Idalia A. Machuca | Curriculum Vitae

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Academic Qualifications

- **M.Sc. in Physical Oceanography** — **2015 – 2019**
  University of British Columbia — Vancouver, Canada
- **B.Sc. in Geophysics, Minor in Oceanography** — **2010 – 2014**
  University of British Columbia — Vancouver, Canada
- **A.Sc. in Physics and Mathematics** — **2008 – 2010**
  St. John's College Junior College — Belize City, Belize

Research Experience

- **Research Scientist (Oceanography)** — **Sep 2015 – Apr 2019**
  Ocean Circulation and Upwelling in Mackenzie Canyon, Beaufort Sea — University of British Columbia
  - Developed a nested-grid modelling system based on the Nucleus for European Modelling of the Ocean (NEMO) framework to study circulation patterns in Mackenzie Canyon, a submarine canyon offshore of the Canadian Arctic.
  - Incorporated a high-resolution model grid for regions in the model domain where complex ocean dynamics required enhanced resolution for increased accuracy using the Adaptive Grid Refinement in FORTAN (AGRIF) software.
  - Defined an analytical formulation for wind stress based on realistic meteorological trends to force numerical simulations.
  - Applied data processing, analysis, and visualization techniques to large, 3-dimensional, geophysical datasets with model results and observational measurements of temperature, salinity, and currents velocity.
  - Designed and implemented analysis tools and quantitative metrics to investigate the influence of variability in wind strength, regional topography, and local stratification on modelled ocean dynamics.
  - Evaluated model performance by comparing simulation results with observational data (CTD, ADCP, moorings).
  - Discussed the response of physical processes to the rapidly evolving environmental conditions due to climate change.
  - Published a graduate thesis and collaborated with external researchers on peer-reviewed articles (in preparation).

- **Research Assistant (Oceanography)** — **Jul 2014 – Apr 2015**
  Storm Surge Forecasting in the Salish Sea, British Columbia — University of British Columbia
  - Contributed to the development and evaluation of a 3-dimensional, ocean circulation model of the Salish Sea used to investigate the physical processes driving coastal flooding and to forecast extreme sea level events.
  - Employed statistical methods to evaluate model performance in simulating tidal constituents and, by extension, water level and motion in the region.
  - Calculated river outflow streamlines and oil spill dispersion using the particle tracking tool Ariane.
  - Produced data visualizations (featured on the project's website `salishsea.eos.ubc.ca`) presenting real-time and forecasted wind speeds, maximum water levels, and storm surge risk at coastal stations.
  - Facilitated workshops with stakeholders (coastal communities, provincial and federal agencies, private companies) regarding modelling efforts, future directions for the project, and methods for disseminating information.
  - Contributed to documentation of model development, participated in weekly project meetings, and assisted collaborators in understanding and using the model and group's software tools.

Teaching Experience

- **Graduate Teaching Assistant** — **Sep 2015 – Dec 2017**
  Undergraduate-Level Courses — University of British Columbia
  - Assisted in the creation and marking of student assignments, lab exercises, midterm tests, and final exams.
  - Supported instructors during in-class lessons and provided individual and group support for students.
  - Planned and delivered classroom lessons, exercises, and speaker series presentations.
  - Conducted mid-term and final participation evaluations and returned constructive feedback to the students.
  - Evaluated classroom exercises based on efficacy in promoting classroom discussion and improving student knowledge retainment.

- **Science Educator and Web Developer** — **Jun 2013 – Sep 2013**
  T.A. Belize — Oceana Belize
  - Developed lessons about the environmental issues affecting Belize and the world, such as climate change, plastic pollution, energy consumption, mangroves, and threats to biodiversity.
  - Researched current and relevant information available for Belize and organized lessons and supplementary materials, including classroom activities and assignments.
  - Worked in collaboration with the Oceana Belize staff to collect data, scientific reports, and relevant photographs.
  - Created a website `www.oceanateachbz.com` to host the environmental lessons and promoted the website to the Belizean public via televised news reports and newspaper articles

Professional Experience

- **Features Writer** — **Jan 2019 – Jul 2019**
  Earth Matters: Volume 5 (2019) — University of British Columbia
  - Authored feature profiles on world-class researchers and academic leaders and news articles on student initiatives and community events in the Earth, Ocean and Atmospheric Sciences department of the University of British Columbia.
  - Coordinated interviews with the scientists, administration staff, and university students featured in the magazine.
  - Partnered with other writers to pitch content ideas, review and edit story manuscripts, and publish the magazine (`www.eoas.ubc.ca/news-events/earth-matters`).

- **Accessibility Exam Invigilator** — **Sep 2016 – Apr 2017**
  UBC Access and Diversity — University of British Columbia
  - Monitored exams for students with disabilities in private and group spaces, set up adaptive and computer equipment, conducted accurate and confidential record keeping, and maintained good communication with senior coordinators.

- **Office Assistant** — **May 2011 – Aug 2011**
  Central Health Region — Ministry of Health Belize
  - Assisted staff of the regional office with administrative affairs regarding doctors, ministry workers, and patients, and compiled reports using statistical data from regional health facilities.

Volunteer Experience

- **Workshop Helper** — **Sep 2018 – Oct 2018**
  PyLadies Vancouver — Vancouver, Canada

- **Seminar Coordinator** — **May 2017 – Dec 2017**
  Physical Oceanography Seminar Series — University of British Columbia

- **Workshop Helper** — **Oct 2014 – Sep 2016**
  The Carpentries — Vancouver, Canada

- **Public Information Volunteer** — **Jun 2014 – Apr 2015**
  David Suzuki Foundation — Vancouver, Canada

Workshops

- **BC Data Science Workshop** — **May 2018**
  Pacific Institute for the Mathematical Sciences — Vancouver, Canada
- **Instructional Skills Workshop** — **Mar 2018**
  UBC Centre for Teaching, Learning and Technology — Vancouver, Canada

Conference Presentations

- **Ocean Sciences Meeting** — **2018**
  Effects of a Dynamically Wide Submarine Canyon on Coastal Currents During an Upwelling Event — Portland, USA
- **3 Minute Thesis** — **2018**
  Mackenzie Canyon: a Submarine Oasis — Vancouver, Canada
- **UBC Jumpstart Program** — **2017**
  Thinking in the Sciences — Vancouver, Canada
- **Canadian Meteorological and Oceanographic Society (CMOS) Congress** — **2017**
  Characterization of the Flow Dynamics in a Wide, Arctic Canyon — Toronto, Canada
- **INCISE International Submarine Canyon Symposium** — **2016**
  Numerical Simulation Exploring the Mechanisms Driving Upwelling in Mackenzie Canyon — Victoria, Canada
- **MEOPAR Mobilizing Science Knowledge and Research Symposium** — **2015**
  Communicating Storm Surge Predictions in the Strait of Georgia — Halifax, Canada

Technical Skills

- **Programming languages:** Python (5 years), MATLAB (9 years), FORTRAN (3 years)
- **Numerical modelling:** NEMO (Nucleus for European Modelling of the Ocean) framework, AGRIF (Adaptive Grid Refinement in Fortran) software, high performance computing (Compute Canada, WestGrid)
- **Project management:** version control (Mercurial, Bitbucket), documentation (reStructuredText, Sphinx, Read the Docs, LaTeX, Microsoft and Apple programs)
- **Oceanographic field equipment:** CTD (Conductivity-Temperature-Depth) Profiler, ADCP (Acoustic Doppler Current Profiler)
- **Presentation:** graphic design (Inkscape), web design (HTML), public speaking (conferences, workshops, seminars)

Scientific Publications

- Machuca, Idalia A. "Circulation and Upwelling in Mackenzie Canyon, a Dynamically Wide Submarine Canyon in the Beaufort Sea." MSc Thesis. University of British Columbia. 2019. `https://open.library.ubc.ca/cIRcle/collections/ubctheses/24/items/1.0378375`
- Soontiens, N., Allen, S., Latornell, D., Le Souef, K., Machuca, I., Paquin, J.-P., Lu, Y., Thompson, K., Korabel, V. "Storm surges in the Strait of Georgia simulated with a regional model." Atmosphere-Ocean 54 1-21. 2016. `https://doi.org/10.1080/07055900.2015.1108899`
- Waterhouse, A. F., et al. "Influence of Mackenzie Canyon on water mass transformation in the Beaufort Continental Slope". (In preparation).