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CURRICULUM VITAE

DACIAN N. DAESCU

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Mathematics and Statistics	Fax: (503) 725-3661
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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

09/2013 - present	Professor, Portland State University
09/2009 - 09/2013	Associate Professor (tenured), Portland State University
09/2003 - 08/2009	Assistant Professor, Portland State University
09/2001 - 09/2003	Postdoctoral Associate, IMA, University of Minnesota

Research Interests

▷ applied mathematics, computational sciences, geophysical data assimilation
▷ numerical weather prediction, sensitivity analysis, uncertainty quantification
▷ large-scale numerical optimization, inverse problems, reduced order modeling

Honors, Fellowships, Awards

▷ NASA Center for Climate Simulation High End Computing resources: 2013 - 2015.
▷ NASA Earth and Space Science Fellowship: 2011-2012.
▷ NASA Center for Computational Sciences High End Computing resources: 2006 - 2010.
▷ European Centre for Medium-Range Weather Forecasts Invited Visiting Scientist: 2010.
▷ Columbia-Willamette Chapter of Sigma Xi Scientific Research Society Outstanding Researcher Award: 2010, 2007.
▷ Intel Oregon Faculty Fellowship Award: 2006.
▷ Who's Who in America: 2004 - 2007.
▷ University of Minnesota Supercomputing Institute Research Scholarship: 2002 - 2003.
▷ NASA Goddard Space Flight Center Graduate Student Research Scholarship: 2000.

Research Grants

Awarded $1.3M+ as Principal Investigator & $500K+ as Co-PI since at PSU

[1] 2013-2016 Naval Research Laboratory: *Adaptive Optimization of Parametric Error Covariance Models in Variational Data Assimilation.* Role: PI (sole investigator), $249,843.

[2] 2013-2016 NASA Modeling, Analysis, and Prediction Program: *Error Covariance Diagnosis and Forecast Impact Estimation in NASA GEOS DAS.* Role: PI (Co-I: Ricardo Todling, NASA/GMAO), $248,444 (PSU PI budget).

[3] 2009-2013 NSF Program in Computational Mathematics:
Collaborative Research: A Computational Framework for Assessing the Observation Impact in Air Quality Forecasting. Role: PI (collaboration with NSF award #0915047, PI: Sandu, Virginia Tech), $244,403 (PSU PI budget).

[4] 2010-2013 Naval Research Laboratory: *Adjoint-based Data Assimilation System Sensitivity, Diagnostics, and Estimation of Input Error Statistics.* Role: PI (sole investigator), $119,794.

[5] 2011-2012 NASA Earth and Space Science Fellowship: *Optimization of the Information Error Statistics in Multi-Sensor Atmospheric Data Assimilation.* Role: PI (PSU graduate student fellow: Jeremy Shaw), $29,854.

[6] 2005-2009 NASA Modeling, Analysis and Prediction Research Program: *Development of a new methodology for adaptive observations in the framework of four-dimensional variational data assimilation.* Role: PI (Co-PI: I.M. Navon, Florida State University), $387,253.

[7] 2006 Intel Oregon Faculty Fellowship, 2006: $25,000. *High Performance Computing in Applied Mathematics at PSU.* Role: PI (sole investigator), $25,000.

[8] 2014 NSF Program Computational Mathematics: *Pacific Northwest Numerical Analysis Seminar 2014.* Role: Co-PI (PI: Bin Jiang, Portland State University), $8,000.

[9] 2007-2008 NSF Antarctic Glaciology Program: *Collaborative Research: IPY, the Next Generation: A Community Ice Sheet Model for scientists and educators, with demonstration experiments in the Amundsen Sea Embayment.* Role: Co-PI (PI: C. Hulbe, Portland State University), $145,000.

[10] 2003-2006 NSF Collaborations in Mathematical Geosciences: *Collaborative Research: Ensemble data assimilation based on control theory.* Role: Co-PI (PI: I.M. Navon, Florida State University), $396,304.

Refereed Publications [1]

Refereed Book Chapters

1. Daescu DN, Navon IM, 2013. Sensitivity Analysis in Nonlinear Variational Data Assimilation: Theoretical Aspects and Applications. In *Advanced Numerical Methods for Complex Environmental Models: Needs and Availability*, p 276–300. Istvan Faragó and Zahari Zlatev (Editors), Bentham Science Publishers, ISBN: 978-1-60805-777-1.

2. Daescu DN, Langland RH, 2013. The Adjoint Sensitivity Guidance to Diagnosis and Tuning of Error Covariance Parameters. In *Data Assimilation for Atmospheric, Oceanic and Hydrologic Applications (Vol. II)*, p 205–232. Seon K. Park and Liang Xu (Editors), Springer, ISBN: 978-3-642-35087-0.

3. Daescu DN, 2009. Sensitivity Analysis Methods in Air Quality Models. In *Modelling of Pollutants in Complex Environmental Systems: Volume I*, p. 241–259. Grady Hanrahan (Editor), ILM Publications, ISBN: 978-1-906799-00-7.

Refereed Journal Articles

1. Daescu DN, Langland RH, 2013. Error covariance sensitivity and impact estimation with adjoint 4D-Var: theoretical aspects and first applications to NAVDAS-AR. *Quarterly Journal of the Royal Meteorological Society*, **139**, 226–241.

2. Hossen MJ, Navon IM, Daescu DN, 2012. Effect of random perturbations on adaptive observation techniques. *International Journal for Numerical Methods in Fluids* **69**, 110–123.

3. Godinez HC, Daescu DN, 2011. Observation targeting with a second-order adjoint method for increased predictability. *Computational Geosciences* **15**, 477–488.

4. Sandu A, Constantinescu E, Carmichael GR, Chai T, Daescu DN, Seinfeld JH, 2011. Ensemble methods for dynamic data assimilation of chemical observations in atmospheric models. *Journal of Algorithms and Computational Technology* **5** (4), 667–692.

5. Daescu DN, Todling R, 2010. Adjoint sensitivity of the model forecast to data assimilation system error covariance parameters. *Quarterly Journal of the Royal Meteorological Society* **136**, 2000–2012.

6. Daescu DN, 2009. On the deterministic observation impact guidance: a geometrical perspective. *Monthly Weather Review* **137**, 3567–3574.

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

8. Veerman JJP, Daescu DN, Romero-Valles MJ, Torres PJ, 2009. A single particle impact model for motion in avalanches. *Physica D-Nonlinear Phenomena* **238** (18), 1897–1908.

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

10. Daescu DN, Navon IM, 2008. A dual-weighted approach to order reduction in 4D-Var data assimilation. *Monthly Weather Review* **136**, 1026–1041.

11. Carmichael GR, Sandu A, Chai T, Daescu DN, Constantinescu EM, Tang Y, 2008. Predicting air quality: Improvements through advanced methods to integrate models and measurements. *Journal of Computational Physics* **227**, 3540–3571.

[1] The author(s) listed in same order as they appear in the publication.

12. Daescu DN, Navon IM, 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.

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

14. Chai T, Carmichael GR, Sandu A, Tang Y, Daescu DN, 2006. Chemical data assimilation of Transport and Chemical Evolution over the Pacific (TRACE-P) aircraft measurements. *Journal of Geophysical Research*, **111** D02301, doi: 10.1029/2005JD005883, 18pp.

15. Sandu A, Daescu DN, Carmichael GR, Chai T, 2005. Adjoint sensitivity analysis of regional air quality models. *Journal of Computational Physics* **204**, 222–252.

16. Daescu DN, Navon IM, 2004. Adaptive observations in the context of 4D-Var data assimilation. *Meteorology and Atmospheric Physics* **85**, 205–226.

17. Sandu A, Daescu DN, Carmichael GR, 2003. Direct and adjoint sensitivity analysis of chemical kinetics systems with KPP: I-Theory and software tools. *Atmospheric Environment* **37**, 5083–5096.

18. Daescu DN, Sandu A, Carmichael GR, 2003. Direct and adjoint sensitivity analysis of chemical kinetics systems with KPP: II-Numerical validation and applications. *Atmospheric Environment* **37**, 5097–5114.

19. Daescu DN, Navon IM, 2003. An analysis of a hybrid optimization method for variational data assimilation. *International Journal of Computational Fluid Dynamics*, **17** (4), 299–306.

20. Daescu DN, Carmichael GR, 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.

21. Miehe P, Sandu A, Carmichael GR, Daescu DN, 2002. A communication library for the parallelization of air quality models on structured grids. *Atmospheric Environment* **36** (24), 3917–3930.

22. LeDimet FX, Navon IM, Daescu DN, 2002. Second order information in data assimilation. *Monthly Weather Review* **130** (3), 629–648.

23. Daescu DN, Carmichael GR, Sandu A, 2000. Adjoint implementation of Rosenbrock methods applied to variational data assimilation problems. *Journal of Computational Physics* **165** (2), 496–510.

24. Carmichael GR, Sandu A, Song CH, He S, Phadnis MJ, Daescu DN, Damian-Iordache V, Potra FA, 1999. Computational challenges of modelling interactions between aerosol and gas phase processes in large-scale air pollution models. *Environmental Management and Health*, **10** (4), 224–235.

Refereed Conference Proceedings Articles

1. Daescu DN, 2010. Forecast sensitivity to the observation error covariance in variational data assimilation. *Procedia Computer Science*, Volume 1, Issue 1, May 2010, 1271-1279. *Proceedings to the 10^{th} International Conference on Computational Science.*

2. Godinez HC, Daescu DN, 2009. A second order adjoint method to targeted observations. *Lecture Notes in Computer Science: Computational Science - ICCS 2009 9th International Conference Proceedings.* Springer, Volume 5545, 322–331.

3. Carmichael GR, Sandu A, Chai T, Daescu DN, Constantinescu EM, Tang Y, 2008. Predicting air quality: current status and future directions. *Air Pollution Modeling and Its Application XIX. NATO Science for Peace and Security Series C: Environmental Security*, 2008, Vol. 5, 481-495, Springer.

4. Navon IM, Daescu DN, Liu Z, 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.

5. Sandu A, Constantinescu EM, Liao W, Carmichael GR, Chai T, Seinfeld JH, Daescu DN, 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.

6. Sandu A, Liao W, Carmichael GR, Henze D, Seinfeld JH, Chai T, Daescu DN, 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.

7. Carmichael GR, Daescu DN, Sandu A, Chai T, 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.

8. Daescu DN, Carmichael GR, 2002. Adjoint sensitivity analysis applied to the adaptive location of the observations. *Proceedings of* 2^{nd} *International Conference on Air Pollution Modeling and Simulation*. Bruno Sportisse (Ed.), Springer, 476–488.

9. Sandu A, Daescu DN, Carmichael GR, 2002: Adjoint data assimilation for aerosol dynamics equations. *Proceedings of* 2^{nd} *International Conference on Air Pollution Modeling and Simulation*. Bruno Sportisse (Ed.), Springer, 319–331.

10. Daescu DN, Carmichael GR, Sandu A, 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.

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

Recent Conference Presentations

2014

- *The World Weather Open Science Conference*, Montreal, Canada.
- *European Space Agency Workshop on Correlated Observation Errors*, Reading, U.K.

2013

- *World Meteorological Organization Symposium on Data Assimilation*, College Park, MD.
- *SIAM Conference on Computational Science and Engineering*, Boston, MA.
- 93^{rd} *American Meteorological Society Annual Meeting*, Austin, TX.

2012

- 1^{st} *International Conference on Frontiers in Computational Physics*, Boulder, CO.
- *SIAM Conference on Uncertainty Quantification*, Raleigh, NC.

2011

• 8^{th} *Annual Meeting Asia Oceania Geosciences Society*, Taipei, Taiwan.

• 7^{th} *International Congress on Industrial & Applied Mathematics*, Vancouver, Canada.

• *SIAM Conference on Mathematical and Computational Issues in the Geosciences*, Long Beach, CA.

• 91^{st} *American Meteorological Society Annual Meeting*, Seattle, WA.

2010

• 10^{th} *International Conference on Computational Science*, Amsterdam, The Netherlands.

2009

• *European Centre for Medium-Range Weather Forecasts, Workshop on Diagnostics of Data Assimilation System Performance*, Reading, U.K.

• 9^{th} *International Conference on Computational Science*, Baton Rouge, LA.

• 8^{th} *Workshop on Adjoint Model Applications in Dynamic Meteorology*, Tannersville, PA.

• *SIAM Conference on Computational Science and Engineering*, Miami, FL.

Recent Colloquium, Seminar, and Science Meetings Invited Talks

▷ *Naval Research Laboratory, Marine Meteorology Division*, Monterey, CA: 2009–2014.
▷ *NASA Goddard Space Flight Center, Global Modeling and Assimilation Office*: 2014.
▷ *Oregon State University, Cascade Seminar*, 2014.
▷ *Intel Corporation - PSU Mathematics & Statistics Science Meeting, Hillsboro, OR*: 2012.
▷ *Portland State University, Applied and Computational Mathematics Seminar*: 2012.
▷ *Los Alamos National Laboratory, Applied Mathematics and Plasma Physics T-5*: 2011.
▷ *North Carolina State University, Department of Nuclear Engineering*: 2011.
▷ *Portland State University, Department of Mechanical and Materials Engineering*: 2011.
▷ *Portland State University, Department of Civil & Environmental Engineering*: 2011.
▷ *Oregon State University, Department of Mathematics Colloquium*: 2009.

Mentoring, and Curricular Achievements

Doctoral Students Advised

▷ Sebastian Baldivieso, since Fall 2014

▷ Jeremy Shaw, since 2010

◇ NASA Earth and Space Science Fellowship 2011-2012

▷ Humberto Godinez, Ph.D. Mathematical Sciences 2009

◇ Postdoctoral Fellowship, Los Alamos National Laboratory 2009 - 2012

▷ Oleg Roderick, Ph.D. Mathematical Sciences 2009

◇ Postdoctoral Fellowship, Argonne National Laboratory 2009 - 2012

M.S. Students Advised

▷ Christopher Ellison, M.S. Mathematics 2012
▷ Greg Rainwater, M.S. Mathematics 2011
▷ Bethany Downs, M.S. Mathematics 2010
▷ Laurie Vasquez, M.S. Mathematics 2007

Undergraduate Students Advised: Mathematics Honors Track

▷ Sebastian Baldivieso, 2014.
▷ Kjersten Criss, 2013.
▷ Ken Kennedy, 2007.

Other Community Outreach Achievements

Conference Minisymposia & Science Meetings organizer

◇ *2015 SIAM Conference on Computational Science and Engineering*,
MS 168/194/218/243/267/292: Inverse Problems and Data Assimilation: Part I–VI
◇ *2014 Pacific Northwest Numerical Analysis Seminar*
◇ *2013 SIAM Conference on Computational Science and Engineering*,
MS 215/269: Data Assimilation and PDE-Constrained Optimization I, II.
◇ *2012 SIAM Conference on Uncertainty Quantification*,
MS 70/78: Data Assimilation and Inverse Problems: I, II
◇ *2011 SIAM Conference on Mathematical and Computational Issues in the Geosciences*,
MS 9: Data Assimilation for Geophysical Fluids.
◇ *2009 SIAM Conference on Computational Science and Engineering*,
MS 110/122: Recent Progress in Atmospheric and Ocean Data Assimilation: I, II
◇ *2007 SIAM Conference on Computational Science and Engineering*,
MS 11/22: Recent Advances in Data Assimilation: I, II
◇ *2004 SIAM Annual Meeting*,
MS 42/49: Data Assimilation and Predictability: I, II.

Governance Activities for the University, College, Department

University Committees

2013-2016: University Senate
2012-2013: Faculty Grievance Panel
2010-2012: Advisory Committee on Academic Information Technologies (ACAIT)

Graduate Office Representative

2013: Ralf Juengling (Ph.D. Computer Science)
2007: Danny Bolleddula (M.S. Mech. Engr.)
2006: Peter Tonn (M.S. Mech. Engr.)

2005: Cory Nardin (M.S. Mech. Engr.)

Departmental Committees

2014/2015: GTA Committee (Chair), Executive Committee, Math Committee
2013/2014: Ph.D. Math. Sciences (Chair), Math Committee, Maseeh Professorship Search Committee, Promotion and Tenure, Executive Committee
2012/2013: Ph.D. Math. Sciences (Chair), Math Committee, Maseeh Professorship Search Committee, Promotion and Tenure
2011/2012: Ph.D. Math. Sciences (Chair), Math Committee, Maseeh Professorship Search Committee
2010/2011: Math Committee, Maseeh Distinguished Chair Search Committee
2009/2010: Math Committee (Chair), Executive Committee
2008/2009: Ph.D. Math. Sciences, GTA.
2007/2008: Ph.D. Math. Sciences (Chair), GTA, Executive Committee
2006/2007: Ph.D. Math. Sciences (Chair), 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

2014: Nicole Oliveras, Paulina Sepulveda
2012: Jeremy Shaw
2010: Robert Lyons
2008: Andrew Tolland (Systems Science)
2006: Oleg Roderick (Chair), Humberto Godinez (Chair)

Ph.D. Dissertation Committee

2015- : Timothy Meager
2014- : Robert Lyons
2013- : Jeremy Shaw (Chair)
2011/2012: Andrew Tolland (System Sciences)
2010/2011: Tom Fielden
2008/2009: Oleg Roderick (Chair), Humberto Godinez (Chair)

M.S. Committee

2014: Nils Wagman (Math)
2012: Megan Fitzgerald (Math)
2011: Marc Leisenring (Civil & Environ. Engr.)
2010: Caleb Dechant (Civil & Environ. Engr.)
2006: Tom Kurrasch (Math), Hyang-sug Lee (Math)

Professionally-related service

▷ Panel reviewer for grant proposals: NSF (2010), NASA (2008).

▷ Reviewer to research manuscripts:

- ◇ Applied Numerical Mathematics
- ◇ Atmospheric Environment
- ◇ International Conference on Computational Science
- ◇ International Journal for Numerical Methods in Fluids
- ◇ International Journal of Optimization and Engineering
- ◇ Inverse Problems
- ◇ Journal of Computational Physics
- ◇ Journal of Geophysical Research - Atmospheres
- ◇ Monthly Weather Review
- ◇ Nuclear Science and Engineering
- ◇ Ocean Dynamics
- ◇ Quarterly Journal of the Royal Meteorological Society
- ◇ SIAM Journal on Scientific Computing
- ◇ Tellus-A: Dynamic Meteorology and Oceanography

Memberships in Professional Societies

◇ Society for Industrial and Applied Mathematics (SIAM)

- ▷ SIAM Activity Group in Computational Science and Engineering
- ▷ SIAM Activity Group in Uncertainty Quantification
- ▷ SIAM Activity Group in Geosciences