative

2008: Ph.D. Dissertation Committee - Ralf Juengling (Comp. Sci.)
2007: M.S. Committee - Danny Bolleddula (Mech. Eng.)
2006: M.S. Committee - Peter Tonn (Mech. Eng.)
2005: M.S. Committee - Cory Nardin (Mech. Eng.)

Service to Profession

Minisymposium organizer: *Recent Progress in Atmospheric and Ocean Data Assimilation* - Part I, II (MS110/122). 2009 SIAM Conference on Computational Science and Engineering, March 2-6, 2009, Miami, FL.

Minisymposium organizer: *Recent Advances in Data Assimilation for Atmospheric and Oceanographic Modeling* - Part I, II (MS 11/22). 2007 SIAM Conference on Computational Science and Engineering, February 19-23, 2007, Costa Mesa, CA.

Minisymposium organizer: *Data Assimilation and Predictability for Atmospheric and Oceanographic Modeling* - Part I, II (MS 42/49). 2004 SIAM Annual Meeting, July 12-16, 2004, Portland, Oregon.

Workshop participation: Open workshop on the implementation of the global atmospheric research program THORPEX, August 19-20, 2004, Boulder, Colorado.

Reviewer for Applied Numerical Mathematics, Inverse Problems, Monthly Weather Review, Journal of Geophysical Research - Atmospheres, International Journal for Numerical Methods in Fluids, International Journal of Optimization and Engineering, International Conference on Computational Science.

Reviewer for grant proposals to NSF, NASA.

Membership in Professional Societies: Society for Industrial and Applied Mathematics, American Meteorological Society.