

ASL uses High-performance Computing for Numerical Modeling

ASL has been involved in numerous numerical modeling and data analysis projects for the last 40 years, for the purpose of generating preliminary metocean design criteria including winds, waves, and currents (e.g., Ross et al., 2014; Ross et al., 2016; Lin et al., 2019). Metocean projects have been throughout the Alaskan and the Canadian coasts, including work in the Arctic Ocean (Shell, ExxonMobil, ConocoPhillips, BP, Statoil, Chevron), in Cook Inlet (ExxonMobil, ConocoPhillips, BP, Alaska LNG), various proponents of LNG and terminal facilities in the Prince Rupert, BC area, the waters approaching Kitimat for the Northern Gateway project, and for various projects further south in BC, including Port Metro Vancouver.

ASL has developed processes and systems to manage metocean projects. These include processes and systems for Document management, Data management, Quality management, and Health, Safety and Environment (HSE) system. We are very proud of our success in collecting metocean data in some of the world's most challenging oceanographic environments. ASL has developed its own hydrodynamic model and runs publicly available models such as 3-D unstructured Finite Volume Community Ocean Model (FVCOM), Delft3D, and SWAN. ASL has a complete MATLAB based suite of software for the editing, analyses and visualization of metocean data.

Besides wave modeling for metocean studies, ASL has implemented the SWAN wave model in a number of other coastal projects, including modeling nearshore spectral wave transformation off the west coast of Vancouver Island (Jiang and Fissel, 2003), modeling nearshore spectral wave transformation off the west coast of Africa (Fissel and Jiang, 2004), modeling locally wind-generated waves in the Strait of Georgia and Roberts Bank (Jiang and Fissel, 2005), modeling ocean waves at Victoria Fisherman's Wharf (Fissel, et al., 2007), and wave modeling for Victoria International Marina with and without attenuators (Jiang and Fissel, 2008 and 2009; Fissel and Lin 2012; Lin and Fissel 2014).

The SWAN third generation spectral wave model was originally developed at the Delft University of Technology in the Netherlands. SWAN is capable of modeling wind generation of waves, current-wave interaction, wave refraction, diffraction and reflection processes as well as shoaling effects. The SWAN model can be operated on three-layer nested model grids with different spatial scales in order to capture the wave dynamics in the shelf to coastal scales with a sufficiently detailed resolution.

ASL is also experienced on the Sverdrup, Munk and Bretschneider (SMB) wave algorithms which are widely used as the basis for estimation of wave design conditions, based on the computation of wave heights and periods from wind speed and direction and the fetch and duration of the specified winds.

Recent technical reports and publications include:

Lin, Y., D.B. Fissel, J. Lawrence, R. Clouston, R. Birch, and A. Lam, 2019. Final Report: Metocean Study of Ocean Currents and Waves for the Pebble Cook Inlet Pipeline Route. Report for the Pebble Limited Partnership via IntecSea by ASL Environmental Sciences Inc., 104 p.

Lin, Y., D.B.Fissel, and E.Ross, 2017. Extreme Wave Events in Chatham Sound Inland Sea. Paper Presented at Waves In Shallow water (WISE) Meeting, Victoria, B.C., Canada.

Ross, E., D. B. Fissel, A. Slonimer, D. Billenness, R. Clouston, A. Scoon, Y. Lin, J. Lawrence, M. Asplin, L. Sadova, M. Henley, and K. Borg, 2016. Preliminary Metocean Design Criteria for the Island Gas Connector Pipeline. Unpublished Report for AMEC Foster Wheeler, by ASL Environmental Sciences Inc., Victoria, B.C., Canada, 153p.

Lin, Y. and D.B. Fissel, 2014. Modeling the Wave Attenuator on the NW Side of the Marina. Report for Community Marine Concepts Ltd., Victoria B.C., by ASL Environmental Sciences Inc., Victoria, B.C., Canada, 11p.

Ross, E., D.B. Fissel, A. Slonimer, and Y. Lin, 2014. Westcoast Connector Gas Transmission Metocean Study. Unpublished Report for Golder Associates Ltd., by ASL Environmental Sciences Inc., Victoria, B.C., Canada, 112p.

Fissel, D.B., and Lin, Y., 2012. Wave Orbital Bottom Velocity Amplitudes for Southwest Winds of 25 knots: With and Without the Wave Attenuator on the NW Side of the Marina. Report for Victoria International Marina, by ASL Environmental Sciences Inc., Victoria, B.C., Canada, 11p.