

PERSONAL DETAILS

Name Richard Tian
Email rtian@chesapeakebay.net

EDUCATION

1991 PhD from the University of Bordeaux

1988 MS from the University of Bordeaux

1986 BA from Shandong College of Oceanography.

EMPLOYMENT

2012- Research Scientist. UMCES Chesapeake Bay Program, Annapolis, Maryland

2011-2012 Scientist. Applied Science Associates, Rhode Island.

2005-2011 Research Scientist. University of Massachusetts Dartmouth.

2002-2005 Research Associate. Harvard University

1996-2002 Research Associate. University of Newfoundland and DFO.

1991-1996 Postdoctoral fellow. University of Pierre & Marie Curie.

PROFESSIONAL EXPERIENCE

I mostly devoted my career in marine ecosystem and water quality modeling. The scientific scope of my research ranges from biogeochemical cycles, through nutrient dynamics, ecosystem function at the primary and secondary production levels to fish larvae, with over 30 papers published in peer-reviewed journals. Sewage discharge and its impact on water quality parameters and ecosystem function constitute a major topic of my career. At Harvard University, I was the lead scientist in developing the Generalized Biological Model (GBM), which consists of 7 functional groups covering suspended detritus, nutrient dynamics, primary production and secondary trophic flows. This generic model with flexible structure was coupled with the Harvard Ocean Prediction System (HOPS) and applied to Monterey Bay for adaptive modeling application. At the University of Massachusetts Dartmouth, we improved the GBM with more function options, coupled the model with the Finite-Volume Coastal Ocean Model (FVCOM) using unstructured grid and finite-volume algorithms and extended the model package to fish larvae with a Lagrangian individual-based population dynamics model (IBM) implemented. The coupled package was applied to the Gulf of Maine and Georges Bank region over multiple decades. On water quality modeling, we coupled the HydroQual RCA model to FVCOM and applied the system to Boston Harbor, Massachusetts Bay and Abu-Dhabi embayment (UAE) for environmental monitoring, assessment and mitigation analysis.

Cross the board in Canada, I was essentially involved in biological model development and

application. I developed a biological and biogeochemical model of 11 components with data assimilation and parameter estimation procedures and applied the model in the Gulf of St. Lawrence and the Labrador Sea. Back to France, I developed an environmental perturbation model of lead based on industrial discharge, leaded gasoline consumption, governmental policy, atmospheric deposition, physical and biogeochemical cycles in the Mediterranean Sea. Before modeling though, I was essentially a sea-going person for sampling and analysis of nutrients, primary production and environmental indicators during my graduate studies.

FELLOWSHIPS/AWARDS/GRANTS

2008: NSF Biological Oceanography funded proposal: Interannual Variability of Coastal Phytoplankton Blooms in the Gulf of Maine and Their Relationships to Local and Remote Forcings.

2001: Canadian AquaNet funded project EI5: Environmental Requirements for Sustainable Shellfish Aquaculture.

1999: Newfoundland Human Capacity Building Scholarship.

1996: Canada DFO Postdoctoral Fellowship.

1992: French NSF (CRS) Postdoctoral Fellowship.

1990: Award of Best Young Scientist Papers, Chinese National Conference on Estuarine Studies.

1986: Chinese Government Oversea Graduate Fellowship.

SPECIAL SKILLS

Programming in FORTRAN, MATLAB, BASIC, SAS, R and NetCDF with Unix and Linux operating systems; biogeochemical analyses; statistical analyses and numerical modeling; extensive experience at sea; trilingual (English, French and Chinese). Reviewer for Marine Ecology Progress Series, Continental Shelf Research, Deep-Sea Research, Journal of Plankton Research, Graphical Modeling, Geophysical Research Letter, Ecological Modeling, Journal of Sea Research and Ecological Application.

PEER-REVIEWED PUBLICATIONS

Tian, R.C., C.S. Chen, J.H. Qi, R.B. Ji, R.C. Beardsley, and C. Davis(2012) Seasonal and Interannual Variability of Nutrients and Phytoplankton Dynamics in the Gulf of Maine: A Decadal Simulation Using an Unstructured-grid NPZD Model. Marine Ecology Progress Series, *in press*.

Hu, S., Chen C.S., Ji R.B., Townsend, D.W., **Tian, R.C.**, Beardsley, R.C. and Davis, C.S. A process-oriented modeling study of impacts of surface forcing on interannual variability of fall phytoplankton bloom in the Gulf of Maine. Marine Ecology Progress Series, 427, 29-49, doi: 10.3354/meps09043

Lai, Z.G., Changsheng Chen, C.S., Robert C. Beardsley, R.C., Brian Rothschild, B. and **Tian, R.C.** 010. Impact of high-frequency nonlinear internal waves on plankton dynamics in Massachusetts Bay,

Tian, R.C., C.S. Chen, K.D.E. Stokesbury, B.J. Rothschild, Q. Xu, S. Hu, G.W. Cowles, B.P. Harris and M.C. Marino II (2009) Modeling the connectivity between sea scallop populations in the Middle Atlantic Bight and over Georges Bank. *Marine Ecology Progress Series* 390: 147-160.

Tian, R.C., C.S. Chen, K.D.E. Stokesbury, B.J. Rothschild, Q. Xu, S. Hu, G.W. Cowles, B.P. Harris and M.C. Marino II (2009) Sensitivity analysis of sea scallop (*Placopecten magellanicus*) larvae trajectories to hydrodynamic model configuration on Georges Bank and adjacent coastal regions. *Fisheries Oceanography* 18: 173-184.

Tian, R.C., C.S. Chen, K.D.E. Stokesbury, B.J. Rothschild, Q. Xu, S. Hu, G.W. Cowles, B.P. Harris and M.C. Marino II (2009) Dispersal and settlement of sea scallop larvae spawned in the fishery closed areas on Georges Bank. *ICES Journal of Marine Science*, 66:2155-2164.
doi:10.1093/icesjms/fsp175.

Tian, R.C. and C.S. Chen, 2006. Influence of model geometrical fitting and turbulence parameterization on phytoplankton simulation on Georges Bank, Gulf of Maine. *Deep-Sea Research II* 53: 2808-2832.

Tian, R.C., 2006. Toward standard parameterizations in marine biological modeling. *Ecological Modelling*, 193, 363-386.

Patrikalakis, N.M., J.J. McCarthy, A.R. Robinson, H. Schmidt, C. Evangelinos, P.J. Haley, S. Lalís, P.F.J. Lermusiaux, **R.C. Tian**, W.G. Leslie and W. Cho, 2006. Towards a dynamic data driven system for rapid adaptive interdisciplinary ocean forecasting. In: F. Darema (ed.) *Dynamic-Data Driven Application Systems*. Kluwer Academic Publisher, Amsterdam, pp.34-55.

Lermusiaux, P.F.J., C. Evangelinos, **R.C. Tian** and P.J. Haley, 2005. Adaptive coupled physical and biogeochemical ocean predictions: A conceptual basis. In: Darema, F., M. Buback, G.D. van Albada, P.M.A. Sillot and J.J. Krakow (eds.) *Lecture Notes in Computer Science* 3038: 685-692, Springer, Berlin.

Tian, R.C., D. Deibel and R. Rivkin, A. Vezina, 2004 Biogenic carbon and nitrogen export in a deep-convection region: simulations in the Labrador Sea. *Deep-Sea Research Part I* 51: 413-437.

Tian, R.C., D. Deibel, R. Thompson and R. Rivkin, 2003. Modeling of climate forcing on a cold-ocean ecosystem, Conception Bay, Newfoundland. *Marine Ecology Progress Series* 262: 1-17.

Tian, R.C., A. Vezina, D. Deibel and R. Rivkin, 2003. Sensitivity of biogenic carbon export to ocean climate in the Labrador Sea, a deep-water formation region. *Global Biogeochemical Cycles* (4): 1-11.

Tian, R.C., A. Vezina, M. Starr and F. Saucier, 2001. Seasonal dynamics of coastal ecosystems and export production at high latitudes: a modeling study. *Limnology and Oceanography* 46: 1845-1859.

Packard, T., W. Chen, D. Blasco, A. Vezina, **R.C. Tian**, L. St-Amand, J.C. Therriault, L. Legendre and R.C. Ingram, 2000. Dissolved organic carbon in the Gulf of St. Lawrence. *Deep-Sea Research* 47: 435-460.

Tian, R. C., A. Vezina, L. Legendre, T. Packard, S. Roy, C. Savenkoff, N. Silverberg and J.E. Trembley, 2000. Effects of pelagic food-web interactions and nutrient remineralization on the biogeochemical cycling of carbon: a modeling approach. *Deep-Sea Research* 47: 637-662.

Rivkin, R., **R.C. Tian**, M.R. Anderson, J. Payne and D. Deibel, 2000. Ecosystem level effects of offshore platform discharges-identification, assessment and modeling. *Can. Tech. Rep. Fish. Aquat. Sci.* 2331: 3-12.

Tian R.C., J.C. Marty, E. Nicolas, J. Chiaverini, D. Ruiz-Pino and M.D. Pizay, 1997. Iodine speciation: a potential indicator to evaluate new production versus regenerated production, *Deep-Sea Research* 43: 723-738.

Tian, R.C. and A. Vezina, 1997. Fonctionnement de l'écosystème du Golfe du Saint-Laurent, une approche de modélisation (Function of the ecosystem of the Gulf of St. Lawrence). *Nouvelles des Sciences, Pêches et Océans* 7: 5-8 (in French).

Migon, C., C. Mori, A. Orsini and **R.C. Tian**, 1996. Arsenic and Antimony contamination in riverine environments. *Toxicological and Environmental Chemistry* 52: 221-230.

Tian R.C. and E. Nicolas, 1995. Iodine speciation in the Northwestern Mediterranean Sea: method and vertical profiles. *Marine Chemistry* 48: 151-156.

Tian R.C. and D. Ruiz-Pino, 1995. Simulation and prediction of anthropogenic lead perturbation in the Mediterranean Sea. *The Science of the Total Environment* 164: 135-150.

Tian, R.C., M.A. Sicre and A. Saliot, 1995. Biogeochemistry of organic compounds in the Changjiang Estuary. *J. of East China Normal University* 21: 121-133.

Sicre M.A., **R.C. Tian** and A. Saliot, 1994. Distribution of sterols in suspended particles in the Changjiang Estuary. *Marine Chemistry* 44: 11-24.

Tian R.C., F.X. Hu and J.M. Martin, 1993. Summer nutrient fronts in the Changjiang Estuary. *Estuarine, Coastal and Shelf Science* 37: 24-41.

Tian R.C., F.X. Hu and A. Saliot, 1993. Biogeochemical processes controlling nutrient behaviors in the Changjiang Estuary. *Biogeochemistry* 19: 83-102.

Sicre M.A., **R.C. Tian** and A. Saliot, 1993. Aquatic distribution of 4-desmethyl sterols in the Changjiang Estuary and adjacent East China Sea. *Organic Geochemistry* 21: 1-10.

Tian, R.C. and J.Z. Zhou, 1993. Nutrient dynamics in the Changjiang Estuary. *J. of East China Normal University* 19: 128-138.

Tian R.C., M.A. Sicre and A. Saliot, 1992. Biogeochemistry of sedimentary sterols in the Changjiang Estuary. *Organic Geochemistry* 18: 843-850.

Tian R.C., J.Y. Chen, C.Z. Liu and X.J. Wang, 1992. Geochemical characteristics of box corer sediments in the Changjiang Estuary region. *Chinese J. Oceanography and Limnology* 10: 1-8.

Tian R.C., J.Y. Chen and J.Z. Zhou, 1991. Dual geochemical and biogeochemical filtration effect of the Changjiang Estuary. *Chinese J. Oceanography and. Limnology* 9: 23-41.

Tian R.C., 1990. Remineralization of organic carbon at the sediment-water interface. *Limnology and Oceanography Sinica* 19: 127-132 .

REPORTS AND OTHER PUBLICATIONS

Tian, R.C., K. Knee and C. Swanson (2012) Environmental Mitigation Analysis Using Particle Trajectory Modeling For Abu Dhabi Corniches. ASA report, 2012-162.

Tian, R.C. and Y. Kim (2012) Inter-model comparison of SABGOM, NGOM, HYCOM and ADCIRC in northern Gulf of Mexico. Deepwater Horizon Oil Spill (*DWHOS*) Natural Resource Damage Assessment (NRDA) Conference, Mar. 27-29, 2012, South Kingstown, R.I. (Presentation)

Zhao, L.Z. ,**Tian R.C.**, Xue P., Chen C. , Leo W.S., Mickelson M.J. 2011. Modeling 2010 in Massachusetts Bay using the unstructured-grid Bays Eutrophication Model. Boston: Massachusetts Water Resources Authority. Report 2011-09. 118p.

Tian, R.C., Chen, C., Zhao, L.Z., Xue, P., Leo, W.S., Mickelson M.J. 2010. Modeling 2009 in Massachusetts Bay using the unstructured-grid Bays Eutrophication Model. Boston: Massachusetts Water Resources Authority. Report 2010-22. 100p.

Chen C, **Tian R.C.**, Beardsley R.C., Qi J. and Xu Q. 2010. Modeling 2008 in Massachusetts Bay using an upgraded unstructured-grid Bays Eutrophication Model. Boston: Massachusetts Water Resources Authority. Report 2010-15. 128p.

Tian, R.C. 2010. Connectivity and remote forcing in ecosystem function and population dynamics in the Northwest Atlantic. ICES Northwest Atlantic Regional Sea Meeting, 20-22 April 2010, Woods Hole. ICES CM 2010/SSGRSP:03, 48-49.

Tian, R.C., C.S. Chen, Kevin D.E. Stokesbury, Brian J. Rothschild 2010. Interannual variability of sea scallop larval dispersion and settlement over Georges Bank: A model simulation experiment. 2010 AGU Ocean Sciences Meeting, Poster IT45F-01, 22-26 February 2010, Portland, Oregon.

Tian R.C., Chen C, Xu Q, Xue P, Cowles GW, Beardsley RC, Rothschild BJ. 2009. The Massachusetts Bay water quality model: 2006-2007 simulation. Boston: Massachusetts Water Resources Authority. Report 2009-11. 124 p.

Chen C, Beardsley RC, Xu Q, Mickelson MJ, **Tian R**, Xue P, Cowles GW, Rothschild BJ. 2009. The Massachusetts Bay hydrodynamic model: 2006-2007 simulation. Boston: Massachusetts Water Resources Authority. Report 2009-10. 77 p.

Lai, Z.G., Chen, C.S., **Tian, R.C.**, Beardsley, R.C., and Cowles, G. 2009. Impacts of high-frequency internal waves on plankton dynamics in Massachusetts Bay, Gulf of Maine. Gordon Research Conference, June 7-12, 2009, New London, New Hampshire.

Tian, R.C., C.S. Chen, K. Stokesbury, B. Rothschild, G. Cowles, Q.C. Xu, S. Hu, B. Harris and M. Marino II 2008. Sea scallop larvae connectivity between the Middle Atlantic Bight and Georges Bank. Mid-Atlantic Bight Physical Oceanography and Meteorology Meeting, September 22-23, 2008, Woods Hole, Massachusetts.

Tian, R.C., C.S. Chen, K. Stokesbury, B. Rothschild, G. Cowles, Q.C. Xu, S. Hu, B. Harris and M. Marino II 2008. Interannual variability in sea scallop larval dispersal and settlement on Georges Bank: a modeling experiment. 100th Annual National Shell fisheries Association Conference. Providence, Apr. 6-10 2008.

Tian, R.C. 2008. A modeling exploration of connection between sea scallop population in the Middle Atlantic Bight and over Georges Bank. AGU-ASLO 2008 Ocean Science Meeting. Orlando, Mar. 3-6, 2008.

Tian, R.C., C.S. Chen, K. Stokesbury, B. Rothschild, G. Cowles and Q.C. Xu 2007. Analysis on the efficiency of fishery closed area as scallop larval replenishment sources on Georges Bank using Lagrangian trajectory simulation. 2007 World Conference on Natural Resource Modeling. June 19-22, 2007. Cape Cod MA, USA.

Tian, R.C., C.S. Chen, K. Stokesbury and B. Rothschild 2007. A Lagrangian individual-based population dynamic model of sea scallop coupled with a Eulerian concentration-based ecosystem model. 2007 World Conference on Natural Resource Modeling. June 19-22, 2007. Cape Cod MA, USA.

Tian, R.C., C.S. Chen, Rothschild, K. Stokesbury, 2006. Influence of physical models and turbulence parameterizations on phytoplankton simulation on Georges Bank, Gulf of Maine. AGU Ocean Science Meeting, Feb. 20-24, 2006, Honolulu.

Leslie, W.G., A.R. Robinson, P.J. Haley Jr., P.F. Lermusiaux, X. Liang, **R.C. Tian**, O. Logutov and P. Moreno. Forecasting of multi-scale ocean dynamics with the Harvard Ocean Prediction System (HOPS) during AOSN-II. AGU Ocean Science Meeting, Feb. 20-24, 2006, Honolulu.

P.J. Haley Jr., P.J., A.R. Robinson, P.F. Lermusiaux, W.G. Leslie, X. Liang, **R.C. Tian**, O. Logutov, P. Moreno, C. Evangelinos and N. Patrikalakis. Advances in adaptive, interdisciplinary, multi-scale, distributed, web-based, ocean prediction. AGU Ocean Science Meeting, Feb. 20-24, 2006, Honolulu.

Tian, R.C. and C.S. Chen, 2005. User-adjustable biological modules of FVCOM. SMAST Oceanographic Report.

Tian, R.C., P. Lermusiaux, A.R. Robinson and J.J. McCarthy, 2005. Adaptive physical and biological modeling in Monterey Bay, California. AOSN-II Monterey Bay Workshop, Oct. 20-21, Napa Valley.

Tian, R.C., P. Lermusiaux, A.R. Robinson and J.J. McCarthy, 2004. A generalized biogeochemical-ecosystem dynamic model of pelagic ecosystems: Structure, parameterization and adaptive modeling. Harvard Oceanographic Reports, No 66, 78p.

Tian, R.C., D. Deibel, M. R. Anderson, R.B. Rivkin, R. Thompson, J. E. Stacey and D. Churchill, 2001. Numerical modeling in mussel aquaculture. Aquanet Annual Meeting I, Sep. 29-Oct. 2, Halifax.

Tian, R.C., D. Deibel and R. Thompson, 2001. Modeling of climate forcing on cold-ocean ecosystems: application in Conception Bay, Newfoundland. ASLO 2001 Aquatic Sciences Meeting, Albuquerque, p. 141.

Vezina, A., **R.C. Tian**, M. Starr and F. Saucier, 2000. Seasonal trophic dynamics and export production: a modeling and data assimilation study. ASLO Ocean Sciences Meeting, pp. 302, February 24-28, San Antonio.

Tian, R.C. and A. Vezina, 2000. Sensitivity of carbon export to ocean climate in the Labrador Sea: a modeling approach. *EOS* 80 (No 49): p. 303.

Vezina, A., C. Savenkoff and **R.C. Tian**, 1999. A modeling investigation of vertical export processes in margin seas. ASLO Aquatic Sciences Meeting, pp. 332, February 10-14, Santa Fe, New Mexico (Abstract).

Tian, R.C., A. Vezina and L. Legendre, 1996. Modeling of carbon biogeochemical cycles in cold seas: an application to the Gulf of Saint Lawrence. In: *Modeling Hydrodynamically Dominated Marine Ecosystems*. 28th International Liège Colloquium of Ocean Hydrodynamics, pp. 40 (abstract).

Tian, R.C., A. Vezina and L. Legendre, 1995. Modélisation des cycles biogéochimiques du carbone dans les mers froides (Modeling of biogeochemical cycles of carbon in cold seas). *Modélisation JGOFS-France*, 22: 34-40 (in French).

Tian, R.C., 1994. Biogeochemical cycles of iodine in the Mediterranean Sea. *Postdoctoral Report*, Observatoire Océanologique de Villefranche, 23pp.

Tian, R.C., 1993. Biogeochemical behaviors of lipids in the Changjiang Estuary. *Postdoctoral Report*, Laboratoire de Physique et Chimie Marines, Univ. Paris VI, 61pp.