Ryan P. Mulligan, PhD, PEng

Professor and Associate Department Head, *Department of Civil Engineering*
Director, *Beaty Water Research Centre*
Editor, *Journal of Geophysical Research Oceans*

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Appointments
2023 – present: Associate Department Head, Civil Engineering, Queen's University, ON, Canada
2022 – present: Professor, Civil Engineering, Queen's University, ON, Canada
2021 – present: Director, Beaty Water Research Centre, Queen's University, ON, Canada
2017 – 2022: Associate Professor, Civil Engineering, Queen's University, ON, Canada
2011 – 2017: Assistant Professor, Civil Engineering, Queen's University, ON, Canada
2009 – 2011: Assistant Professor, Geological Sciences, East Carolina University, NC, USA
2008 – 2009: Postdoctoral Fellow, Bedford Institute of Oceanography, NS, Canada
2003 – 2008: Research Assistant, Oceanography, Dalhousie University, NS, Canada
1999 – 2003: Coastal Engineer, Hay & Company Consultants Inc., BC, Canada
1997 – 1999: Research Assistant, Civil Engineering, University of British Columbia, BC, Canada

Awards
2022: Ocean Voyager Award, *American Geophysical Union*, for fundamental work on predicting the combined impact of sea level rise and extreme events on coastal and estuarine systems
2018: Outstanding Reviewer Award, *Coastal Engineering*.
2012: Outstanding Contribution Award, *International Conference on Coastal Engineering*, Santander, Spain
2004: Kathy Ellis Memorial Book Prize, *Dalhousie University*, for the highest grades in the Department of Oceanography

Academic Degrees
2008: Doctorate, Oceanography, Dalhousie University, Halifax, NS, Canada
1999: Master's, Civil Engineering, University of British Columbia, Vancouver, BC, Canada
1997: Bachelor's, Geological Engineering, Queen's University, Kingston, ON, Canada

Editorial Boards
2022-2025: Lead Organizer, American Geophysical Union (AGU) Special Collection on "Forcing, response, and impacts of coastal storms in a changing climate" in four journals: *JGR-Oceans, JGR- Earth Surface, Water Resources Research* and *Earth's Future*
2020-present: Editor, *Journal of Geophysical Research Oceans*
2019-2020: Associate Editor, *Regional Studies in Marine Science*
2017-2020: Associate Editor, *Journal of Geophysical Research Oceans*

Training of Highly Qualified Personnel
In progress: 4 undergraduate, 3 Masters, 4 PhD
Completed: 21 undergraduate, 22 Masters, 8 PhD, 3 Postdoc

Currently Funded Projects

2024-2028 Climate Change and Hurricane Impacts to Atlantic Coasts
Agency: Environment and Climate Change Canada

2024-2029 Predicting Coastal Environmental Conditions in a Changing Climate
Agency: NSERC Discovery Grant

2023-2026 Numerical Modelling for Nature-Based Infrastructure Design and Site Selection
Agency: National Research Council of Canada

2023-2026 Collaborative Research: Swash zone dynamics driven by obliquely incident waves
Agency: US National Science Foundation

2023-2025 Predictive sediment modelling to delineate threats to habitat in the Minas Basin
Agency: Fisheries and Oceans Canada

2021-2026 CASTLE: Climate Adaptive infraStructure Testing and Longevity Evaluation Innovation Cluster
Agency: Canadian Foundation for Innovation, Innovation Fund 2020

Peer-Reviewed Publication Summary

74 journal papers, 27 conference papers, 7 book chapters, 222 conference presentations

Selected Book Chapters and Design Guidelines (since 2019, Graduate students in bold)

1. Wiebe, J., Danyluk, A., Davies, M., Didier, D., Eyquem, J., Ferguson, S., Greenan, B., Hastings, N., Jones, C., Kolijn, D., Mulligan, R.P., Osler, M., Shoubridge, J., Tétégan Simon, M., Van de Valk, J., Zuzek, P. and Steenhof, P. (2024). *Coastal Flood Risk Assessment for Building and Infrastructure Design Standard*. Canadian Standards Association (CSA Group), CSA W224:24, National Standard of Canada
2. Murphy, E., Cornett, A., van Proosdij, D., and Mulligan, R.P. (Eds.) (2024). *Nature-Based Infrastructure for Coastal Flood and Erosion Risk Management – A Canadian Design Guide*. ISBN 978-0- 660-71886-6. https://doi.org/10.4224/40003325.
3. Mulligan, R.P., Stolle, J., Kolijn, D., **Benoit., D**., and Lamont, G., 2023. Modelling Performance. Chapter 11 *in* Murphy, E., Cornett, A., van Proosdij, D., and Mulligan, R.P., Eds., *Nature-based Infrastructure for Coastal Flood and Erosion Risk Management – A Canadian Design Guide*, ISBN 978-0- 660-71886-6. https://doi.org/10.4224/40003325.
4. Winter, G., Hetzel, Y., Huang, P., Hipsey, M.R., Mulligan, R.P. and Hansen, J., 2019. Coastal processes, extreme events and forecasting. In E. Techera and G. Winter (Eds.), *Marine Extremes: Ocean Safety, Marine Health and the Blue Economy*. Routledge Publishing.

Selected Journal Publications (since 2019, Graduate students in bold)

1. **Benoit, D.M.**, Delisle, M.P.C., Siemens, G., Raubenheimer, B., Elgar, S. and Mulligan, R.P., 2025. Groundwater hydrodynamic oscillations from swash with transparent sand (GHOSTS). *Journal of Geophysical Research: Oceans*, *130*(3), e2024JC021293.

2. **Burns, R.A**., Mulligan, R.P., Elliott, M., van Proosdij, D. and Murphy, E., 2025. Numerical modelling of the hydrodynamics driven by tidal flooding of the land surface after dyke breaching. *Nature-Based Solutions*, p.100218.
3. **Barlow, K**., Walsh, A., McKellar, M., Mulligan, R., McDougall, S., Evans, S.G. and Take, W.A., 2025. Effect of the presence of a tailings dam beach on breach outflow and erosion during overtopping failure. *Engineering Geology*, *344*, p.107805.
4. **Zimmerman, Z.D**., Mulligan, R.P. and Storlazzi, C.D., 2024. Hurricane wave energy dissipation and wave-driven currents over a fringing reef. *Coral Reefs*, pp.1-18.
5. **Barlow, K**., Walsh, A., McKellar, M., Mulligan, R., McDougall, S., Evans, S.G. and Take, W.A., 2024. Effect of the presence of a tailings dam beach on breach outflow and erosion during overtopping failure. *Engineering Geology*, p.107805.
6. **Swatridge, L.L**., Mulligan, R.P., Boegman, L. and Shan, S., 2024. Development and performance of a high-resolution surface wave and storm surge forecast model: application to a large lake. *Geoscientific Model Development*, *17*(21), pp.7751-7766.
7. **Szczyrba, L**., Mulligan, R.P., Pufahl, P., Humberston, J. and McNinch, J., 2024. Nearshore flow dynamics over shore-oblique bathymetric features during storm wave conditions. *Journal of Geophysical Research: Oceans*, 129 (7), e2023JC020630
8. Birchler, J.J., Palmsten, M.L., Doran, K.S., Karwandyar, S., Pardun, J.M., **Oades, E.M.**, Mulligan, R.P. and Whitehead-Zimmers, E.S., 2024. Skill assessment of a total water level and coastal change forecast during the landfall of a hurricane. *Coastal Engineering*, 193, 104590.
9. LeRoux, N.K., Pavlovskii, I., O'Sullivan, A.M., Mulligan, R.P., Bonnington, A.C. and Kurylyk, B.L., 2024. Morphodynamics of a composite sand-cobble beach in response to extratropical cyclone Fiona and seasonal wave variability. *Science of the Total Environment*, 916, p.170077.
10. **Barlow, K**., Mulligan, R.P., McDougall, S., Evans, S.G. and Take, W.A., 2024. Simulation of breaching of laboratory-scale earth dams by overtopping with XBeach. *Coastal Engineering*, 189, p.104471.
11. Cantelon, J.A., LeRoux, N.K., Mulligan, R.P., Swatridge, L. and Kurylyk, B.L., 2024. Interrelated coastal flooding, erosion, and groundwater salinization on a barrier island during Hurricane Fiona. *Journal of Geophysical Research: Earth Surface*, 129(4), p.e2023JF007551.
12. **Treflik-Body, E**., Steel, E., Take, W.A. and Mulligan, R.P., 2024. Large-scale physical modeling of wave generation and runup on slopes from the collapse of partially and fully submerged granular columns. *Journal of Geophysical Research: Oceans*, 129(5), p.e2023JC020689.
13. **Szczyrba, L**., Mulligan, R.P., Humberston, J., Bak, A.S., McNinch, J., and Pufahl, P.K., 2023. Nearshore wave angles and directional variability during storm events. *Coastal Engineering*, 185, p.104372.
14. **Oades, E.M**., Mulligan, R.P. and Palmsten, M.L., 2023. Evaluation of nearshore bathymetric inversion algorithms using camera observations and synthetic numerical input of surface waves during storms. *Coastal Engineering*, 184, p.104338.
15. Mulligan, R.P., **Swatridge, L.**, Cantelon, J.A., Kurylyk, B.L., George, E., and Houser, C. 2023. Local and remote storm surge contributions to total water levels in the Gulf of St. Lawrence during Hurricane Fiona. *Journal of Geophysical Research Oceans*, 128, e2023JC019910.
16. **Manchia, C.M.**, Mulligan, R.P., Mallinson, D.J., and Culver, S.J., 2023. Coastal response to the landfall of a hurricane on a series of inlets and narrow back-barrier waterways. *Estuaries and Coasts*, 1 0.1007/s12237-023-01242-6
17. **Bullard, G.K.**, Mulligan, R.P., and Take, W.A., 2023. Landslide tsunamis: exploring momentum transfer to waves generated by a range of materials with different mobility impacting water. *Landslides*, 10.1007/s10346-023-02126-3

18. **Szczyrba, L.**, Mulligan, R.P., Humberston, J., Bak, A.S., McNinch, J., and Pufahl, P.K., 2023. Nearshore wave angles and directional variability during storm events. *Coastal Engineering*, 185, 104372.
19. **Oades, E.M**., Mulligan, R.P. and Palmsten, M.L., 2023. Evaluation of nearshore bathymetric inversion algorithms using camera observations and synthetic numerical input of surface waves during storms. *Coastal Engineering*, 184, 104338.
20. **Mahyari, F.G**., Boegman, L., **Rey, A**., Mulligan, R.P., Champagne, P., Filion, Y., da Silva, A., 2023. Evaluation of a three-dimensional hydrodynamic and water quality model for design of wastewater stabilization ponds, *Journal of Environmental Engineering* 149 (4), 05023003.
21. **López-Ramade, E**., Mulligan, R.P., Medellín, G., and Torres-Freyermuth, A., 2023. Modelling beach morphological responses near coastal structures under oblique waves driven by sea-breezes, *Coastal Engineering*, 182, 104290.
22. **Marmoush, R.Y.**, and Mulligan, R.P., 2023. An experimental investigation of alongshore wave momentum transfer to nearshore flows in the outer surf zone of a steep sand beach*. Estuaries and Coasts*, 46 (1), 12-29.
23. **Swatridge, L.L**., Mulligan, R.P., Boegman, L., Shan, S., and Valipour, R., 2022. Coupled modelling of storm surge, circulation and surface waves in a large stratified lake. *Journal of Great Lakes Research*, 48(6), pp.1520-1535.
24. George, D.A., Castelle, B. and Mulligan, R.P., 2022. Crossing the boundaries: how key advancements in understanding of headland sediment bypassing improves definition of littoral cells. *Journal of Geophysical Research: Oceans*, 127(8), p.e2021JC018269.
25. **Zuchuat, V**., Steel, E., Mulligan, R.P., Collins, D.S. and Green, J.M., 2022. Tidal dynamics in palaeo-seas in response to changes in physiography, tidal forcing and bed shear stress. *Sedimentology*, 69(4), pp.1861-1890.
26. **Manchia, C.M.** and Mulligan, R.P., 2022. Hurricane wind-driven surface waves on a narrow continental shelf and exposed coast. *Continental Shelf Research*, 237, p.104681.
27. **Lin, S**., Boegman, L., Shan, S. and Mulligan, R.P., 2022. An automatic lake-model application using near-real-time data forcing: development of an operational forecast workflow (COASTLINES) for Lake Erie. *Geoscientific Model Development*, 15(3), pp.1331-1353.
28. **McLaughlin, C**., Law., B.A. and Mulligan, R.P., 2021. Modelling surface waves and tide-surge interactions leading to enhanced total water levels in a macrotidal bay, *Coastal Engineering Journal*, 10.1080/21664250.2021.1965417.
29. **Marmoush, R.Y.** and Mulligan, R.P., 2021. Non-hydrostatic modelling of alongshore variability in waves and wave-driven currents during the morphodynamic change of a laboratory beach. *Coastal Engineering,* 167, 103913.
30. Franz, M., Jaboyedoff, M., Mulligan, R.P., Podladchikov, Y. and Take, W.A., 2021. An efficient two-layer landslide-tsunami numerical model: effects of momentum transfer validated with physical experiments of waves generated by granular landslides. *Natural Hazards and Earth System Sciences Discussions*, 21, 1229-1245.
31. **Trinaistich, W.C**., Mulligan, R.P. and Take, W.A., 2021. Runup of landslide-generated waves breaking on steep slopes captured using digital imagery and hydrochromic paint. *Coastal Engineering*, *166*, p.103888.
32. Rauter, M., Hoße, L., Mulligan, R.P., Take, W.A. and Løvholt, F., 2021. Numerical simulation of impulse wave generation by idealized landslides with OpenFOAM. *Coastal Engineering*, 165, p.103815.
33. **Rey, A**., Mulligan, R.P., da Silva, A.M.F., Filion, Y., Champagne, P., and Boegman, L., 2021b). Temperature stratification in an operational waste stabilization pond, *Journal of Environmental Engineering*, 147(6), 05021001.

34. **Rey, A**., and Mulligan, R.P., 2021. Influence of hurricane wind field variability on real-time forecast simulations of the coastal environment. *Journal of Geophysical Research: Oceans*, 126(1), e2020JC016489.
35. **Rey, A**., Mulligan, R.P., da Silva, A.M.F., Filion, Y., Champagne, P., and Boegman, L., 2021a). Three-dimensional hydrodynamic behavior of an operational waste stabilization pond, *Journal of Environmental Engineering*, 147(2), 05020009.
36. **Rey, A.**, Corbett, D.R., and Mulligan, R.P., 2020. Impacts of hurricane winds and precipitation on hydrodynamics in a back-barrier estuary*, Journal of Geophysical Research: Oceans*, 125 (12), e2020JC016483.
37. Cabrera, M.A., Pinzon, G., Take, W.A. and Mulligan, R.P., 2020. Wave generation across a continuum of landslide conditions from the collapse of partially submerged to fully submerged granular columns. *Journal of Geophysical Research: Oceans*, *125*(12), p.e2020JC016465.
38. Mulligan, R.P., Franci, A., Celigueta, M.A. and Take, W.A., 2020. Simulations of landslide wave generation and propagation using the particle finite element method. *Journal of Geophysical Research: Oceans*, *125*(6), p.e2019JC015873.
39. **Marmoush, R.Y.** and Mulligan, R.P., 2020. A three-dimensional laboratory investigation of beach morphology change during a storm event. Geomorphology, 363, p.107224
40. **Bullard, G.K**., Mulligan, R.P., **Carreira, A.** and Take, W.A., 2019. Experimental analysis of tsunamis generated by the impact of landslides with high mobility. *Coastal Engineering*, 152, p.103538.
41. **Bullard, G.K**., Mulligan, R.P. and Take, W.A., 2019. An enhanced framework to quantify the shape of impulse waves using asymmetry. *Journal of Geophysical Research: Oceans*, 124(1), pp.652-666.
42. **Hodgkins, L.M**., Mulligan, R.P., McCallum, J.M. and Weber, K.P., 2019. Modelling the transport of shipborne per-and polyfluoroalkyl substances (PFAS) in the coastal environment. *Science of The Total Environment*, 658, pp.602-613.
43. Mulligan, R.P., Mallinson, D.J., **Clunies, G.J., Rey, A.**, Culver, S.J., Zaremba, N., Leorri, E. and Mitra, S., 2019. Estuarine responses to long-term changes in inlets, morphology, and sea level rise. *Journal of Geophysical Research: Oceans*, 124(12), pp.9235-9257.
44. Mulligan, R.P., Take, W.A. and **Bullard, G.K.,** 2019. Non-hydrostatic modeling of waves generated by landslides with different mobility. *Journal of Marine Science and Engineering*, Special Issue on Coastlab 2018, 7(8), p.266.
45. Mulligan, R.P., Smith, P.C., **Tao, J**. and Hill, P.S., 2019. Wind-wave and Tidally Driven Sediment Resuspension in a Macrotidal Basin. *Estuaries and Coasts*, 42(3), pp.641-654.
46. Mulligan, R.P., **Gomes, E.R**., Miselis, J.L. and McNinch, J.E., 2019. Non-hydrostatic numerical modelling of nearshore wave transformation over shore-oblique sandbars. Estuarine, *Coastal and Shelf Science*, 219, pp.151-160.
47. Mulligan, R.P. and Perrie, W., 2019. Circulation and structure of the Mackenzie River plume in the coastal Arctic Ocean. *Continental Shelf Research*, 177, pp.59-68.