

Curriculum Vitae

Brian K. Arbic

Assistant Professor
Department of Geological Sciences
University of Michigan

arbic AT umich DOT edu

3020 C.C. Little Building
1100 North University Avenue
Ann Arbor, MI 48109

Education

- 2000 PhD in Physical Oceanography
MIT-WHOI Joint Program in Oceanography
Massachusetts Institute of Technology, Cambridge, Massachusetts
Woods Hole Oceanographic Institution, Woods Hole, Massachusetts
- 1988 B.S. in Physics (with distinction; high honors) and in Mathematics
University of Michigan, Ann Arbor, Michigan

Employment History

- 2010-present Assistant Professor, Department of Geological Sciences, University of Michigan
--Visiting position begins June 1, 2010; permanent position begins September 1, 2010.
- 2008-2010 Assistant Professor, Department of Oceanography and Center for Ocean-Atmospheric Prediction Studies, Florida State University
--Department downsized due to budget cuts.
--Courtesy appointment retained.
- 2005-2008 Research Associate, Institute for Geophysics, Jackson School of Geosciences, The University of Texas at Austin
--Tenure-track research scientist position.
- 2003-2005 Research Staff Member, Atmospheric and Oceanic Sciences Program, Princeton University
--Faculty sponsor: Professor Jorge Sarmiento

- 2001-2003 Visiting Scientist, Atmospheric and Oceanic Sciences Program,
Princeton University
--Hosting scientists: Dr. Stephen Garner, Dr. Robert Hallberg
- 1994-2000 Graduate Student Research Assistant, MIT-WHOI Joint Program in
Oceanography
--Doctoral thesis supervisor: Professor Glenn Flierl
--Advisor, pre-thesis graduate project: Dr. W. Brechner Owens
- 1993-1994 Research Assistant, Geology Department, University of Michigan
--Supervisor: Professor Kenji Satake
- 1990-1992 United States Peace Corps Volunteer, West Africa
--Taught math and physics in rural secondary schools, first in Liberia
(evacuated due to civil war), then in Ghana.
- 1985-1988 Research Assistant, Physics Department, University of Michigan
--Honors thesis supervisor: Dr. Mark Skalsey
- 1984-1989 Miscellaneous
--Worked several odd jobs to finance undergraduate education and self.

In-press and Submitted Manuscripts—Student Advisees in Bold

Several manuscripts in preparation.

Müller, M., B.K. Arbic, and J.X. Mitrovica (2010), Secular trends in ocean tides: Observations and model results, submitted.

Cummins, P.F., R.H. Karsten, and B.K. Arbic (2010), The semi-diurnal tide in Hudson Strait as a resonant channel oscillation, in press for *Atmosphere-Ocean*.

Publications—Student Advisees in Bold

24) Arbic, B.K., and C. Garrett (2010), A coupled oscillator model of shelf and ocean tides, *Continental Shelf Research*, **30**, 564-574, doi:10.1016/j.csr.2009.07.008.

INCLUDED IN SPECIAL ISSUE “TIDES IN MARGINAL SEAS—A SPECIAL ISSUE IN MEMORY OF PROFESSOR ALEXEI N. NEKRASOV”

23) Arbic, B.K., A.J. Wallcraft, and E.J. Metzger (2010), Concurrent simulation of the eddying general circulation and tides in a global ocean model, *Ocean Modelling Modelling*, **32**, 175-187, doi:10.1016/j.ocemod.2010.01.007.

**INCLUDED IN SPECIAL ISSUE “THE MAGIC OF MODELLING: A SPECIAL VOLUME
COMMEMORATING THE CONTRIBUTIONS OF PETER D. KILLWORTH—PART II”**

22) Scott, R.B., B.K. Arbic, E.P. Chassignet, A.C. Coward, M. Maltrud, W.J. Merryfield, A. Srinivisan, and **A. Varghese** (2010), Total kinetic energy in four global eddying ocean circulation models and over 5000 current meter records, *Ocean Modelling Modelling*, **32**, 157-169, doi:10.1016/j.ocemod.2010.01.005.

**INCLUDED IN SPECIAL ISSUE “THE MAGIC OF MODELLING: A SPECIAL VOLUME
COMMEMORATING THE CONTRIBUTIONS OF PETER D. KILLWORTH—PART II”**

21) Goff, J.A., and B.K. Arbic (2010), Global prediction of abyssal hill roughness statistics for use in ocean models from digital maps of paleo-spreading rate, paleo-ridge orientation, and sediment thickness, *Ocean Modelling*, **32**, 36-43, doi:10.1016/j.ocemod.2009.10.001.

**INCLUDED IN SPECIAL ISSUE “THE MAGIC OF MODELLING: A SPECIAL VOLUME
COMMEMORATING THE CONTRIBUTIONS OF PETER D. KILLWORTH—PART I”**

20) Arbic, B.K., R.H. Karsten, and C. Garrett (2009), On tidal resonance in the global ocean and the back-effect of coastal tides upon open-ocean tides, *Atmosphere-Ocean*, **47(4)**, 239-266, doi:10.3137/OC311.2009.

**INCLUDED IN SPECIAL ISSUE “THE INTERACTING SCALES OF OCEAN
DYNAMICS—A TRIBUTE TO CHRIS GARRETT”**

19) Arbic, B.K., J.F. Shriver, P.J. Hogan, H.E. Hurlburt, J.L. McClean, E.J. Metzger, R.B. Scott, **A. Sen**, O.M. Smedstad, and A.J. Wallcraft (2009), Estimates of bottom flows and bottom boundary layer dissipation of the oceanic general circulation from global high resolution models, *Journal of Geophysical Research*, **114**, C02024, doi:10.1029/2008JC005072.

18) Arbic, B.K., J.X. Mitrovica, D.R. MacAyeal, and G.A. Milne (2008), On the factors behind large Labrador Sea tides during the last glacial cycle and the potential implications for Heinrich events, *Paleoceanography*, **23**, PA3211, doi:10.1029/2007PA001573.

17) Scott, R.B., B.K. Arbic, C.L. Holland, **A. Sen**, and B. Qiu (2008), Zonal versus meridional velocity variance in satellite observations and realistic and idealized ocean circulation models, *Ocean Modelling*, **23**, 102-112, doi:10.1016/j.ocemod.2008.04.009.

16) **Sen, A.**, R.B. Scott, and B.K. Arbic (2008), Global energy dissipation rate of deep-ocean low-frequency flows by quadratic bottom boundary layer drag: Computations from current-meter data, *Geophysical Research Letters*, **35**, L09606, doi:10.1029/2008GL033407.

15) Arbic, B.K., and R.B. Scott (2008), On quadratic bottom drag, geostrophic turbulence, and oceanic mesoscale eddies, *Journal of Physical Oceanography*, **38**, 84-103.

14) Arbic, B.K., P. St-Laurent, G. Sutherland, and C. Garrett (2007), On the resonance and influence of the tides in Ungava Bay and Hudson Strait, *Geophysical Research Letters*, **34**, L17606, doi:10.1029/2007GL030845.

PAPER HIGHLIGHTED BY NATURE GEOSCIENCE

13) Arbic, B.K., G.R. Flierl, and R.B. Scott (2007), Cascade inequalities for forced-dissipated geostrophic turbulence, *Journal of Physical Oceanography*, **37**, 1470-1487.

12) Scott, R.B., and B.K. Arbic (2007), Spectral energy fluxes in geostrophic turbulence: Implications for ocean energetics, *Journal of Physical Oceanography*, **37**, 673-688.

11) Smith, W.H.F., R. Scharroo, V.V. Titov, D. Arcas, and B.K. Arbic (2005), Satellite altimeters measure tsunamis: Early model estimates confirmed, *Oceanography*, **18**, 11-13.

10) Arbic, B.K. (2005), Atmospheric forcing of the oceanic semidiurnal tide, *Geophysical Research Letters*, **32**, L02610, doi:10.1029/2004GL021668.

9) Arbic, B.K., D.R. MacAyeal, J.X. Mitrovica, and G.A. Milne (2004), Ocean tides and Heinrich events, *Nature*, **432**, 460.

8) Arbic, B.K., S.T. Garner, R.W. Hallberg, and H.L. Simmons (2004), The accuracy of surface elevations in forward global barotropic and baroclinic tide models, *Deep-Sea Research II*, **51**, 3069-3101.

INCLUDED IN SPECIAL ISSUE "SMALL AND MESOSCALE PROCESSES AND THEIR IMPACT ON THE LARGE SCALE"

7) Simmons, H.L., R.W. Hallberg, and B.K. Arbic (2004), Internal wave generation in a global baroclinic tide model, *Deep-Sea Research II*, **51**, 3043-3068.

INCLUDED IN SPECIAL ISSUE "SMALL AND MESOSCALE PROCESSES AND THEIR IMPACT ON THE LARGE SCALE"

6) Arbic, B.K., and G.R. Flierl (2004), Baroclinically unstable geostrophic turbulence in the limits of strong and weak bottom Ekman friction: Application to mid-ocean eddies, *Journal of Physical Oceanography*, **34**, 2257-2273.

5) Arbic, B.K., and G.R. Flierl (2004), Effects of mean flow direction on energy, isotropy, and coherence of baroclinically unstable beta-plane geostrophic turbulence, *Journal of Physical Oceanography*, **34**, 77-93.

4) Arbic, B.K., and G.R. Flierl (2003), Coherent vortices and kinetic energy ribbons in asymptotic, quasi two-dimensional f-plane turbulence, *Physics of Fluids*, **15**, 2177-2189.

3) Arbic, B.K., and W.B. Owens (2001), Climatic warming of Atlantic intermediate waters, *Journal of Climate*, **14**, 4091-4108.

2) Dickson, B., J. Hurrell, N. Bindoff, A. Wong, B. Arbic, W.B. Owens, S. Imakawi, and I. Yashayaev (2001), *The world during WOCE*, in *Ocean Circulation and Climate*, edited by G. Siedler, J. Church, and J. Gould, Academic Press, London, pp. 557-583.

1) Arbic, B.K., S. Hatamian, M. Skalsey, J. Van House, and W. Zheng (1988), Angular correlation test of CPT in polarized positronium, *Physical Review A*, **37**, 3189-3194.

Grants and Awards

- 2010 National Science Foundation Grant to the University of Michigan
"Collaborative Research: Impact of bottom boundary layer drag and topographic wave drag on the eddying general circulation"
Lead PI on multiple-institution NSF grant (UMichigan portion \$680,559).
Collaborators include Eric Chassignet (FSU), Glenn Flierl (MIT), Steve Garner (GFDL), Steve Jayne (WHOI), Joe LaCasce (University of Oslo), Mat Maltrud (LANL), Rob Scott (UTexas).
- 2010 National Science Foundation Grant to the University of Michigan
"Collaborative Research: Representing internal-wave driven mixing in global ocean models"
Co-PI on multiple-institution NSF/NOAA Climate Process Team (CPT) grant led by Jennifer MacKinnon (Scripps/UCSD). UMichigan portion \$362,201.
- 2009 Office of Naval Research Grant to Florida State University
"Toward a global 1/25 degree HYCOM ocean prediction system with tides"
Co-PI with Eric Chassignet (lead PI) on five-year project for \$2,156,665.
Project is in collaboration with several scientists at Naval Research Laboratory, Stennis Space Center.
- 2007 Office of Naval Research Grant to The University of Texas at Austin
"Effects of small-scale bathymetric roughness on the global internal wave field"
Co-PI with John Goff (lead PI) on three-year project for \$244,017.
- 2006 National Science Foundation Grant to The University of Texas at Austin
"Collaborative Research: Understanding tidal resonances in the present-day and ice-age oceans"

Co-PI with Samar Khatiwala (Lamont-Doherty Earth Observatory, Columbia) on three year project (UT part \$210,475) .

2006 Naval Research Laboratory Contract to The University of Texas at Austin
"Embedding a forward model of barotropic and baroclinic tides into a high-resolution general circulation model"
Sole PI on contract which ultimately delivered \$191,771. Laid groundwork for a large part of the 2009 Office of Naval Research HYCOM grant, which supercedes this contract.

1994 NSF Graduate Research Fellowship and AMS Graduate Fellowship
Awarded, but declined in favor of:

1994-1997 ONR-NDSEG Graduate Fellowship
MIT-WHOI Joint Program, Cambridge and Woods Hole, MA

1988 William Williams Undergraduate Physics Thesis Award

Mentoring Experience--Postdoctoral Scientists

2008-present – Patrick Timko
--Working on two Navy-funded projects: 1) quantifying the effects of an added statistical roughness on the internal waves generated in high-resolution baroclinic tide models, 2) comparison of the modeled three-dimensional tidal velocity field with current meter data. Both projects will be written up for submission to peer-reviewed journals.

Mentoring Experience—Graduate Students

2010 (spring and summer) -- Verónica Vergara Larrea (Department of Scientific Computing; main advisors Paul van der Mark and Jim Wilgenbusch)
--Partially supported in spring and summer 2010 to work on incorporating the self-attraction and loading calculation into tide models "on the fly" so that current iterative procedures for calculating this term can be avoided.

Mentoring Experience—Undergraduate Students

2009 – 2010 --Byron Conley (physics major; co-advised by Patrick Timko)
--Worked on project utilizing satellite altimeter data. Project currently being written up for submission to peer-reviewed journal. Conley presented work at 2010 Ocean Sciences meeting in Portland, Oregon.

2009 (summer) --Joseph Molinari (entering graduate student in applied math)

--Worked on project on understanding the response of tides to recent changes in stratification. Project will be written up for submission to peer-reviewed journal.

2009 (summer) --Will Godwin and Brian Rivera (physics majors)

--Worked together on understanding the resonances of diurnal tides. Project will be written up for submission to peer-reviewed journal.

Mentoring Experience—High School Students

2008 (summer) --Anson Varghese (co-advised by Rob Scott)

--Worked on comparisons of high-resolution global models and current meter data, leading to co-authorship on Scott et al. 2010 *Ocean Modelling* paper. Varghese went on to undergraduate studies in biomedical engineering at The University of Texas at Austin.

2007 (summer) --Ayon Sen (co-advised by Rob Scott)

-- Worked on computations of dissipation of low-frequency flows by quadratic bottom boundary layer drag. Project led to student first-author paper (Sen et al. 2008, *Geophysical Research Letters*) and student co-author paper (Arbic et al. 2009, *Journal of Geophysical Research*). Sen entered results in Siemens-Westinghouse Science and Technology Competition, placing 4th in national finals (individual category) out of 1,641 initial entries. Sen also entered results in Intel Science Talent Search, and was named one of 40 national finalists, from 1,602 initial entries. Sen went on to undergraduate studies at Caltech, after receiving a scholarship paying full tuition and fees.

2006 (summer) --Ayon Sen (co-advised by Rob Scott and Christina Holland)

--Worked on computing anisotropy of ocean currents from satellite altimeter data. Project led to student co-author paper (Scott et al. 2008, *Ocean Modelling*), and student poster presentations at Fall 2006 AGU meeting.

Mentoring Experience—International

2008-present – Learned of success stories from students in Ghana

--Recently contacted by many of the students I taught in Ghana, who have gone on to success in higher education or in other endeavors, including: founding start-up companies in Ghana and in the US, obtaining MS (International Public Health) in the UK, obtaining PhD (Applied Mathematics) in Canada.

Outreach

Ongoing

--Have delivered numerous presentations on experience as math and science teacher in Peace Corps.

2006

--Authored article on "Tides" for World Book Encyclopedia.

--Delivered presentation on tides to Texas Education Service Center coordinators (mentors of teachers).

--Delivered presentation on tides to students at Lake Travis Middle School.

Service at The University of Texas at Austin

Participated extensively in development of Jackson School strategic plan, particularly in areas of climate graduate curriculum development, expansion of climate research, and outreach to developing nations.

Member, search committee, Jackson School search for multiple permanent hires in Climate Systems Science, 2007-2008. Committee made seven offers for permanent positions, five of which were accepted.

Service to Wider Community

Member of one proposal review panel for NASA and two for National Science Foundation.

Co-convener (with Doug Luther) of session "Observing and Modeling Oceanic Internal Tides and their Impact", 2006 AGU Ocean Sciences Meeting, Honolulu, Hawaii.

Member, advisory committee, Zanzibar Channel Project, run by Theiss Research Inc. Project sends American graduate and undergraduate students to work with members of the Zanzibar Institute for Marine Sciences on coastal modeling problems. Travelled to San Diego to assist PI Jurgen Theiss in preparing students for their summer 2009 departures to Zanzibar.

Review Experience

Reviewer of proposals for

National Science Foundation (Physical Oceanography, Geophysics, Office of Polar Programs)

Naval Research Laboratory Postdoctoral Fellowship Program

Netherlands Organization for Scientific Research (NWO)

Reviewer of manuscripts for the scientific journals

Deep-Sea Research (I and II)
Dynamics of Atmospheres and Oceans
Geophysical Research Letters
Journal of Geophysical Research—Oceans
Journal of Physical Oceanography
Nature Geoscience
Ocean Dynamics
Ocean Modelling
Paleoceanography

Research Cruise Experience

WHOI-directed research cruises in North Atlantic:

- December 1997 PRIMER experiment, R/V Endeavor (4 days)
- July 1997 WOCE experiment, re-occupied 52 West hydrographic section, R/V Knorr (25 days).
- December 1996 GLOBEC experiment, R/V Endeavor (4 days).

Professional Memberships

American Geophysical Union
American Meteorological Society

Professional Conferences and Seminars

Have attended 35 national and international professional conferences. Invited talks at Fall 2008 AGU meeting, Chris Garrett 65th birthday Festschrift, planning meetings for NASA SWOT mission (wide-swath satellite altimeter).

Have delivered 94 professional hour-long seminars, in venues throughout the United States, United Kingdom, France, and Canada.