Peter Sutherland

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Research Interests

- Multi-scale process studies; combining remote sensing, autonomous platforms, and in situ measurements to study high-dynamic-range geophysical processes.
- Ice-ocean-atmosphere interactions; air-sea-ice fluxes, surface wave propagation through sea ice, ice pack evolution and break-up.
- Sensor development; creating innovative instruments and using new platforms to gain insights about the ocean, ice, and atmosphere.
- Surface wave and upper-ocean - lower atmosphere dynamics, especially related to wave breaking and turbulence.
- Sub-mesoscale processes. Connecting small-scale physics like wave breaking and Langmuir circulations to larger scale flows.
- Scientific imaging and computer vision; automated scene reconstruction, stereo imagery, PIV, optical flow, feature identification and tracking.

Education

2013 **Ph.D. Oceanography, Scripps Institution of Oceanography, UCSD**
Title: *On breaking waves and turbulence at the air-sea interface*

2007 **M.S. Oceanography, Scripps Institution of Oceanography, UCSD**

2004 **B.Sc. Physics, Minor Mathematics, University of Victoria**

Research Experience

2015 – present *Institut Français de Recherche pour l'Exploitation de la Mer*, Permanent research scientist.

2014 – 2015 *Université Pierre et Marie CURIE*, Postdoctoral scholar.

2013 – 2014 *Scripps Institution of Oceanography*, Postdoctoral scholar.

2006 – 2013 *Scripps Institution of Oceanography*, Graduate student researcher.

2005 *RSMAS - University of Miami*, Research intern.

2003 – 2004 *University of Victoria - Condensed Matter Physics Group*, Undergraduate researcher.

2003 *Institute of Ocean Sciences, Sidney, British Columbia*, Undergraduate researcher.

2001 *Canadian Centre for Climate Modelling and Analysis*, Undergraduate researcher.

Teaching and Mentoring

2018 – present Supervisor for 1 Ph.D. student (ongoing).

2016 – 2018 Masters student supervision (3 graduated).

2008 – 2014 *Scripps Institution of Oceanography.* SIO202A Wave Physics - Lab component (graduate level).

Oceanographic Field Experience

Feb. 2020 *Ice Canoe*, St. Lawrence estuary. BicWin 2020, Interactions between waves, turbulence, and ice.

Feb. 2019 *Ice Canoe*, St. Lawrence estuary. BicWin 2019, Interactions between waves and sea ice.

Nov. 2018 *R/V Thalia*, Mer d'Iroise. DRIFT4SKIM, Multi-platform proof of concept campaign for Doppler radar sensors for proposed SKIM satellite, **shipboard chief scientist**.

April 2018 *Acqua Alta* Platform, Adriatic Sea. WAVESCALE 2018, Short waves, breaking, and upper-ocean currents.

Feb. 2018 *Ice Canoe*, St. Lawrence estuary. BicWin 2018, Interactions between waves, turbulence, and ice.

Oct. 2017 *R/V Thalia*, Mer d'Iroise. BBWAVES 2017, wave-current interactions, **chief scientist**.

April. 2017 *R/V F. G. Walton Smith*, Gulf of Mexico. SPLASH, interactions between fronts, surfactants, waves, and turbulence.

Feb. 2017 *Ice Canoe*, St. Lawrence estuary. BicWin 2017, Waves attenuation in sea ice.

Oct. 2016 *R/V Thalia*, Mer d'Iroise. BBWAVES 2015, wave-current interactions, **chief scientist**.

Feb. 2016 *Ice Canoe*, St. Lawrence estuary. BicWin 2016, Waves attenuation in sea ice.

Oct. 2015 *R/V Côtes de la Manche*, Mer d'Iroise. BBWAVES 2015, wave-current interactions

Nov. 2013 *R/P FLIP*, Southern California Bight. SoCal2013. Air-sea interactions, **co-chief scientist**.

Dec. 2010 *R/P FLIP*, Southern California Bight. SoCal2010 (HIRES), air-sea interactions.

June 2010 *R/P FLIP*, off Northern California. HIRES2010. High-resolution air sea interactions.

Sept. 2009 *R/P FLIP*, south of Hawai'i. Radiance in a Dynamic Ocean (RaDyO).

July 2009 *R/P FLIP*, Southern California Bight. High-resolution air sea interaction experiment (HIRES).

Winter 2008 – 2009, *Kvitebjørn* Platform, North Sea off Bergen. Wind-wave interactions in extreme conditions.

Sept. 2008 *R/P FLIP*, Santa Barbara Channel. Radiance in a Dynamic Ocean (RaDyO).

May 2002 *C.C.G.S. John P. Tully*, waters surrounding Vancouver Island. Coastal ecology cruise.

May 2000 *C.C.G.S. John P. Tully*, offshore of Vancouver Island. Coastal ecology cruise.

Publications

Zippel, S. F., T. Maksym, M. Scully, **P. Sutherland**, and D. Dumont, 2020. Measurements of enhanced near-surface turbulence under windrows. *Journal of Physical Oceanography*, 50, 197-215, doi: 10.1175/JPO-D-18-0265.1

Carr, M., **P. Sutherland**, A. Haase, K.-U. Evers, I. Fer, A. Jensen, H. Kalisch, J. Berntsen, E. Parau, O. Thiem, and P. A. Davies, 2019. Laboratory Experiments on Internal Solitary Waves in Ice-Covered Waters. *Geophysical Research Letters*, doi:10.1029/2019GL084710

Sutherland, P., and D. Dumont, 2018. Marginal ice zone thickness and extent due to wave radiation stress. *Journal of Physical Oceanography*, 48, 1885-1901, doi:10.1175/JPO-D-17-0167.1

Stopa J. E., **P. Sutherland**, and Fabrice Ardhuin, 2018. Strong and highly variable push of ocean waves on Southern Ocean sea ice. *Proceedings of the National Academy of Sciences*, 115, 5861-5865, doi:10.1073/pnas.1802011115

Sutherland, P., J. Brozena, W. E. Rogers, M. Doble, and P. Wadhams, 2018. Airborne remote sensing of wave

propagation in the marginal ice zone. *Journal of Geophysical Research - Oceans*, 123, 4132-4152, doi:10.1029/2018JC013785

Thomson, J., *et al.*, 2018. Overview of the Arctic Sea State and Boundary Layer Physics Program. *Journal of Geophysical Research - Oceans*, 123, 8674-8687, doi:10.1002/2018JC013766

Veras Guimarães, P., F. Ardhuin, **P. Sutherland**, M. Accensi, M. Hamon, Y. Pérignon, J. Thomson, A. Benetazzo, and P. Ferrant, 2018. A surface kinematics buoy (SKIB) for wave–current interaction studies. *Ocean Science*, 14, 1449-1460, doi: 10.5194/os-14-1449-2018

Benetazzo, A., F. Serafino, F. Bergamasco, G. Ludeno, F. Ardhuin, **P. Sutherland**, M. Sclavo, and F. Barbariol, 2018. Stereo imaging and X-band radar wave data fusion: An assessment. *Ocean Engineering*, 152, 346-352, doi:10.1016/j.oceaneng.2018.01.077

Laxague, N. J. M.; T. M. Özgökmen; B. K. Haus, G. Novelli, A. Shcherbina, **P. Sutherland**, C. M. Guigand, B. Lund, S. Mehta, M. Alday, and J. Molemaker, 2018. Observations of Near-Surface Current Shear Help Describe Oceanic Oil and Plastic Transport. *Geophysical Research Letters*, 45, 245-249, doi: 10.1002/2017GL075891

Sutherland, P. and J. C. Gascard, 2016. Airborne remote sensing of ocean wave directional wavenumber spectra in the marginal ice zone. *Geophysical Research Letters,* 43, doi:10.1002/2016GL067713

Ardhuin, F., **P. Sutherland**, M. Doble, and P. Wadhams., 2016. Ocean waves across the Arctic: attenuation due to dissipation dominates over scattering for periods longer than 19 s. *Geophysical Research Letters*, 43, doi:10.1002/2016GL068204

Sutherland, P., and W. K. Melville, 2015. Measuring turbulent kinetic energy dissipation at a wavy sea surface. *Journal of Atmospheric and Oceanic Technology*, 32, 1498-1514.

Sutherland, P., and W. K. Melville, 2015. Field measurements of surface and near-surface turbulence in the presence of breaking waves. *Journal of Physical Oceanography*, 45, 943-965.

Sutherland, P., and W. K. Melville, 2013. Field measurements and scaling of ocean surface wave-breaking statistics. *Geophysical Research Letters*, 40, 50584.

Dickey, T., *et al.*, 2012. Introduction to special section on Recent Advances in the Study of Optical Variability in the Near-Surface and Upper Ocean. *Journal of Geophysical Research,* 117, C00H20.

Crawford, W., **P. Sutherland**, and P. van Hardenberg, 2005. Cold Water Intrusion in the Eastern Gulf of Alaska in 2002. *ATMOSPHERE-OCEAN*, 43, 119-128.

Selected Presentations

Sutherland, P. and D. Dumont, 2020, The effects of ice formation on wave-driven upper-ocean turbulence and air-sea exchanges. *AGU Ocean Sciences Meeting*, San Diego, USA.

Sutherland, P., J. Stopa, F. Ardhuin, J. Brozena, 2019, Airborne and Satellite Remote Sensing of Waves in Sea Ice. *ESA Living Planet Symposium 2019*, Milan, Italy.

Sutherland, P., D. Dumont, L. Barast, 2019, Remote sensing and in situ observations of wave attenuation dynamics in diverse marginal ice zones. *51st International Liège Colloquium on Ocean Dynamics*, Liège, Belgium.

Sutherland, P., D. Dumont, J. Stopa, F. Ardhuin, 2018, Surfaces Waves Set the Marginal Ice Zone Thickness and Extent; A Model, A Process Study, Satellite Remote Sensing, and the Global Implications. *AGU Ocean Sciences*, Portland, USA.

Sutherland, P., 2017, Wave forcing and ice formation in marginal ice zones. *Waves in Shallow Environments (WISE)*, Victoria, Canada.

Sutherland, P., 2017, Surface wave physics. *MEOPAR Winter School in Marine Environmental Prediction*, Rimouski, Canada, **Invited**.

Sutherland, P., 2017, Rapid wave field evolution in the near-edge marginal ice zone. *5th Norway-Scotland Waves Symposium*, Oslo, Norway, **Invited**.

Sutherland, P., 2016, Breaking surface waves over a range of scales; observations and their implications for fluxes and energy dissipation at the air-sea interface. *B'WAVES*, Bergen, Norway, **Invited**.

Sutherland, P., F. Ardhuin, J. Stopa, A. Mouche, B. Chapron, and J.L. Redelsperger, 2016, Wave-driven mixing in open water and sea ice. *Journées Scientifiques LEFE/GMMC*, Toulon, France.

Sutherland, P., 2016, Mechanisms for the attenuation of ocean surface waves in marginal ice zones. *Waves in Shallow Environments (WISE)*, Venice, Italy.

Sutherland, P., 2015, Airborne measurements of waves propagating into sea ice; evolution of the directional wavenumber spectrum. *4th Norway-Scotland Waves Symposium*, Edinburgh, Scotland, **Invited**.

Sutherland, P., 2014, On breaking waves and turbulence at the air-sea interface. *Physical Oceanography Dissertation Symposium VIII*, Lihue, USA.

Sutherland, P., W. K. Melville, 2014, Simultaneous measurements of breaking waves and turbulence at the air-sea interface. *AGU Ocean Sciences*, Honolulu, USA.

Sutherland, P., W. K. Melville, 2013, Field measurements and scaling of wave breaking statistics. *Waves in Shallow Environments (WISE)*, College Park, USA.

Sutherland, P., W. K. Melville, L. Lenain, N. Statom, 2012, Measurements of near-surface wave coherent turbulence in the presence of breaking waves. *AGU Ocean Sciences*, Salt Lake City, USA.

Sutherland, P., L. Lenain, W. K. Melville, 2010, Surface wave processes affecting light transmission and imaging through the ocean surface. *AGU Ocean Sciences*, Portland, USA.

Certifications and Activities

Offshore worker safety training (including basic first aid and fire-fighting, survival at sea, and helicopter underwater escape).

Professional drone pilot certification, France (télépilote de drone professionnel)

RPAS Basic operations pilot certificate, Canada.

FAA Private Pilot Certificate, Glider.

Sailing – Advanced race coach (not current). 20,000 offshore miles.

PADI Open Water Diver SCUBA.