

Annalisa Bracco

Associate Professor
School of Earth and Atmospheric Sciences
Georgia Institute of Technology

Educational Background:

Ph.D.	Geophysics and Oceanography	2000	Univ. of Genoa, Italy
B.A.	Theoretical Physics	1995	University of Torino, Italy

Employment History:

Associate Professor	2010-present
Assistant Professor	2007-2010
Earth and Atmospheric Sciences Georgia Institute of Technology, Atlanta, GA	
Assistant Scientist (Tenure Track position) and MIT/WHOI Joint Program Faculty Woods Hole Oceanographic Institution Woods Hole, MA	2005-2006
Junior UNESCO Tenure Track Scientist International Center for Theoretical Physics, Trieste, ITALY	2002-2005
Postdoctoral Scholar Woods Hole Oceanographic Institution Woods Hole, MA	2000-2002

Current Fields of Interest:

Geostrophic Turbulence in the Ocean
Vertical mixing in the Ocean
Tropical Climate Dynamics
Marine Ecosystem Dynamics at the ocean mesoscale

Refereed Publications:

A) Published

(* indicates student's publications)

- 1) Luo H.*, Bracco A., Di Lorenzo E., (2011) The interannual variability of the surface eddy kinetic energy in the Labrador Sea. *Progress in Oceanography*, doi:10.1016/j.pocean.2011.01.006, Published on-line March 2011.

- 2) Neelin, J. D. Bracco A., Luo H.*, McWilliams J.C., Meyerson J. E. (2010) Consideration for parameter optimization and sensitivity in climate models, *PNAS*, **107**, 21349-21354.
- 3) Di Lorenzo E., Cobb K. M. Furtado J. C., Schneider N., Anderson B. T., Bracco A., Alexander M. A., Vimont D. J. (2010) Central Pacific El Nino and decadal climatic change in the North Pacific Ocean, *Nature Geoscience*, **3** (11), 762-765, doi: 10.1038/NCEO984
- 4) Kuckarski F., Bracco A., Barimalala* R., Yoo J.-H. (2010) Contribution of the east-west thermal heating contrast to the South Asian Monsoon and consequences for its variability. *Climate Dynamics*, doi: 10.1007/s00382-010-0858-3
- 5) Bracco A., McWilliams, J.C (2010) Reynolds number dependency in equilibrium two-dimensional turbulence. *J. Fluid Mechanics*, **646**, 517-526.
- 6) Koszalka, I.*, Ceballos, L.*, Bracco A. Vertical mixing and coherent anticyclones in the ocean: The role of stratification. *Nonlinear Processes in Geophysics*, **17**, 37-47.
- 7) Koszalka I.*, Bracco A., McWilliams, J.C., Provenzale A. (2009) Dynamics of wind-forced coherent anticyclones in the open ocean. *J. Geophysical Research – Oceans*, doi:10.1029/2009JC005388, **114**, C08011, doi:10.1029/2009JC005388.
- 8) Di Lorenzo, E., Fiechter J., Schneider N., Bracco A., Miller A. J., Franks P. J. S., Bograd S. J., Moore A. M., Thomas A., Crawford W., Pena A., Herman A., (2009) Nutrient and Salinity Decadal Variations in the central and eastern North Pacific. *Geophysical Research Letters*, doi:10.1029/2009GL038261.
- 9) Kucharski F., Bracco A., Yoo J.H., Tompkins A., Feudale L., Ruti P., dell'Aquila A. (2009) A Gill-Mastuno-type mechanism explains the Tropical Atlantic influence on African and Indian Monsoon rainfall. *Quart. J. Royal Meteor. Soc.*, **135**, 569-579, doi:10.1002/qj.406.
- 10) Wang C., Kucharski F., Barimalala R.*, Bracco A. (2009) Teleconnections of the Tropical Atlantic to the Tropical Indian and Pacific Oceans:A Review of Recent Findings. Special Issue of *Meteorologische Zeitschrift*, **18**, 445-454, doi 10.1127/0941.
- 11) Bracco A., Clayton S.*, Pasquero C. (2009) Horizontal advection, diffusion and plankton spectra at the sea surface. *Journal of Geophysical Research – Ocean*, **114**, C02001, doi:10.1029/2007JC004671
- 12) Furtado J. C., Di Lorenzo E., Cobb K., Bracco A. (2009) Paleoclimate reconstructions of tropical seas surface temperatures from precipitation proxies: Methods, uncertainties and nonstationarity. *Journal of Climat.*, **22**(5),1104-1123, doi: 10.1175/2008JCLI2415.1
- 13) Bracco A., Pedlosky J., Pickart R. S. (2008) Eddy formation near the West coast of Greenland *Journal of Physical Oceanography*, **38**(9), 1992-2002
- 14) Kucharski F., Bracco A., Yoo J.H., Molteni F. (2008) The Atlantic forced component of the Indian Monsoon interannual variability *Geophysical Research Letters*, vol. 35 L04706, DOI:10129/2007GL033037. Also American Geophysical Union **Editor Highlights**, March 19 2008, **EOS Highlights** (89(16), April 15 2008, pg. 154 and **Global Change collection Highlights**)
- 15) Koszalka I.*, Bracco A., Pasquero C., Provenzale A. (2007) Plankton cycles disguised by turbulent advection. *Theoretical Population Biology*. doi:10.1016/j.tpb.2007.03.007

- 16) Kucharski F., Bracco A., Yoo J. H. and Molteni F. (2007) Low frequency variability of the Indian Monsoon – ENSO relation and the Tropical Atlantic. The ‘weakening’ of the ‘80s and ‘90s. *Journal of Climate*, **20**(16), 4255-4266
- 17) Bracco A., Kucharski F., Molteni F., Hazeleger W., Severijns C., (2007) A recipe for simulating the interannual variability of the Asian summer monsoon and its relation with ENSO. *Climate dynamics*, doi: 10.1007/s000382-006-0190-0.
- 18) Kucharski F., Molteni F., Bracco A. (2006) Decadal interactions between the Western tropical Pacific and the North Atlantic Oscillation *Climate Dynamics*, **26**(1), 79-91, doi:10.1007/s000382-005-0085-5
- 19) Bracco A., Kucharski F., Molteni F., Hazeleger W., Severijns C., (2005) Internal and forced modes of variability in the Indian Ocean. *Geophysical Research Letters*, **32**, L12707, doi: 10.1029/2005GL023154.
- 20) Pasquero C., Bracco A., Provenzale A. (2005) Impact of the spatio-temporal variability of the nutrient flux on primary productivity in the ocean. *Journal of Geophysical Research - Oceans*, **110**, C07005, doi:10.129/2004JC002738.
- 21) Kucharski, F. Molteni F., Bracco A. (2005). A western tropical Pacific relation to the NAO. *Bulletin of the American Meteorological Society*, **86**(10), 1418-1419
- 22) Bracco A., Kucharski F., Kallummal R., Molteni F. (2004) Internal variability, external forcing and climate trends in multi-decadal AGCM ensembles *Climate Dynamics*, **23**(6), 659-678, doi: 10.1007/s00382-004-0465-2
- 23) Bracco A., von Hardenberg J., Provenzale A., Weiss J., McWilliams J.C. (2004) Dispersion and mixing in quasigeostrophic turbulence. *Physical Review Letters*, **92** (8), 084501-1-4
- 24) Bracco A., Chassignet E. P., Garraffo Z., Provenzale A. (2003) Lagrangian velocity distributions in a high resolution numerical simulation of the North Atlantic. *Journal of Atmospheric and Oceanic Technology*, **8**, 1212-1220
- 25) Bracco A., Pedlosky J. (2003) Local baroclinic instabilities over variable topography in channel flows. *Journal of Physical Oceanography*, **33**, 207-219
- 26) Martin A., Richards J. K., Bracco A., Provenzale A. (2002) Patchy productivity in the open ocean. *Global Biogeochemical Cycles*, **16**(2) 10.1029/2001GB001449 Also in *Editor's Choice: Biogeosciences*, July 2002.
- 27) Berloff P., McWilliams J. C., Bracco A. (2002) Material Transport in Oceanic Gyres. Part I: Phenomenology. *Journal of Physical Oceanography*, **32**, 764-796.
- 28) Bracco A., McWilliams J. C., Murante G., Provenzale A., Weiss J. B. (2000) Revisiting 2D turbulence at millennial resolution. *Physics of Fluids*, **12**(11), 2931-2941
- 29) Bracco A., LaCasce J., Pasquero C., Provenzale A. (2000) Velocity PDFs in barotropic turbulence, *Physics of Fluids*, **12**, 2478-2488.
- 30) Bracco A., LaCasce J., Provenzale A. (2000) Velocity probability density functions for oceanic floats. *Journal of Physical Oceanography*, **30**, 461-474.
- 31) Bracco A., Provenzale, I. Scheuring, (2000) Mesoscale vortices and the paradox of the plankton. *Proceedings of the Royal Society of London B.*, **267** (1454), 1795-1800.

- 32) Bracco A. (2000) Boundary layer separation in the Surface Quasi-Geostrophic equations. *Nuovo Cimento C*, **23** (5), 487-506.
- 33) Bracco A. (2000) Transport of passive tracers by monopoles on the beta-plane. *Nuovo Cimento C*, **23** (6), 597-609.
- 34) Bracco A., Chavanis P., Provenzale A, Spiegel E. A (1999) Particle aggregation in a turbulent keplerian flow. *Physics of Fluids*, **11**, 2280-2291.

B) Manuscripts Submitted or In Press

- 35) Barimalala R.*, Bracco A., Kucharski F. The representation of the South Tropical Atlantic teleconnection to the Indian Ocean in the AR4 coupled models. *Climate Dynamics*, In Press, April 2011
- 36) Cardona Y.*, Bracco A. Enhanced vertical mixing within mesoscale eddies due to high frequency winds in the South China Sea. *Ocean Modelling*, Submitted April 2011

Referred Articles in Books and Conference Proceedings

- 37) Bracco A., Kucharski F., Rosenheim B. (2009) Commentary: Challenges in the Tropical Atlantic: Understanding its interannual to decadal variability. In "The Atlantic Ocean: New Oceanographic Research", Nova Science Publishers, Hauppauge, NY. (80%)
- 38) Provenzale A., Babiano A., Bracco A., Pasquero C. and Weiss J.B. (2008) Coherent vortices and tracer transport, in "*Transport and Mixing in Geophysical Flows*", *Series: Lecture Notes in Physics*, Vol. 744, edited by J.B. Weiss and A. Provenzale, Springer, ISBN: 978-3-540-75214-1. (30%)
- 39) Pasquero C., Bracco A., Provenzale A., Weiss J. (2007) Particle motion in a sea of eddies, in *Lagrangian Analysis and Prediction of Coastal and Ocean Dynamics*, pg. 89-118, edited by A. Griffa, A. D. Kirwan, A. J. Mariano, T. Ozgokmen, and T. Rossby, Cambridge University Press, ISBN-13: 9780521870184. (40%)
- 40) Pasquero C., Bracco A., Provenzale A.(2004) Coherent vortices, Lagrangian particles and the marine ecosystem. In *Shallow Flows*, pag. 399-412, edited by G.H. Jirka and W.S.J. Uijttewaal, Balkema Publishers,Leiden, NL. (40%)
- 41) Hazeleger W., Molteni F., Severijns C., Haarsma R., Bracco A., Kucharski F. (2003) SPEEDO: A flexible coupled model for climate studies. *Clivar Exchanges* N. 28 - Coupled Modelling. (15%)
- 42) Bracco A., von Hardenberg J., Provenzale A., Weiss J. B. (2003) Modeling planetary turbulence at very high Reynolds number. In *Science and Supercomputing at CINECA*, 2003. (70%)
- 43) Bracco A., Provenzale A., Spiegel E. A, Jecko P. A. (1999) Spotted disks. In "*Theory of Black Hole Accretion Disks*", ed. M. Abramowicz, G. Bjornson, J. Pringle. Cambridge: Cambridge Univ. Press. (60%)

C) Non-referred Articles for the general public in Italian

- 44) Bracco A., Koszalka I.*, Pasquero C., Provenzale A. (2008) Produttività primaria dell'ecosistema marino, turbolenza oceanica e cicli biogeochimici globali. In “Modellistica del clima” , Clima e cambiamenti climatici: le attività di ricerca del CNR. CNR Editore. Also on-line at <http://www.dta.cnr.it/content/view/712/109/lang,en/> (70%)
- 45) Bracco A. Studiare e prevedere i cambiamenti climatici. (2004). Atti del II Convegno dell'Unione Meteorologica del Friuli-Venezia-Giulia. Also on line at <http://ulisse.sissa.it/biblioteca/saggio/2003/Ubib031201s001> (100%)

Committees and Service:

A) Conference Chair, Organizer and Director:

Co-Chair, Organizing Panel of US-CLIVAR and Ocean Carbon Biogeochemistry First Joint Meeting, Since Feb 2011

Session Co-Convener, EGU annual meeting, session on “The global monsoon system: variability and dynamics”, Vienna, April 2011

Session Co-Chair and Convener, AGU Annual Meeting 2011, session on “Turbulent Fluid Dynamics”, San Francisco, December 2010

Session Convener, EGU annual meeting, session on “The global monsoon system: variability and dynamics”, Vienna, May 2010

Co-Chair, PPAI (Predictability, Prediction & Applications Interface) Panel of the U.S. Climate Variability and Predictability Research Program (US-CLIVAR) since Jan 2010

Session Co-Chair, AGU Ocean Science Meeting 2010, session on Submesoscales: From Space to the Ocean Interior IV, 02/2010

Director, Workshop and Conference on “Biogeochemical impacts of climate and land-use changes on marine ecosystems” be held at the International Center for Theoretical Physics - UNESCO, Trieste, (Italy) 2-10 November, 2009

Session Chair, IAMAS - IAPSO - IACS - Assembly - 2009 (MOCA-09), session on “Monsoon Observations, Modelling and Prediction”, Montreal, 07/2009

Director, International Summer School on “Monsoon Systems”, Valsavaranche, Italy 8-14 June 2009 (information at <http://www.to.isac.cnr.it/aosta/>. Media coverage for the school: Italian National TV – Rai 3, and Italian newspaper La Stampa)

Session Chair and Convener, AGU Fall meeting of Global Change session on “Understanding tropical climate variability: Combining observations, models and paleoclimate records”, San Francisco, 12/2007

Co-Director and lecturer, “Conference on Milankovitch cycles over the past 5 million years”, Trieste, IT 03/2007

Organizer and lecturer, “First ICTP workshop on Climate variability over Africa” Alexandria, Egypt, 03/2005

Co-Director and lecturer, “Workshop on Climate Variability in the XX century”, Trieste, IT, 06/2004

Organizer, “ICTP workshops on Climate variability studies in the ocean”, Trieste IT, 05/2003

B) Invited Lecturer

Lecturer, GFD Summer School on "Swirling and Swimming in Turbulence", Woods Hole, MA, July 2010

Lecturer, Honor Program in Environmental Engineering, University of Savona, Italy, 06/07 and 06/05. Course taught: ‘Interazioni Biofisiche in Oceano’ (Ocean biophysical interactions)

Key-lecturer, NATO "Advanced Study School on Nonlinear Processes in Marine Science", Hageri, Estonia. 11/2003

Professional Activities

A. Membership

Member of the PPAI (Predictability, Prediction & Applications Interface) Panel of the U.S. Climate Variability and Predictability Research Program (US-CLIVAR) 02/2009 – 01/2012.

Co-Chair of the PPAI panel since Jan 2010

B. Journal Review

- *Atmosphere-Ocean, Atmospheric Chemistry and Physics, Chaos, Climate Dynamics, Climate Change, Continental Shelf Research, Deep-Sea Research I and II, Ecological Complexity, Geophysical Research Letters, J. Climate, J. Fluid Mechanics, J. Geophysical Research-Atmosphere, J. Geophysical Research-Oceans, J. Physical Oceanography, J. Marine Research, J. Marine Systems, Limnology and Oceanography: Fluids and the Environments, Physics of Fluid, Nonlinear Processes in Geophysics, Physica D*

C. Proposal Reviewer and Panelist:

National Science Foundation:

- Division of Ocean Sciences, Physical Oceanography Program, Reviewer and Panelist
- Division of Atmospheric Science, Climate and Large Scale Dynamics Program, Reviewer
- Collaboration in Mathematical Geosciences, Reviewer and Panelist
- NSF Graduate Fellowship, Geosciences Program, Panelist, 2009 and 2010

National Oceanic and Atmospheric Administration:

- Climate Prediction Program for the Americas, Reviewer

Honors, Awards, and Recognitions:

2011 AMS Nicholas Fofonoff Award

2006 Mary Sears Award, Woods Hole Oceanographic Institution

2001 NSF Student and Young Scientist Travel Award Grant.

2000 Postdoctoral Scholar Award at the Woods Hole Oceanographic Institution.

1997 Geophysical Fluid Dynamics Summer School Fellowship Award, Woods Hole Oceanographic Institution, MA - USA.

Graduate and Undergraduate Students Supervised:

Virgilio Maisonet, Graduate Student, 08/2010 – present, in progress, EAS – Georgia Tech

Ilias Foudalis, Graduate Student, 08/2010 – present, in progress, College of Computing (co-advised with Dr. C. Dovrolis) – Georgia Tech

Yuley Cardona, Graduate Student, 01/2008 – present, in progress, EAS – Georgia Tech

Yisen Zhong, Graduate Student, 08/2008 – present, in progress, EAS – Georgia Tech

Rondrotiana Barimalala, Graduate Student, 01/2008 – present, terminating, ICTP/Unesco and EAS-Georgia Tech (co-advised with Dr. F. Kucharski).

Inga Koszalka, graduate, 2004-2008 Program in Environmental Engineering, Politecnico di Torino and ICTP/Unesco. (Currently postdoctoral fellow at University of Oslo, Norway).

Asha Nair, Master Student, 2004 -2005 ICTP/Unesco (currently PhD student at S.I.S.S.A., Trieste, IT)

Yosr Boukhris, Graduate Student, 2004-2005 Co-advised with Dalila Elmhaidi, ICTP/Unesco and Un. of Science in Tunis, Tunisia

Sophie Clayton, undergraduate, 2006, Woods Hole Oceanographic Institution (currently PhD student at the WHOI/MIT Joint Program)

Postdoctoral Fellows Supervised:

Hao Luo, Postdoctoral Fellow, 05/2008 – 2010, Currently Research Scientist II EAS – Georgia Tech.

External funding while at Georgia Tech

1) Collaborative Research Type 1. LOI L02170206: Robust Climate Projections, Stochastic Models and GCM-EaSM Optimization. NSF Division of Mathematical Science, Computational Foundations for Emerging Science Frontiers (PI) Total award amount: \$ 205,583.

2) Collaborative Research: Nitrogen fixation, nutrient supply and biological production in the Gulf of Mexico. NSF – OCE Biological Oceanography. (Co-PI, with J. Montoya, Georgia

Tech and Tracy Villareal, Texas A&M). 09/01/2009 – 08/31/2012. Total award amount to Georgia Tech: \$ 636,893.

3) GLOBEC Pan-regional Synthesis: Pacific Ocean Boundary Ecosystems: response to natural and anthropogenic climate forcing (Co-PI, with E. Di Lorenzo and 24 other PIs), NSF – Globec, 09/01/2008 – 08/31/2011, \$ 455,940 (total awarded to Georgia Tech)

4) Vortex dynamics and interannual variability in the Labrador Sea. NSF-OCE, Physical Oceanography, (PI), 03/15/2008 – 03/14/2012, \$202,802.

5) Subcontract on Diagnosing and improving convective processes in large-scale ocean-atmosphere interaction (PI David Neelin, UCLA), funding NOAA-CVP, \$ 40,737

6) Subcontract on Collaborative Research: Robust climate projections and stochastic stability of dynamical systems (PIs at UCLA M. Ghil, J. McWilliams, D. Neelin), DOE, 06/01/2008 – 05/31/2010, \$ 15,116 for year 2008-2009 and \$ 69,856 for year 2009-2010.

7) SGER: ENSO and droughts over North America. The interdecadal variability of the SST forced signal. NSF – ATM CLIVAR, DRICOMP (Single PI), 09/01/2007 – 08/31/2008, \$ 28,449

8) Funding for summer school on Monsoon System, Course XVII of the International Alpine French-Italian Summer School. Amount awarded \$ 20,000 from NSF – ATM, through UCAR (University Corporation for Atmospheric Research), and Euros 25,000 through seven European Agencies (Centre National de la Recherche Scientifique, Institut français de recherche pour l'exploitation de la mer, Institut Pierre Simon Laplace, Universite Joseph Fourier, Universita' Italo Francese, ISAC-CNR, Parco Nazionale del Gran Paradiso)

9) Funding for workshop and conference at the International Center for Theoretical Physics on Biogeochemical impacts of climate and land-use changes on marine ecosystems. Amount awarded Euros 35,000 by UNESCO and \$5,000 by NASA