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Jann Paul Mattern

Curriculum Vitae

research

My current research interests are focused on the development and implementation of statistical methods that combine observations with complex numerical models, specifically coupled biological-physical ocean models. These methods include data assimilation, optimization and uncertainty analyses.

PhD thesis — *Parameter, State and Uncertainty Estimation for 3-dimensional Biological Ocean Models* (supervisors: Dr. Katja Fennel and Dr. Mike Dowd)

- data assimilation for complex, high-dimensional models and satellite observations using particle filter and statistical emulator techniques
- assessment of model uncertainty and sensitivity
- application of the methods to regional ROMS models for the Middle-Atlantic Bight and the Texas-Louisiana Shelf

Master's thesis — *Ensemble-based data assimilation for a physical-biological ocean model near Bermuda* (supervisors: Dr. Dirk Langemann, *Universität zu Lübeck*, Dr. Katja Fennel and Dr. Mike Dowd, *Dalhousie University*)

- implementation and comparison of the Ensemble Kalman Filter and a particle filter for a 1-dimensional ocean model and real-world observations

Bachelor's thesis — *Unterschriftsverifikation basierend auf lokal extrahierten Merkmalen temporaler Sequenzen* (*Verification of handwritten signatures based on locally extracted features of temporal sequences*; supervisors: Dr. Thomas Martinetz and Dipl. Inf. Kai Labusch)

- development of a method to compare and classify handwritten signatures using sequence alignment and optimization techniques

academic work experience

Sept. 2012 – present — Postdoctoral Fellow, Department of Oceanography, *Dalhousie University* (supervisor: Dr. Katja Fennel)

July 2008 – Dec. 2008 — Research assistant, Department of Oceanography, *Dalhousie University*

2004 – 2007 — Student assistant, Institute for Neuro- and Bioinformatics, *Universität zu Lübeck*

education

Jan. 2009 – Aug. 2012	PhD program: Statistics (with emphasis on Oceanography) *Dalhousie University*, Halifax, Canada
May 2007 – June 2008	Visiting student, Department of Oceanography as part of the Master's program *Dalhousie University*, Halifax, Canada
Oct. 2005 – June 2008	Master's program: Computational life science (final grade: 1.2, with honours) *Universität zu Lübeck*, Lübeck, Germany
Oct. 2002 – Sept. 2005	Bachelor's program: Computational life science (final grade: 1.5) *Universität zu Lübeck*, Lübeck, Germany

peer-reviewed publications

Mattern, J. P., K. Fennel, and M. Dowd (in prep.), Uncovering annual periodicity in the optimal parameter values of a biological ocean model.

Bianucci, L., K. Fennel and **J. P. Mattern** (in prep.), What drives phytoplankton growth during deep winter mixing? A model study for the Northwest Atlantic.

Wilson, R. F., K. Fennel and **J. P. Mattern** (accepted), Simulating sediment-water exchange of nutrients and oxygen: A comparative assessment of models against mesocosm observations, *Continental Shelf Research*.

Mattern, J. P., M. Dowd, and K. Fennel (accepted), Particle Filter-based Data Assimilation for a 3-dimensional Biological Ocean Model and Satellite Observations, *Journal of Geophysical Research*, doi:10.1002/jgrc.20213.

Mattern, J. P., K. Fennel, and M. Dowd (2013), Sensitivity and Uncertainty Analysis of Model Hypoxia Estimates for the Texas-Louisiana Shelf, *Journal of Geophysical Research*, 118, doi:10.1002/jgrc.20130.

Mattern, J. P., K. Fennel, and M. Dowd (2012), Estimating time-dependent parameters for a biological ocean model using an emulator approach, *Journal of Marine Systems*, 9697, 32–47, doi: 10.1016/j.jmarsys.2012.01.0

Hu, J., K. Fennel, **J. P. Mattern**, and J. Wilkin (2012), Data assimilation with a local Ensemble Kalman Filter applied to a three-dimensional biological model of the Middle Atlantic Bight, *Journal of Marine Systems*, 94, 145–156, doi: 10.1016/j.jmarsys.2011.11.016.

Hidy, A. J., J. C. Gosse, J. L. Pederson, **J. P. Mattern**, and R. C. Finkel (2010), A geologically constrained Monte Carlo approach to modeling exposure ages from profiles of cosmogenic nuclides: An example from Lees Ferry, Arizona, *Geochemistry Geophysics Geosystems*, 11, Q0AA10, doi: 10.1029/2010GC003084.

Mattern, J. P., K. Fennel, and M. Dowd (2010), Introduction and Assessment of Measures for Quantitative Model-Data Comparison Using Satellite Images, *Remote Sensing*, 2, 794–818, doi: 10.3390/rs2030794.

Mattern, J. P., M. Dowd, and K. Fennel (2010), Sequential data assimilation applied to a physical-biological model for the Bermuda Atlantic time series station, *Journal of Marine Systems*, 79, 144–156, doi: 10.1016/j.jmarsys.2009.08.004.

selected published abstracts

Dowd M., **J. P. Mattern**, J. Briggs, and K. Fennel (2012), Statistical Inference for Differential Equation Models. *Statistical Society of Canada Annual Meeting* University of Guelph, Canada.

Mattern J.P., M. Dowd, and K. Fennel (2012), Particle Filter-based Data Assimilation for a 3D Biological Ocean Model and Satellite Observations. *2012 CMOS Congress*, Montréal, Canada. (oral presentation)

Bianucci, L., K. Fennel and **J. P. Mattern** (2012), Temporal and spatial variability of net phytoplankton growth rates in the North Atlantic: a modelling approach. *2012 CMOS Congress*, Montréal, Canada.

Mattern J.P., K. Fennel, and M. Dowd (2012), Temporal and Spatial Dependence of Plankton Parameters in a Biological Ocean Model. *2012 Ocean Sciences Meeting*, Salt Lake City, USA. (poster presentation)

Hu, J., K. Fennel, **J. P. Mattern**, and J. Wilkin (2012) The Localized Ensemble Kalman Filter Applied to a 3-dimensional Biological Model of the Middle Atlantic Bight. *2012 Ocean Sciences Meeting*, Salt Lake City, USA.

Bianucci, L., K. Fennel and **J. P. Mattern** (2012), An Emulator Approach for Constraining Net Phytoplankton Growth Rates in the North Atlantic in Winter. *2012 Ocean Sciences Meeting*, Salt Lake City, USA.

Mattern J.P., K. Fennel, and M. Dowd (2011), Using polynomial chaos to uncover time dependence of optimal parameter values in a biological ocean model. *2011 CMOS Congress*, Victoria, Canada. (oral presentation)

Mattern J.P., K. Fennel, and M. Dowd (2010), Satellite Data Assimilation for a 3D Physical-Biological Model using a Particle Filter. *2010 Ocean Sciences Meeting*, Portland, USA. (poster presentation)

Dowd, M., **J.P. Mattern**, K. Fennel (2010), State Space Models and Data Assimilation for Ocean Biogeochemical Models. *2010 Ocean Sciences Meeting*, Portland, USA.

Mattern J.P., K. Fennel, and M. Dowd (2009), Application of Sequential Importance Resampling (SIR) to satellite data assimilation for a 3D ocean model. *Vancouver Dynamics Systems Workshop*, Vancouver, Canada. (poster presentation)

Mattern J.P., K. Fennel, and M. Dowd (2009), Application of Sequential Importance Resampling (SIR) to satellite data assimilation for a 3D ocean model. *Statistical Society of Canada 2009 Annual Meeting*, Vancouver, Canada. (poster presentation)

Mattern J.P., M. Dowd, and K. Fennel (2008), Application of two Sequential Data Assimilation Procedures to a 1D Biological Model of the BATS Site. *ICES 2008 Annual Science Conference*, Halifax, Canada. (poster presentation)

Mattern J.P., M. Dowd, and K. Fennel (2008), Application of two Statistical Data Assimilation Procedures to a 1D Biological Model of the BATS Site. *2008 Ocean Sciences Meeting*, Orlando, USA. (poster presentation)

awards & stipends

stipend	ACEnet graduate fellowship two year stipend (2011 – 2012; $ 20 000)
travel award	travel grant from the Dalhousie Faculty of Graduate Studies (February 2012; $ 400)
presentation award	Prize for best PhD talk in 2011 and 2012 at the annual Conference of Dalhousie Oceanography Graduate Students (C-DOGS; $ 200 each)
travel award	CMOS travel award for the 2011 CMOS Congress (June 2011; $ 200)
travel award	travel award for the 2009 ASP Summer Colloquium on "Marine Ecosystems and Climate", National Center for Atmospheric Research, Boulder, USA (August 2009)
travel award	travel award for presenting a poster at the Vancouver Dynamics Systems Workshop (June 2009; $ 300)
travel award	"2008 Ocean Sciences Meeting Student Travel Award", travel award for the 2008 Ocean Sciences Meeting (March 2008; $ 250)
stipend	DAAD (Deutscher Akademischer Austauschdienst, German Academic Exchange Service) four month stipend (Oct. 2007 – Jan. 2008)
award	Third best Bachelor certificate in the Bachelor Program Computational Life Science

other professional activities

teaching experience	Teaching labs for "Marine Modelling", *Dalhousie University* (2008, 2010, 2011; 9h total) Teaching class in "Multivariate Analysis", *Dalhousie University* (2011; 1.5h total)
manuscript reviewer	Biogeosciences (1 review), Journal of Geophysical Research (1 review), Journal of Marine Systems (4 reviews)

computer/programming skills

expert knowledge:	Matlab, Python	advanced knowledge:	FORTRAN, C++, Java, JavaScript