



Zhaoqing Yang, Ph.D.
Chief Scientist, Coastal Modeling

Biography

Dr. Yang is a nationally recognized coastal modeling expert in the Department of Energy's (DOE) Pacific Northwest National Laboratory (PNNL). Dr. Yang's research covers broad areas, including integrated modeling assessment of impacts of climate change and extreme events on coastal infrastructure and marine ecosystem, storm surge and coastal flooding modeling, tidal stream and wave energy resource characterization and environmental impacts, estuarine and coastal hydrodynamics, sediment and water quality transport processes, nearshore restoration and carbon cycle in coastal wetlands. Dr. Yang currently leads PNNL's modeling efforts on the regional integrated assessment modeling for the impacts of storm surge on coastal infrastructure and ecosystem, as well as ocean renewable energy resource characterization. Dr. Yang is the lead modeler for the development of PNNL's high resolution hydrodynamic and transport model of Puget Sound, and the real-time Puget Sound operational forecast system. Dr. Yang also has extensive experience in wave dynamics, ocean engineering, CFD modeling, water quality and sediment and fate transport in reservoir and river systems.

Research Interests

- Impacts of climate change and sea level rise on coastal infrastructure and ecosystem
- Storm surge and coastal flood modeling
- Integrated modeling approach with climate, coastal and hydrological models
- Resources characterization and environmental impacts of tidal stream and wave energy extraction
- Modeling of circulation, sediment transport and water quality in estuarine and coastal waters
- Dynamics of estuarine plumes, tidal fronts and residuals
- Modeling analysis of nearshore wetland restorations
- Carbon cycle in coastal wetlands

Education and Credentials

- Postdoctoral Associate, Oregon Graduate Institute of Science and Technology, 1996-1998
- Ph.D. Physical Oceanography, College of William and Mary, 1996
- M.S. Ocean Engineering, University of Rhode Island, 1992
- M.S. Physical Oceanography, State Oceanic Administration, P.R., China, 1986
- B.S. Mathematics and Mechanics, Zhongshan University, P.R., China, 1982

Affiliations and Professional Service

- American Geophysical Union
- Puget Sound Marine Environmental Modeling Consortium
- International Conference of Estuarine and Coastal Modeling Advisory Committee: 2001 – present
- NAS/NRC's Committee on Marine and Hydrokinetic Energy Assessment, 2010 – 2013
- Guest professor, Guangdong Ocean University, China
- Guest professor, East China Normal University, China

Awards and Recognitions

- PNNL EED Exceptional Contribution Program Award, 2005, 2007, 2011
- PNNL EED Outstanding Performance Award, 2006

Peer Review Journal Publications:

- Yang, Z.**, T. Wang, A. Copping and N. Voisin, 2014. Estuarine Response to River Flow and Sea-Level Rise under Future Climate Change and Human Development, *Estuarine, Coastal and Shelf Sciences*. DOI: 10.1016/j.ecss.2014.08.015
- Li, Y., JH. Yi, H. Song, Q. Wang, **Z. Yang**, N. D. Kelley, and KS. Lee, 2014. On Natural Frequency of Tidal Power Systems-A Discussion on Sea Test. *Applied Physics Letters*, 105 (2), 023902. DOI: 10.1063/1.4886797.
- Yang, Z.**, T. Wang, A. Copping and S. Geerlofs, 2014. In-stream Tidal Energy Development and its Potential Effects in Tacoma Narrows, Washington, USA. *Journal of Ocean and Coastal Management*. 99, 52-62. DOI: 10.1016/j.ocecoaman.2014.02.010
- Yang, Z.**, T. Wang, D. Cline and B. Williams. 2014. Hydrodynamic Modeling Analysis to Support Nearshore Restoration Projects in a Changing Climate, *J. Mar. Sci. Eng.*, 2(1), 18-32. [doi:10.3390/jmse2010018](https://doi.org/10.3390/jmse2010018)
- Yang, Z.**, T. Wang, L-YR, Leung, K.A. Hibbard, A.C. Janetos, I.P. Kraucunas, J.S. Rice, B. Preston, and T. Wilbanks. 2014. A modeling study of coastal inundation induced by storm surge, sea level rise and subsidence in the Gulf of Mexico. *Natural Hazards*, 71, 1771-1794, [DOI: 10.1007/s11069-013-0974-6](https://doi.org/10.1007/s11069-013-0974-6)
- Wang, T., **Z. Yang**, and A. Copping. 2014. A modeling study of the potential water quality impacts from in-stream tidal energy extraction. *Estuaries and Coast*. doi:[10.1007/s12237-013-9718-9](https://doi.org/10.1007/s12237-013-9718-9).
- Yang, Z.** and T. Wang. 2014. Modeling the effects of tidal energy extraction on estuarine hydrodynamics in a stratified estuary. *Estuaries and Coasts*. [doi: 10.1007/s12237-013-9684-2](https://doi.org/10.1007/s12237-013-9684-2).
- Yang, Z.** and T. Wang, 2013. Tidal Residual Eddies and Their Effect on Water Exchange in Puget Sound. *Ocean Dynamics*, 63, 995-1009. [DOI: 10.1007/s10236-013-0635-z](https://doi.org/10.1007/s10236-013-0635-z)
- Yang, Z.**, T. Wang and A. Copping, 2013. Modeling Tidal Stream Energy Extraction and its Effects on Transport Processes in a Tidal Channel and Bay System Using a Three-dimensional Coastal Ocean Model. *Renewable Energy*, 50, 605-613. [DOI: 10.1016/j.renene.2012.07.024](https://doi.org/10.1016/j.renene.2012.07.024)
- Yang, Z.**, T. Wang, T. Khangaonkar and S. Breithaupt, 2012. Integrated Modeling of Flood Flows and Tidal Hydrodynamics over a Coastal Floodplain. *Journal of Environmental Fluid Mechanics*. 12, 63-80. [DOI: 10.1007/s10652-011-9214-3](https://doi.org/10.1007/s10652-011-9214-3)
- Khangaonkar, T., **Z. Yang**, T. Kim and M. Robert, 2011. Tidally Averaged Circulation in Puget Sound Sub-basins: Comparison of Historical Data, Analytical Model, and Numerical Model. *Estuarine, Coastal and Shelf Science*, 93, 305-319.

- Yang, Z.**, T. Khangaonkar and T. Wang, 2011. Use of Advanced Meteorological Model Output for Coastal Ocean Modeling in Puget Sound. *International Journal of Ocean and Climate Systems*, vol. 2, no. 2, 101-117.
- Khangaonkar, T. and **Z. Yang**, 2011. A High Resolution Hydrodynamic Model of Puget Sound to Support Nearshore Restoration Feasibility Analysis and Design. *Journal of Ecological Restoration*, 29 (1-2):173-184. doi:10.3368/er.29.1-2.173.
- Yang, Z.** and T. Khangaonkar, 2010. Multi-scale Modeling of Puget Sound Using an Unstructured-grid Coastal Ocean Model: from Tide flats to Estuaries and Coastal Waters. *Ocean Dynamics*. 60, 1621-1637, [DOI 10.1007/s10236-010-0348-5](https://doi.org/10.1007/s10236-010-0348-5)
- Yang, Z.**, K.L. Sobocinski, D. Heatwole, T. Khangaonkar, R. Thom, and R. Fuller, 2010. Hydrodynamic and Ecological Assessment of Nearshore Restoration: A Modeling Study. *Ecol. Model.* 221, 1043-1053. [doi:10.1016/j.ecolmodel.2009.07.011](https://doi.org/10.1016/j.ecolmodel.2009.07.011)
- Yang, Z.**, T. Khangaonkar, M. Calvi, K. Nelson, 2010. Simulation of Cumulative Effects of Nearshore Restoration Projects on Estuarine Hydrodynamics. *Ecol. Model.* 221, 969-977. [doi:10.1016/j.ecolmodel.2008.12.006](https://doi.org/10.1016/j.ecolmodel.2008.12.006)
- Yang, Z.**, and T. Khangaonkar, 2009. Modeling Tidal Circulation and Stratification in Skagit River Estuary Using an Unstructured Grid Ocean Model. *Ocean Modelling*, 28, 34-49. [doi:10.1016/j.ocemod.2008.07.004](https://doi.org/10.1016/j.ocemod.2008.07.004).
- Yang, Z.** and T. Khangaonkar, 2009. Modeling of Coastal Effluent Transport: An Approach to Linking Far-field and Near-field Models. *Acta Oceanologica Sinica*, 27, Suppl., 21-30.
- Yang, Z.** and T. Khangaonkar, 2008. Modeling of Salt Intrusion, Intertidal Mixing, and Circulation in a Braided Estuary. *J. Coastal Research*. 52, 171-180. [doi: 10.2112/1551-5036-52.sp1.171](https://doi.org/10.2112/1551-5036-52.sp1.171)
- Khangaonkar, T., **Z. Yang**, J. Paik and F. Sotiropoulos, 2008. Simulation of Hydrodynamics at Stratified Reservoirs Using a Staged Modeling Approach. *J. Coastal Research* 52, 79-86. [doi:10.2112/1551-5036-52.sp1.79](https://doi.org/10.2112/1551-5036-52.sp1.79)
- Khangaonkar, T., **Z. Yang**, 2008. Dynamic Response of Stream Temperatures to Boundary and Inflow Perturbation due to Reservoir Operations. *River Research and Applications*, 24, 420-433. [doi:10.1002/rra.1088](https://doi.org/10.1002/rra.1088)
- Frick WE, T. Khangaonkar, AC Sigleo, and **Z Yang**. 2007. Estuarine-ocean exchange in a North Pacific estuary: comparison of steady state and dynamic model. *Estuarine, Coastal and Shelf Science* 74(1-2):1-11. [doi:10.1016/j.ecss.2007.02.019](https://doi.org/10.1016/j.ecss.2007.02.019) (Full Text)
- Khangaonkar T. P., **Z. Yang**, C. DeGasperi, and K. Marshall. 2005: Modeling hydrothermal response of a reservoir to modifications at a high-head dam. *Water International*, 30, 378-388.
- Yang, Z.**, and J.M. Hamrick. 2005. Optimal Control of Salinity Boundary Condition in a Tidal Model Using a Variational Inverse Method. *Estuarine, Coastal and Shelf Science*, 62, 13-24. [doi:10.1016/j.ecss.2004.08.003](https://doi.org/10.1016/j.ecss.2004.08.003). (Full Text)
- Yang, Z.**, and J.M. Hamrick. 2003. Variational Inverse Parameter Estimation in a Cohesive Sediment Transport Model: an Adjoint Approach. *J. Geophys. Res*, 108(C2), 3055, doi:10.1029/2002JC001423, 2003 [Abstract](#) | [Full Text](#)
- Yang, Z.**, and J.M. Hamrick. 2002. Variational Inverse Parameter Estimation in a Long-term Tidal Transport Model. *Water Resources Research*, 38 (10), 1204, doi:10.1029/2001WR001121, 2002 [Abstract](#) | [Full Text](#)
- Yang, Z.**, A. Baptista, and J. Darland. 2000. Numerical modeling of flow characteristics in a rotating annular flume. *Dynamics of Atmospheres and Oceans*. (31):271-294. doi:[10.1016/S0377-0265\(99\)00037-8](https://doi.org/10.1016/S0377-0265(99)00037-8)

Publications in Conference Proceedings:

- Yang Z**, T Wang, and AE Copping. 2014. "A Modeling Study of the Effect of Tide Energy Extraction on Tidal Circulation and Its Implication to the Changes of Marine Ecosystem." In *International Council for the Exploration of the Sea - Annual Science Conference 2011*. International Council for the Exploration of the Sea, Gdansk, Poland.
- Yang Z**, T Wang, A Copping, and SH Geerlofs. 2014. "Modeling In-stream Tidal Energy Extraction and Its Potential Environmental Impacts." In *Proceedings of the 10th European Wave and Tidal Energy Conference*, vol. 2013, p. n/a. European Wave and Tidal Energy Conference, London, United Kingdom
- Yang Z**, T Wang, and A Copping. 2014. "ARRAY OPTIMIZATION FOR TIDAL ENERGY EXTRACTION IN A TIDAL CHANNEL – A NUMERICAL MODELING ANALYSIS." In *Proceedings of the 2nd Marine Energy Technology Symposium*. PNNL-SA-102213, Pacific Northwest National Laboratory, Richland, WA.
- Yang Z**, and T Wang. 2014. "Modeling Wave Field Using an Unstructured-Grid Surface Wave Model for Regional Wave Energy Resource Assessment." In *World Renewable Energy Congress 2014 Proceedings*. PNNL-SA-104358, Pacific Northwest National Laboratory, Richland, WA.
- Yang, Z**, and T. Wang, 2012. Hydrodynamic Modeling Analysis of Wetland Restoration in Snohomish River, Washington. In: Proceedings of the 12th International Conference on Estuarine and Coastal Modeling, M. L. Spaulding, ed., American Society of Civil Engineers, St. Augustine, FL. pp 139-155. [doi: 10.1061/9780784412411.00008](https://doi.org/10.1061/9780784412411.00008)
- Wang, T. and **Z. Yang**, 2012. A Modeling Study of Hydrodynamic Circulation in a Fjord of Pacific Northwest. In: Proceedings of the 12th International Conference on Estuarine and Coastal Modeling, M. L. Spaulding, ed., American Society of Civil Engineers, St. Augustine, FL. pp 257-273. [doi: 10.1061/9780784412411.00016](https://doi.org/10.1061/9780784412411.00016)
- Yang, Z**, T. Khangaonkar, J. Chase and T. Wang, 2010. Puget Sound Operational Forecast System - A Real-time Predictive Tool for Marine Resource Management and Emergency Responses. In: Proceedings of the 11th International Conference on Estuarine and Coastal Modeling, M. L. Spaulding, ed., American Society of Civil Engineers, Seattle, WA. pp 356-372. [doi: 10.1061/41121\(388\)22](https://doi.org/10.1061/41121(388)22)
- Khangaonkar, T., **Z. Yang**, S. Geerlofs and A. Copping, 2010. Overland Tidal Power Generation Using Modular Tidal Prism. In: Proceedings of the 11th International Conference on Estuarine and Coastal Modeling, M. L. Spaulding, ed., American Society of Civil Engineers, Seattle, WA. pp 466-477. [doi: 10.1061/41121\(388\)28](https://doi.org/10.1061/41121(388)28)
- Kim, T., L. Labiosa, T. Khangaonkar, **Z. Yang**, C. Chen, J. Qi and C. Cerco, 2010. Development of a Coupled Hydrodynamic (FVCOM) and Water Quality Model (CE-QUAL-ICM) for Application to Puget Sound, WA. In: Proceedings of the 11th International Conference on Estuarine and Coastal Modeling, M. L. Spaulding, ed., American Society of Civil Engineers, Seattle, WA. pp 373-388. [doi: 10.1061/41121\(388\)23](https://doi.org/10.1061/41121(388)23)
- Lee, C., T. Khangaonkar and **Z. Yang**. 2008. Application of Hydrodynamic and Sediment Transport Model for the Restoration Feasibility Assessment - Cottonwood Island, Washington. In: Proceedings of the 10th International Conference on Estuarine and Coastal Modeling, M. L. Spaulding, ed., American Society of Civil Engineers, Newport, RI, pp. 839-861. [doi 10.1061/40990\(324\)45](https://doi.org/10.1061/40990(324)45)
- Yang, Z.** and T. Khangaonkar, 2008. Development of a 3D Unstructured Circulation Model of Puget Sound. In: Proceedings of the 10th International Conference on Estuarine and Coastal Modeling, M. L. Spaulding, ed., American Society of Civil Engineers, Newport, RI. pp 1-17. [doi 10.1061/40990\(324\)1](https://doi.org/10.1061/40990(324)1).
- Yang, Z.**, H. Liu, and T. Khangaonkar, 2006. Development of a Hydrodynamic Model for Skagit River Estuary for Estuarine Restoration Feasibility Assessment. In: Proceedings of the 9th International Conference on Estuarine and Coastal Modeling, M. L. Spaulding, ed., American Society of Civil Engineers, Charleston, SC, pp. 752-767. [doi:10.1061/40876\(209\)43](https://doi.org/10.1061/40876(209)43) ([Abstract](#))

- Lee, C., **Z. Yang**, T. Khangaonkar, and A. Divers., 2006. Application of a Hydrodynamic Model for Assessing the Hydraulic Capacity and Flow Field at Willamette Falls Dam, Oregon. In: Proceedings of the 9th International Conference on Estuarine and Coastal Modeling, M. L. Spaulding, ed., American Society of Civil Engineers, Charleston, SC, pp. 788-805. [doi 10.1061/40876\(209\)45](https://doi.org/10.1061/40876(209)45) ([Abstract](#))
- Yang, Z.**, T. Khangaonkar, and S. Breithaupt. 2004. Modeling of Tidal Circulation and Pollutant Transport in Port Angeles Harbor and Strait of Juan de Fuca. In: Proceedings of the 8th International Conference on Estuarine and Coastal Modeling, M. L. Spaulding, ed., American Society of Civil Engineers, Monterey, CA, pp. 55-73, [doi 10.1061/40734\(145\)5](https://doi.org/10.1061/40734(145)5)
- Khangaonkar, T. and **Yang, Z.** 2004. Coastal Circulation and Effluent Transport Modeling at Cherry Point, Washington. In: Proceedings of the 8th International Conference on Estuarine and Coastal Modeling, M. L. Spaulding, ed., American Society of Civil Engineers, Monterey, CA: pp. 475-491. [doi: 10.1061/40734\(145\)30](https://doi.org/10.1061/40734(145)30)
- Yang, Z.**, T. Khangaonkar, C. DeGasperi, S. Breithaupt and K. Marshall. 2002. Temperature Stratification and Water Quality Modeling for Lake Simtustus, Oregon. In: Proceedings of the 7th International Conference on Estuarine and Coastal Modeling, M. L. Spaulding, ed., American Society of Civil Engineers, St Pete Beach, FL, pp.765-782. [doi 10.1061/40628\(268\)49](https://doi.org/10.1061/40628(268)49)
- Breithaupt, S., T. Khangaonkar, **Z. Yang**. 2002. Numerical Modeling for the Chinook River Wetlands Restoration Project. In: Proceedings of Coastal Water Resources Conference, American Water Resources Association, New Orleans, LA, pp. 99-104.
- Khangaonkar, T., **Z. Yang**, R. Hummell and E. Tokkar. 2002. Effluent Solids Transport and Deposition Using Coupled Near-field Dilution and Far-field 3D Circulation and Transport Models. In: Proceedings of TAPPI 2002.
- Yang, Z.**, T. Khangaonkar, C. DeGasperi and K. Marshall. 2000. Three-dimensional Modeling of Temperature Stratification and Density-driven Circulation in Lake Billy Chinook, Oregon. In: Proceedings of the 6th International Conference on Estuarine and Coastal Modeling, M. L. Spaulding, et al., (eds.). American Society of Civil Engineers, New Orleans, LA, pp. 411-425.

Technical Reports (Since 2005):

- Moss, Richard H; Mearns, Linda; Blohm, Andrew J; Henriques, Justin Joseph; Malone, Elizabeth L; McCrary, Rachel; Rice, Jennie S; Wang, Taiping; **Yang, Zhaoqing**. 2014. Installation Briefing Document: United States Naval Academy Climate Change Vulnerability Assessment. PNWD-4433—Pacific Northwest Division, Richland, WA.
- Khangaonkar T, **Z Yang**, C Lee, T Wang, and W Long. 2014. Hydrodynamic and Suspended Sediment Transport Model of Skagit and Padilla Bay System . PNNL-23143, Pacific Northwest National Laboratory, Richland, WA
- Copping AE, **Z Yang**, N Voisin, J Richey, T Wang, RY Taira, M Constans, MS Wigmosta, FB Van Cleve, and TK Tesfa. 2013. Integrated Modeling and Decision-Support System for Water Management in the Puget Sound Basin: Snow Caps to White Caps . PNNL-23078, Pacific Northwest National Laboratory, Richland, WA.
- Yang Z**, and T Wang. 2013. Hydrodynamic Modeling Analysis for the Fir Island Farm Estuary Restoration Project in Skagit Bay, Washington . PNWD-4398, Battelle—Pacific Northwest Division, Richland, WA.
- Yang Z** and T. Wang. 2013. Hydrodynamic Modeling Analysis of Fir Island Farm Restoration (Phase II) – Model Output. PNWD-SA-10178 Battelle—Pacific Northwest Division, Richland, WA.
- Breithaupt SA, **Z Yang**, and T Wang. 2011. Hydrodynamic Modeling Analysis of Fir Island Farm Restoration - Preferred Alternative . PNWD-4306, Battelle—Pacific Northwest Division,

- Richland, WA.
- Yang Z** and T. Wang. 2011. Hydrodynamic Modeling Analysis of Fir Island Farm Restoration – Baseline Condition . PNWD-SA-9379 Battelle—Pacific Northwest Division, Richland, WA.
- Yang Z**, LK Berg, JC States, and AE Copping. 2011. Improved Assessment Tool for Offshore Wind Resource Characterization . PNNL-20795, Pacific Northwest National Laboratory, Richland, WA.
- Yang Z** and T. Wang. 2011. Assessment of Tidal Energy Removal Impacts on Physical Systems: Development of MHK Module and Analysis of Effects on Hydrodynamics. PNNL-20804, Pacific Northwest National Laboratory, Richland, WA.
- Khangaonkar T., T. Kim, **Z. Yang**, and R. Labiosa. 2011. Puget Sound Dissolved Oxygen Modeling Study: Water Quality Development – Phase I. PNNL-20384, Pacific Northwest National Laboratory, Richland, WA.
- Yang Z**, and T. Wang. 2010. Modeling Analysis of Union Slough Restoration Project. PNNL-20076, Pacific Northwest National Laboratory, Richland, WA.
- Wang T., **Z. Yang**, and T. Khangaonkar. 2010. Development of a Hydrodynamic and Transport model of Bellingham Bay in Support of Nearshore Habitat Restoration. PNNL-19347, Pacific Northwest National Laboratory, Richland, WA.
- Yang Z**, T. Khangaonkar, and T. Wang. 2010. Assessment of Energy Removal Impacts on Physical Systems: Hydrodynamic Model Domain Expansion and Refinement, and Online Dissemination of Model Results. PNNL-19882, Pacific Northwest National Laboratory, Richland, WA.
- Lee, C., T. Khangaonkar, **Z. Yang**, and E. Beamer. 2010. Development of a Land Use Planning Tool for Estuarine Habitat Protection, Restoration, and Cumulative Effects Assessment in Northern Puget Sound, WA. PNWD-4175, Battelle—Pacific Northwest Division, Richland, WA.
- Yang, Z.**, T. Khangaonkar, R. Labiosa and T. Kim. 2010. Puget Sound Dissolved Oxygen Modeling Study: Development of an Intermediate-Scale Hydrodynamic Model. PNNL-18484, Pacific Northwest National Laboratory, Richland, WA
- Lee C, and **Z Yang**. 2009. Calculation of Significant Wave/Storm Overtopping Height in Turners Bay Lagoon . PNWD-4067, Battelle—Pacific Northwest Division, Richland, WA.
- Judd C, RM Thom, AB Borde, DL Woodruff, GC Roegner, J Vavrinc, III, **Z Yang**, and J Zhang. 2009. Eelgrass Enhancement and Restoration in the Lower Columbia River Estuary. PNNL-18711, Pacific Northwest National Laboratory, Richland, WA.
- Yang, Z.**, TP Khangaonkar, and C Lee. 2008. Hydrodynamic Modeling Analysis for Leque Island Restoration Feasibility Study . PNWD-3979, Battelle—Pacific Northwest Division, Richland, WA.
- Yang, Z.**, and T. Khangaonkar. 2007. Hydrodynamic Modeling Study of the Snohomish River Estuary: Snohomish River Estuary Restoration Feasibility Study. PNWD-3864, Battelle—Pacific Northwest Division, WA
- Yang, Z.**, and T. Khangaonkar. 2007. Development of a Hydrodynamic Model of Puget Sound and Validation and Application for the Northwest Straits. PNNL-17161, Pacific Northwest National Laboratory, Richland, WA
- Yang, Z.**, and T. Khangaonkar. 2007. Hydrodynamic Modeling Analysis for McGlenn Island Causeway Feasibility Study. PNWD-3979, Battelle—Pacific Northwest Division, Richland, WA
- Lee, C., **Z. Yang**, and T. Khangaonkar. 2007. Hydrothermal Modeling of the Cooling Water Pond in the Carty Reservoir – PGE Boardman Power Plant. PNWD-3886, Battelle—Pacific Northwest Division, Richland, WA
- Yang, Z.**, K. Sobocinski, A. Borde, T. Khangaonkar, and R. Thom. 2006. Hydrodynamic and Ecological Assessment for Port Susan Bay Restoration Project. PNWD-3674, Battelle—Pacific Northwest Division, Richland, WA

- Yang, Z.**, and T. Khangaonkar. 2006. Hydrologic and Hydrodynamic Modeling of the Skagit River Estuary - Rawlins Road Restoration Feasibility Study. PNWD-3692, Battelle—Pacific Northwest Division, Richland, WA
- Whelan G, WD Millard, GM Gelston, MA Pelton, **Z Yang**, DL Strenge, C Lee, C Sivaraman, MJ Simpson, JK Young, TP Khangaonkar, TR Downing, BL Hoopes, and LE Hachmeister. 2006. Rapid Risk Assessment: FY05 Annual Summary Report. PNNL-15697, Pacific Northwest National Laboratory, Richland, WA.
- Yang, Z.**, T. Khangaonkar and C. Lee. 2005. Computational Fluid Dynamics Modeling for the Willamette Falls Dam Pre-forebay and Forebay – Willamette Falls Hydroelectric Project. PNWD-3599, Battelle—Pacific Northwest Division, Richland, WA
- Yang, Z.**, H. Liu, and T. Khangaonkar. 2005. Coastal Circulation and Effluent Dispersion Modeling for G-P Toledo's Outfalls 001 and 003 on the Yaquina River and Nye Beach, Newport, OR. PNWD-3578, Battelle—Pacific Northwest Division, Richland, WA
- Khangaonkar, T., S. Chopakatla, **Z. Yang** and H. Liu. 2005. MIXING ZONE STUDY Report – GP TOLEDO, NPDES PERMIT NO. 101409, for Georgia-Pacific Corporation, Toledo, OR. PNWD-3554, Battelle—Pacific Northwest Division, Richland, WA

Presentations (Since 2005):

- Yang Z.**, and T Wang. 2014. "Extraction of Marine and Hydrokinetic Energy for a Sustainable Environment – A Modeling Perspective." Presented by Zhaoqing Yang (Invited Speaker) at World Renewable Energy Congress 2014, London, United Kingdom on August 4, 2014. PNNL-SA-103459.
- Yang Z.**, T Wang, LYR Leung, S Taraphdar, and B Preston. 2014. "Modeling coastal storm surge and its potential impact on energy infrastructure." Presented by Ruby Leung (Invited Speaker) at Climate and Earth System Modeling PI Meeting, Washington DC, DC on May 13, 2014. PNNL-SA-102692.
- Wang T, **Z Yang**, and JM Brandenberger. 2014. "Modeling Water Exchange and Transport Timescales in A Multi-inlet Bay System of Puget Sound, Washington." Presented by Taiping Wang at 2014 Salish Sea Ecosystem Conference, Seattle, WA on April 30, 2014. PNNL-SA-102429.
- Yang Z.**, and T Wang. 2014. "Effects of Storm Surge Induced by Pacific Northwest Windstorms on Nearshore Processes in Puget Sound – A Preliminary Modeling Study." Presented by Zhaoqing Yang at 2014 Salish Sea Ecosystem Conference, Seattle, WA on May 1, 2014. PNNL-SA-102413.
- Yang Z.** 2014. "Modeling In-stream Tidal Energy Extraction and its Potential Environmental Impacts." Presented by Zhaoqing Yang (Invited Speaker) at Seminar at Central Washington University, Ellensburg, WA on April 25, 2014. PNNL-SA-102316.
- Yang Z.**, T Wang, and AE Copping. 2014. "Array Optimization for Tidal Energy Extraction In Tacoma Narrows: A Numerical Modeling Analysis." Presented by Zhaoqing Yang at Global Marine Renewable Energy Conference, Seattle, WA on April 16, 2014. PNNL-SA-102111.
- Wang T, **Z Yang**, LYR Leung, S Taraphdar, KA Hibbard, IP Kraucunas, JS Rice, B Preston, and T Wilbanks. 2014. "A Modeling Study of Hurricane-Induced Coastal Inundation and Its Impacts to Coastal Energy Infrastructure in the Gulf of Mexico." Presented by Taiping Wang at 2014 Ocean Sciences Meeting, Honolulu, HI on February 25, 2014. PNNL-SA-101143.
- Yang Z.**, T Wang, and AE Copping. 2014. "Modeling In-Stream Tidal Energy Extraction and Its Potential Environmental Impacts ." Presented by Simon Geerlofs (Invited Speaker) at DOE Waterpower peer review, Crystal City , VA on February 24, 2014. PNNL-SA-100561.

- Copping AE, J Richey, MS Wigmosta, **Z Yang**, N Voisin, M Constans, RY Taira, T Wang, FB Van Cleve, and TK Tesfa. 2014. "Snow Caps to White Caps: Numerical Modeling in the Snohomish Basin to Assist Resource Managers." Presented by Andrea Copping (Invited Speaker) at Snohomish MRC Meeting, Everett, WA on January 22, 2014. PNNL-SA-100422.
- Yang Z**, and T Wang. 2013. "Hydrodynamic Modeling Analysis of Wetland Restoration in Skagit Bay, Washington ." Presented by Zhaoqing Yang at ECM13, San Diego, CA on November 5, 2013. PNWD-SA-1023.
- Yang Z**, T Wang, N Voisin, and A Copping. 2013. "Modeling the Hydrodynamic Response to River Runoff Under Future Climate Change and Land Use Conditions." Presented by Zhaoqing Yang at ECSA53, Shanghai, China on October 14, 2013. PNNL-SA-98438.
- Yang Z**, T Wang, AE Copping, and SH Geerlofs. 2014. "Modeling In-stream Tidal Energy Extraction and its Potential Environmental Impacts." Presented by Zhaoqing Yang at European Wave and Tidal Energy Conference, Aalborg, Denmark on September 3, 2014. PNNL-SA-97484.
- Yang Z**, T Wang, LYR Leung, KA Hibbard, IP Kraucunas, JS Rice, and S Taraphdar. 2013. "Modeling Hurricane-induced Storm Surge and Impacts on Energy Infrastructure in Gulf of Mexico." Presented by Zhaoqing Yang at DAC meeting, Richland, WA on June 1, 2013. PNNL-SA-9617.
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