Rui Xin Huang

Scientist Emeritus
Woods Hole Oceanographic Institution

W. Van Alan Clark, Jr., Chair for Excellence in Oceanography, Woods Hole Oceanographic Institution, 2002-2006;

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**Education**

The University of Science and Technology of China, 1960-65; B.S. in Thermo-physical Fluid Dynamics of Jet Propulsion, 1965.

Graduate School, University of Science and Technology of China, Meteorology, 1978-80.

The Johns Hopkins University, Geophysical Fluid Dynamics, Sep. 1980-Feb. 1981.

Massachusetts Institute of Technology/Woods Hole Oceanographic Institution, Feb. 1981- May 1984; Ph.D. in Physical Oceanography 1984.

**Experience**

Research Associate, Institution of Mechanics, Beijing, China,

1965--1978. Self-study of English and mathematics during the Cultural Revolution in China; aerodynamics of wings; transonic flow in Turbo-machine; design of transonic turbo-machine; design and build the first transonic cascade tunnel in China; translation of a large five-language dictionary in physics.

Postdoctoral, M.I.T., June-Aug. 1984.

Visiting Scientist, Geophysical Fluid Dynamics Laboratory (NOAA), Princeton University, 1984--1986, March--June 1992.

Assistant Scientist, 1986--1990; Associate Scientist, 1990-1998; tenure awarded, 1993, Senior Scientist, 1998-2008, Woods Hole Oceanographic Institution; W. Van Alan Clark, Jr., Chair for Excellence in Oceanography, 2002-2006;

Visiting Associate Professor, University of Hawaii, Jan.-June, 1994.

Visiting Scientist, Cooperative Institute for Marine and Atmospheric Studies, University of Miami, Feb., 1999.

Visiting Professor, Lamont-Doherty Earth Observatory, Columbia University, March-May., 1999.

Corresponding Member, U.S. WOCE Working Group on Numerical Modeling, 1989-1992.

Joint Committee of Physical Oceanography, MIT/WHOI Joint Program, 1990-93.

Member, Working Group on Oceanic Thermohaline Circulation and Variability, Climate System Modeling Project, USA, 1993-96.

Member, Climate Change Committee, WHOI, 1995-1999.

Member, Advisory Committee, Ocean and Climate Change Institute, WHOI, 2001-2005.

**Teaching**

Steady Circulation in the Oceans and Atmosphere, MIT/WHOI Joint Program, 1988-1991.

Recent Advances in Large-Scale Ocean Circulation Theory, Second Institute of Oceanography, Hangzhou, China, October 7-17, 1992.

Theories of the Oceanic General Circulation, University of Hawaii, Spring, 1994.

Advances in Theories of Wind-Driven and Thermohaline Circulation, International Summer School on Ocean-Atmosphere Interaction, July 25-August 4, 1994, Qingdao, China.

Theories of the Oceanic General Circulation, MIT/WHOI Joint Program, Spring 1995, Fall 1998, Fall 2001, Spring 2004, Spring 2006.

**Supervision**

Served as a mentor for Dr. Krupitsky (Institution Postdoctoral Fellow), Dr. Mahdi Ben Jelloul (Institutional Postdoctoral Fellow).

Mr. James McLaren, 1987-89; Mr. Li Ping Wang, 1989-93 (Ph.D.);

On thesis committee of other six students, chairman of thesis defense committee for Mr. Hui Ming Zhang and Ms. Sarah Gille.

Michael Masterson, Summer Student Fellow, 1987; Marcel Lieberman, Summer Student Fellow, 1989; Sarah Russell, Summer Student Fellow, 1993. Tiffany Psemeneki: Summer Student Fellow, 1993.

**Sea Cruises**

RV OCEANUS, Sensor test cruise, July, 1989.

Oceanus, Immerges Sea Cruise, August, 2003.

**Honor**

Nominee of President Young Investigator Award, 1989.

**Research Interest**:

Theoretical and numerical studies of the wind-driven and thermohaline circulation in the oceans, dynamics of western boundary currents, flow over topography, climate and paleoclimate dynamics.

Author or co-author of 136 refereed scientific publications.

**Refereed Publications**

Huang, R. X. and J. P. Chao, 1980. A linear theory of spiral cloud bands of typhoon. *Scientia Atmospherica Sinica*, **4**, No. 2. (in Chinese with English Abstract).

Chao, J. P. and R. X. Huang, 1980. The cnoidal waves of a rotating barotropic atmosphere. *Scientia Sinica*, **XXIII** , No. 10, 1266--1277.

Huang, R. X., 1986. Solutions of the ideal fluid thermocline with continuous stratification. *J. Phys. Oceanogr.*, **16**, 39--59.

Bogue, N. M., R. X. Huang, and K. Bryan, 1986. Verification experiments with an isopycnal coordinate ocean model. *J. Phys. Oceanogr.*, **16**, 985--990.

Huang, R. X., 1986. Numerical simulation of wind-driven circulation in a subtropical-subpolar basin. *J. Phys. Oceanogr.*, **16**, 1636--1650.

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Huang, R. X., 1987. A three-layer model for wind-driven circulation in a subtropical-subpolar basin. Part I: Model formulation and the Sub-critical state. *J. Phys. Oceanogr.*, **17**, 664--678.

Huang, R. X., 1987. A three-layer model for wind-driven circulation in a subtropical-subpolar basin. Part II: The supercritical and hypercritical states. *J. Phys. Oceanogr.*, **17**, 679--697.

Huang, R. X. and G. R. Flierl, 1987. Two-layer models for the thermocline and current structure in subtropical/subpolar gyres. *J. Phys. Oceanogr.*, **17**, 872--884.

Huang, R. X. and K. Bryan, 1987. A multi-layer model of the thermohaline and wind-driven ocean circulation. *J. Phys. Oceanogr.*, **17**, 1909--1924.

Huang, R. X., 1988. On boundary value problems of the ideal-fluid thermocline. *J. Phys. Oceanogr.*, **18**, 619--641.

Huang, R. X., 1988. Ideal-fluid thermocline with weakly convective adjustment in a subpolar basin. *J. Phys. Oceanogr*., **18**, 642--651.

Huang, R. X., 1988. A three-layer model for wind-driven circulation in a subtropical-subpolar basin. Part III. Potential vorticity analysis. *J. Phys. Oceanogr*., **18**, 739--752.

Huang, R. X., 1989. The generalized eastern boundary conditions and the three-dimensional structure of the ideal fluid thermocline. *J. Geophs. Res*., **94**(C4), 4855--4865.

Huang, R. X., 1989. Simulating the main thermocline in the North Atlantic with an ideal-fluid model. *J. Phys. Oceanogr*., **19**, 543--547.

Huang, R. X., 1989. Sensitivity of a multi-layered oceanic general circulation model to the sea surface thermal boundary condition. *J. Geophs. Res*., **94**(C12), 18,011--18,021.

Huang, R. X., 1990. Does atmospheric cooling drive the Gulf Stream recirculation? *J. Phys. Oceanogr*., **20**, 750--757.

Huang, R. X., 1990. On the three-dimensional structure of the wind-driven circulation in the North Atlantic. *Dynamics of Atmospheres and Oceans*, **15**, 117--159.

Huang, R. X., 1990. On the structure of inertial western boundary currents with two moving layers. *Tellus*, **42A**, 594--604.

Huang, R. X. and H. M. Stommel, 1990. Cross-sections of two-layer inertial Gulf Stream. *J. Phys. Oceanogr*., **20**, 907--911.

Huang, R. X., 1990. Matching a ventilated thermocline model with inertial western boundary currents. *J. Phys. Oceanogr*., **20**, 1599--1607.

Huang, R. X., 1991. A note on combining wind and buoyancy forcing in a simple one-layer ocean model. *Dynamics of Atmospheres and Oceans*, **15**, 535--540.

Huang, R. X., 1991. The three-dimensional structure of wind-driven gyres: ventilation and subduction. U.S. National Report to International Union of Geodesy and Geophysics 1987--1990, Supplement to Reviews of Geophysics, 590--609.

Huang, R. X., J. Luyten, and H. M. Stommel, 1992. Multiple equilibrium states in combined thermal and saline circulation. *J. Phys. Oceanogr*., **22**, 231--246.

Huang, R. X. and H. M. Stommel, 1992. Convective flow patterns in a eight-box cube driven by combined wind stress, thermal, and saline forcing. *J. Geophs. Res*., **97**(C2), 2347--2364.

Lin, R. Q., R. X. Huang, and J. R. Apel, 1992. A study of the astronomical theory of ice ages in a two-dimensional nonlinear climate model. *J. Geophs. Res*., **97**(D9), 10,029--10,036.

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Huang, R. X., 1993. A two-layer model for the wind and buoyancy forced circulation. *J. Phys. Oceanogr*., **23**, 104--115.

Huang, R. X. and R. W. Schmitt, 1993. The Goldsbrough—Stommel circulation of the world oceans. *J. Phys. Oceanogr*., **23**, 1277--1284.

Huang, R. X., 1993. Real freshwater flux as a natural boundary condition for the salinity balance and thermohaline circulation forced by evaporation and precipitation. *J. Phys. Oceanogr*., **23**, 2428--2446.

Huang, R. X. and H. Stommel, 1993. The globe on a heart-shaped map. In "New equal area world map projections to better display polar regions," by Athelstan Spilhaus, *Proceedings of the American Philosophical Society*, **137**, (2), 181-184.

Huang, R. X. and R. L. Chou, 1994. Parameter sensitivity study of the saline circulation. *Climate Dynamics*, **9**, 391-409.

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Huang, R. X., 1994. Thermohaline circulation: Energetics and variability in a single-hemisphere basin model. *J. Geophs. Res*., **99**, (C6), 12,471-12,485.

Huang, R. X. and B. Qiu, 1994. Three-dimensional structure of the wind-driven circulation in the subtropical North Pacific. *J. Phys. Oceanogr*., **24**, 1608-1622.

Wang, L. P. and R. X. Huang, 1994. A simple model of abyssal circulation in a circumpolar ocean. *J. Phys. Oceanogr*., **24**, 1040-1058.

Huang, R. X. and S. Russell, 1994. Ventilation of the subtropical North Pacific. *J. Phys. Oceanogr*., **24**, 2589-2605.

Wang, L. P. and R. X. Huang, 1995. A linear homogeneous model of wind-driven circulation in a $\beta$ -plane channel. *J. Phys. Oceanogr*., **25**, 587-603.

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Dewar, W. K. and R. X. Huang, 1995. Fluid flow in loops driven by freshwater and heat fluxes. *J. Fluid Mech*., **297**, 153-191.

Pickart, R. and R. X. Huang, 1995. Structure of an inertial deep western boundary current. *J. Mar. Res*., **53**, 739-770.

Qiu, B. and R. X. Huang, 1995. Ventilation of the North Atlantic and North Pacific: Subduction vs. Obduction. *J. Phys. Oceanogr*., **25**, 2374-2390.

Huang, R. X. and J. R. Luyten, 1996. Reply. *J. Phys. Oceanogr*., **26**, 286.

Dewar, W. K. and R. X. Huang, 1996. On the forced flow of salty water in a loop. *Physics of Fluids*, **8,** 954-970.

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Yang, J. and R. X. Huang, 1996. Decadal oscillations driven by the annual cycle in a zonally-averaged coupled ocean-ice model. *Geophy. Res. Lett.*, **23**, 269-272.

Huang, R. X. and W. K. Dewar, 1996. Haline circulation in a loop model: bifurcation and chaos. *J. Phys. Oceanogr*., **26**, 2093-2106.

Huang, R. X. and J. Yang, 1996. Deep-water upwelling in the frictional western boundary layer. *J. Phys. Oceanogr*., **26**, 2243-2250.

Huang, R. X., 1998. Available potential energy in a Boussinesq ocean, *J. Phys. Oceanogr*., **28**, 669-678.

Huang, R. X., 1998. On the energy balance of the oceanic general circulation. *Chin. J. Atmos. Sci*., **22**, 452-467.

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Huang, R. X. and Bo Qiu, 1998. The structure of the wind-driven circulation in the Subtropical South Pacific Ocean, *J. Phys. Oceanogr*., **28**, 1173-1186.

Wang, L. and R. X. Huang, 1998. A homogeneous model of the Decon cell in a circumpolar ocean. *Dyn. Atmos. Oceans*, **28**, 157-177.

Zhang, J., R. Schmitt, and R. X. Huang, 1998. Sensitivity of the GFDL Modular Ocean Model to parameterization of double-diffusive processes, *J. Phys. Oceanogr*., **28**, 589-605.

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Huang, R. X., 1999. Mixing and energetics of the thermohaline circulation. *J. Phys. Oceanogr*., **28**, 727-746.

Zhang, J., R. Schmitt, and R. X. Huang, 1999. The relative influence of diapycnal mixing and hydrologic forcing on the stability of thermohaline circulation, *J. Phys. Oceanogr*., **29**, 1096-1108.

Jin, X.-Z., R. X. Huang, and J.-Y. Yang, 1999. Centennial oscillations in an ocean-ice coupled model. *Adv. Atmos. Sci*., **16**(3), 323-342.

Huang, R. X. and J. Pedlosky, 1999. Climate variability inferred from a layered model of the ventilated thermocline, *J. Phys. Oceanogr*., 29, 779-790.

Huang, R. X., 2000. Climate variability inferred from a continuously stratified model of the ideal-fluid thermocline, *J. Phys. Oceanogr*., 30, 389-1406.

Huang, R. X., 2000. Parameter study of a continuously stratified model of the ideal-fluid thermocline, J. *Phys. Oceanogr*., 30, 1372-1388.

Huang, R. X. and J. Pedlosky, 2000. Climate variability of the equatorial thermocline inferred from a two-moving-layer model of the ventilated thermocline, *J. Phys. Oceanogr*., **30**, 2611-2626.

Huang, R. X., and J. Pedlosky, 2000b: Climate variability induced by anomalous forcing in a multi-layer model of the ventilated thermocline. *J. Phys. Oceanogr*., **30**, 3009-3021.

Huang, R. X., M. A. Cane, N. Maik, and P. Goodman, 2000. Global adjustment of the thermocline in response to deepwater formation. *Geophys. Res. Lett*., **27**, 759-762.

Huang, R. X., X.-Z. Jin, and X.-H. Zhang, 2001. An ocean general circulation model in pressure coordinates. Advances in Atmospheric Science, **18**, 1-22.

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Dewar, W. K, and R. X. Huang, 2001. Adjustment of the ventilated thermocline. *J. Phys. Oceanogr.*, **31**, 1676-1697.

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Huang, R. X. and X.-Z. Jin, 2002. Deep circulation in the South Atlantic induced by bottom-intensified mixing over the mid-ocean ridge. *J. Phys. Oceanogr*., **32**, 1150-1164.

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Huang, R. X., and X.-Z. Jin, 2002. Sea surface elevation and bottom pressure anomalies due to thermohaline forcing: Part I: isolated perturbations. *J. Phys. Oceanogr.*, **32**, 2131-2150.

Zhang, X.-H., W. Li, X.-Z. Jin, and R. X. Huang, 2002. The development of an oceanic general circulation model based on the pressure coordinates and its application. *Advances in Natural Science*, **12**, 1015-1020. (in Chinese).

Huang, R. X. and F. F. Jin, 2003. The asymmetric nature of the equatorial undercurrent in the Pacific and Atlantic. *J. Phys. Oceanogr*., **33**, 1083-1094.

Wang, W. and R. X. Huang, 2004. Wind energy input to the Ekman Layer. *J. Phys. Oceanogr*., **34**, 1267-1275.

Wang, W. and R. X. Huang, 2004. Wind energy input to the surface waves. *J. Phys. Oceanogr*., **34**, 1276-1280.

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Huang, R. X., 2004. Ocean, energy flow in. C. J. Cleveland (Ed.) *Encyclopedia of Energy*, Elsevier, Vol. 4, pp 497-509.

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Wang, Q. and R. X. Huang, 2005: Decadal Variability of Pycnocline Flows from the Subtropical to the Equatorial Pacific, *J. Phys. Oceanogr*., **35**, 1861-1875.

Wang W. and R. X. Huang, 2005. An experimental study on thermal circulation driven by horizontal differential heating, *J. Fluid Mech.*, **540**, 49-73.

Huang, R. X., 2005. Contribution of oceanic circulation to the poleward heat flux, *J. Ocean Uni. China*, **4**, 277-287.

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Wang W., C. C. Qian$^{+}$, and R. X. Huang, 2006. Mechanical energy input to the world oceans due to atmospheric loading, *Science bulletin Sinica*, **51**, 327-330.

Huang R. X. and X.-Z. Jin, 2006. Gravitational potential energy balance for the thermal circulation in a model ocean, *J. Phys.Ocanogr*, **36**, 1420-1429.

Huang R. X., Wei Wang, and Ling Ling Liu, 2006. Decadal variability of wind energy input to the world ocean, *Deep Sea Res II, **53**, 31-41*.

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刘钦燕， 黄瑞新， 王东晓， 谢强， 黄企洲 - 印度尼西亚贯穿流与南海贯流的相互调制, 科学通报, 2006, **26**, No. 6, 1-6.

Wang, D. X, Q. Y. Liu, R. X. Huang, Y. Du and T.-D. Qu**,** 2006. Interannual variability of the South China Sea throughflow inferred from wind data and an ocean data assimilation product. *Geophys Res Lett*, **33**, L14605, doi:10.1029/2006GL026316.

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Feng C. Y., Wei Wang, and R. X. Huang, 2006. Meso-Scale Available Gravitational Potential Energy in the World Oceans, *Oceanology bulletin Sinica*, 25, No.5, 1-13.

Liu, Q. Y., R. X., Huang, D. X., Wang, Q. Xie, and Q. Z. Huang, 2006. Interplay between the Indonesian Throughflow and the Luzon Strait Throughflow. *Science bulletin Sinica*, **51**, 50-58.

Huang, R. X., and X. Z. Jin, 2007. On the natural boundary conditions applied to the sea-ice coupled model, *J. Geophys. Res*., **112**, doi:10.1029/2006JC003735.

Huang, R. X., C. J. Huang, and W. Wang, 2007. Dynamical roles of mixed layer in regulating the meridional mass/heat fluxes, *J. Geophy. Res.*,, 112, C05036, doi:10.1029/2006JC004046.

Huang, C. J., R. X. Huang, and W. Wang, 2007. Climate variability in the Equatorial Pacific Ocean induced by decadal variability of mixing coefficient, *J. Phys. Oceanogr*., **37**, 1163-1176.

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Yang, X.-Y and R. X. Huang, and D. X. Wang, 2007. Decadal trend of wind stress over the Southern Ocean associated with Antarctic ozone depletion, *J. Climate*, **20**, *3395-3410*.

Yang, X. Y., D. X. Wang, J. Wang, and R. X. Huang, 2007. Connection between the decadal variability in the Southern Ocean circulation and Southern Annular mode. *Geophys. Res. Lett.* 34, L16604, doi:10.1029/2007GL030526.

Yang, X. Y., R. X. Huang, J. Wang and D. X. Wang, 2008, Delayed baroclinic response of the Antarctic circumpolar current to surface wind stress, *Sci. in China, Ser. D Earth Sciences*, **51**, 1036-1043.

Liu L. L., W. Wang, and R. X. Huang, 2008, The mechanical energy input to the ocean induced by tropical cyclones, *J. Phys. Oceanogr*., **38**, 1253-1266.

Guan, Y. P. and R. X. Huang, 2008, Stommel's box model of thermohaline circulation revisited – The role of mechanical energy supporting mixing and the wind-driven gyration, *J. Phys. Oceanogr*., **38**, 909-917.

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Shao Q. L., X. Y. Chen, and R. X. Huang, 2012. Effect of opening the Drake Passage on the oceanic general circulation: A box model study, Science China, 56, 1588-1598.

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Part II: Numerical diffusion/diffusivity and gravitational potential energy change due to isopycnal diffusion
Part III: Energetics of horizontal and isopycnal diffusion/advection
Part IV: Energetics of diffusion/advection in sigma coordinates and other coordinates
*Acta Oceanl. Sin. Vol. 33, No. 3.* 1-81.

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