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Jann Paul Mattern

Curriculum Vitae

Applied statistician with research interests focused on the development and implementation of statistical methods that combine large sets of observations with complex numerical models, including data assimilation, optimization and uncertainty analyses.

research

PhD thesis *Parameter, State and Uncertainty Estimation for 3-dimensional Biological Ocean Models* (advisors: 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

MSc thesis *Ensemble-based data assimilation for a physical-biological ocean model near Bermuda* (advisors: 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

BSc thesis *Unterschriftsverifikation basierend auf lokal extrahierten Merkmalen temporaler Sequenzen* (*Verification of handwritten signatures based on locally extracted features of temporal sequences*; advisors: 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

since Sep 2017 Research Scientist, Ocean Sciences Department, *UC Santa Cruz*

2013 – 2017 Postdoctoral Fellow, Ocean Sciences Department, *UC Santa Cruz* (advisor: Dr. Christopher A. Edwards)

2012 – 2013 Postdoctoral Fellow, Department of Oceanography, *Dalhousie University* (advisor: Dr. Katja Fennel)

2008 – 2008 Research assistant, Department of Oceanography, *Dalhousie University*

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

education

2009 – 2012 PhD program: Statistics (with emphasis on Oceanography)
Dalhousie University, Halifax, Canada

2007 – 2008 Visiting student, Department of Oceanography as part of the MSc program
Dalhousie University, Halifax, Canada

2005 – 2008 MSc program: Computational Life Sciences, *Universität zu Lübeck*, Lübeck, Germany

2002 – 2005 BSc program: Computational Life Sciences, *Universität zu Lübeck*, Lübeck, Germany

peer-reviewed publications

J. P. Mattern and C. A. Edwards (in press), *Journal of Geophysical Research – Oceans*, A simple difference quotient-based approximation for biogeochemical tangent linear and adjoint models.

M. Irie, F. Hirose, T. Okada, **J. P. Mattern** and K. Fennel (in press), *Coastal Engineering Journal*, Modeling of nitrogen and phosphorus profiles in sediment of Osaka Bay, Japan with parameter optimization using the polynomial chaos expansion.

J. P. Mattern, C. A. Edwards and A. M. Moore (2018), Improving variational data assimilation through background and observation error adjustments, *Monthly Weather Review*, doi:10.1175/MWR-D-17-0263.1.

J. P. Mattern, H. Song, C. A. Edwards, A. M. Moore and J. Fiechter (2017), Data assimilation of physical and chlorophyll observations in the California Current System using two biogeochemical models, *Ocean Modelling*, doi:10.1016/j.ocemod.2016.12.002.

J. P. Mattern and C. A. Edwards (2017), Simple parameter estimation for complex models – testing evolutionary techniques on 3-dimensional biogeochemical ocean models, *Journal of Marine Systems*, doi:10.1016/j.jmarsys.2016.10.012.

A. Kuhn, K. Fennel and **J. P. Mattern** (2015), Model investigations of the North Atlantic spring bloom initiation, *Progress in Oceanography*, doi:10.1016/j.pocean.2015.07.004.

J. P. Mattern, K. Fennel and M. Dowd (2014), Periodic time-dependent parameters improving forecasting abilities of biological ocean models, *Geophysical Research Letters*, doi:10.1002/2014GL061178.

R. F. Wilson, K. Fennel and **J. P. Mattern** (2013), Simulating sediment-water exchange of nutrients and oxygen: A comparative assessment of models against mesocosm observations, *Continental Shelf Research*, doi:10.1016/j.csr.2013.05.003.

J. P. Mattern, M. Dowd, and K. Fennel (2013), Particle Filter-based Data Assimilation for a 3-dimensional Biological Ocean Model and Satellite Observations, *Journal of Geophysical Research*, doi:10.1002/jgrc.20213.

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

J. P. Mattern, K. Fennel, and M. Dowd (2012), Estimating time-dependent parameters for a biological ocean model using an emulator approach, *Journal of Marine Systems*, doi: 10.1016/j.jmarsys.2012.01.015.

J. Hu, 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*, doi: 10.1016/j.jmarsys.2011.11.016.

A. J. Hidy, 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*, doi: 10.1029/2010GC003084.

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

J. P. Mattern, 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*, doi: 10.1016/j.jmarsys.2009.08.004.

selected published abstracts

Mattern J. P., H. Song, C. A. Edwards, A. M. Moore and J. Fiechter (2016), Comparison of Data Assimilation for Biogeochemical Ocean Models of Different Complexities. *2016 Ocean Sciences Meeting*, New Orleans, LA, USA. (oral presentation)

Mattern J. P., K. Fennel, M. Dowd, C. A. Edwards, H. Song, A. M. Moore and J. Fiechter (2015), When Ocean Models meet Observations – Data Assimilation in Marine Ecosystem Models. *Scripps Institution of Oceanography*, La Jolla, CA, USA. (invited seminar talk)

Mattern J. P. and C. A. Edwards (2014), Optimization and Intercomparison of Biogeochemical Ocean Models of the US West Coast. *2014 Eastern Pacific Ocean Conference*, Mt. Hood, OR, USA. (oral presentation)

Mattern J. P., K. Fennel, and M. Dowd (2013), Using Statistical Emulators for Parameter Estimation in a 3D BGC Model. *2013 Marine Biogeochemical Data Assimilation Symposium*, Hobart, Australia. (oral presentation)

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, UT, USA. (poster 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, OR, USA. (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, FL, USA. (poster presentation)

other professional activities

teaching experience

Teaching graduate level course "Python programming for Ocean Scientists" consisting of 19 classes *UC Santa Cruz* (28.5 h total)
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 (5 reviews), Great Lakes Research (2 reviews), Journal of Agricultural, Biological, and Environmental Statistics (1 review), Journal of Geophysical Research (5 reviews), Journal of Marine Systems (5 reviews), Monthly Weather Review (5 reviews), Ocean Modelling (8 reviews), Remote Sensing Letters (2 reviews)

computer/programming skills

advanced experience: Python, bash, Matlab

intermediate experience: FORTRAN, C++, Java, JavaScript