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Qualifications

... → 1989 PhD Physical Oceanography, National University of Ireland Galway, PhD

... → 1984 BA (Hons) Physics, University of Oxford, BA

Research output

Revised estimates of ocean-atmosphere CO₂ flux are consistent with ocean carbon inventory

Watson, A. J., Schuster, U., Shutler, J. D., Holding, T., Ashton, I. G. C., Landschützer, P., Woolf, D. K. & Goddijn-Murphy, L., 4 Sep 2020, In: Nature Communications. 11, 4422.

The FluxEngine air-sea gas flux toolbox: simplified interface and extensions for in situ analyses and multiple sparingly soluble gases

Holding, T., Ashton, I. G., Shutler, J. D., Land, P. E., Nightingale, P. D., Rees, A. P., Brown, I., Piolle, J-F., Kock, A., Bange, H. W., Woolf, D. K., Goddijn-Murphy, L., Pereira, R., Paul, F., Girard-Arduin, F., Chapron, B., Rehder, G., Arduin, F. & Donlon, C. J., 13 Dec 2019, In: Ocean Science. 15, 6, p. 1707-1728 22 p., 15.

Satellites will address critical science priorities for quantifying ocean carbon

Shutler, J. D., Wanninkhof, R., Nightingale, P. D., Woolf, D. K., Bakker, D. C. E., Watson, A., Ashton, I., Holding, T., Chapron, B., Quilfen, Y., Fairall, C., Schuster, U., Nakajima, M. & Donlon, C. J., 4 Nov 2019, (E-pub ahead of print) In: Frontiers in Ecology and the Environment.

Future policy implications of tidal energy array interactions

Waldman, S., Weir, S., O'Hara Murray, R. B., Woolf, D. K. & Kerr, S., Oct 2019, In: Marine Policy. 108, 103611.

Key uncertainties in the recent air-sea flux of CO₂

Woolf, D. K., Shutler, J. D., Goddijn-Murphy, L., Watson, A. J., Chapron, B., Nightingale, P. D., Donlon, C. J., Piskozub, J., Yelland, M. J., Ashton, I., Holding, T., Schuster, U., Girard-Arduin, F., Piolle, J-F., Warren, M., Wrobel-Niedzwiecka, I., Land, P. E., Torres, R., Prytherch, J., Moat, B. & 3 others, Hanafin, J., Arduin, F. & Paul, F., 5 Sep 2019, (E-pub ahead of print) In: Global Biogeochemical Cycles. 33, 12, p. 1548-1563

SEASTAR: A mission to study ocean submesoscale dynamics and small-scale atmosphere-ocean processes in coastal, shelf and polar seas

Gommenginger, C., Chapron, B., Hogg, A., Buckingham, C., Fox-Kemper, B., Eriksson, L., Soulat, F., Ubelmann, C., Ocampo-Torres, F., Nardelli, B. B., Griffin, D., Lopez-Dekker, F., Knudsen, P., Andersen, O. B., Stenseng, L., Stapleton, N., Perrie, W., Violante-Carvalho, N., Schulz-Stellenfleth, J., Woolf, D. & 50 others, Isern-Fontanet, J., Arduin, F., Klein, P. M., Mouche, A., Pascual, A., Capet, X., Hauser, D., Stoffelen, A., Morrow, R. A., Aouf, L., Breivik, Ø., Fu, L. L., Johannessen, J. A., Aksenov, Y., Briceno, L., Hirschi, J., Martin, A. C., Martin, A. P., Nurser, G., Polton, J., Wolf, J., Johnsen, H., Soloviev, A., Jacobs, G., Collard, F., Groom, S. B., Kudryavstev, V., Wilkin, J. L., Navarro, V., Babanin, A., Martin, M. J., Siddorn, J., Saulter, A., Rippeth, T., Emery, W., Maximenko, N., Romeiser, R., Graber, H., Alvera-Azcárate, A., Hughes, C., Vandemark, D., da Silva, J., Van Leeuwen, P. J., Naveira-Gabarato, A., Gemmrich, J., Mahadevan, A., Marquez, J., Munro, Y., Doody, S. & Burbidge, G., 13 Aug 2019, In: Frontiers in Marine Science. 6, 457.

The FluxEngine air-sea gas flux toolbox: simplified interface and extensions for *in situ* analyses and multiple sparingly soluble gases

Holding, T., Ashton, I. G., Shutler, J. D., Land, P. E., Nightingale, P. D., Rees, A. P., Brown, I., Piolle, J-F., Kock, A., Bange, H. W., Woolf, D. K., Goddijn-Murphy, L., Pereira, R., Paul, F., Girard-Ardhuin, F., Chapron, B., Rehder, G., Ardhuin, F. & Donlon, C. J., 8 May 2019, (Submitted) In: Ocean Science Discussions.

Bubbles

Woolf, D. K., 2019, *Encyclopedia of Ocean Sciences*. Cochran, J. K., Bokuniewicz, H. J. & Yager, P. L. (eds.). 3rd ed. Elsevier, Vol. 6. p. 26-31 (Reference Module in Earth Systems and Environmental Sciences).

Asymmetric transfer of CO₂ across a broken sea surface

Leighton, T. G., Coles, D. G. H., Srokosz, M., White, P. R. & Woolf, D. K., 29 May 2018, In: Scientific Reports. 8, 9 p., 8301.

Tidal resource and interactions between multiple channels in the Goto Islands, Japan

Waldman, S., Yamaguchi, S., O'Hara Murray, R. & Woolf, D., Sep 2017, In: International Journal of Marine Energy. 19, p. 332-344 13 p.

Numerical investigation of tidal resource & far field effects of energy extraction in Lashy Sound, Orkney

Waldman, S. M., Side, J. C. & Woolf, D. K., 27 Aug 2017. 9 p.

The wave and tidal resource of Scotland

Neill, S. P., Vögler, A., Goward-Brown, A. J., Baston, S., Lewis, M. J., Gillibrand, P. A., Waldman, S. M. & Woolf, D. K., 16 Mar 2017, (E-pub ahead of print) In: Renewable Energy.

A Sensitivity Analysis of the Impact of Rain on Regional and Global Sea-Air Fluxes of CO₂

Ashton, I., Shutler, J., Land, P., Woolf, D. K. & Quartly, G., 27 Sep 2016, In: PLoS ONE. 11, 9, e0161105.

The forgotten carbon sink

Woolf, D. K., 27 Jun 2016, In: Laboratory News.

FluxEngine: A flexible processing system for calculating atmosphere-ocean carbon dioxide gas fluxes and climatologies

Shutler, J., Land, P., Piolle, J-F., Woolf, D. K., Goddijn-Murphy, L., Paul, F., Girard-Ardhuin, F., Chapron, B. & Donlon, C., Apr 2016, In: Journal of atmospheric and oceanic technology. 33, 4, p. 741-756 16 p.

Progress in satellite remote sensing for studying physical processes at the ocean surface and its borders with the atmosphere and sea ice

Shutler, J. D., Quartly, G. D., Donlon, C. J., Sathyendranath, S., Platt, T., Chapron, B., Johannessen, J. A., Girard-Ardhuin, F., Nightingale, P. D., Woolf, D. K. & Hoyer, J. L., Apr 2016, In: Progress in Physical Geography. 40, 2, p. 215-246 32 p.

On the calculation of air-sea fluxes of CO₂ in the presence of temperature and salinity gradients

Woolf, D. K., Land, P. E., Shutler, J. D., Goddijn-Murphy, L. M. & Donlon, C. J., 23 Mar 2016, In: Journal of Geophysical Research: Oceans. 121, 2, p. 1229-1248 20 p.

A reconciliation of empirical and mechanistic models of the air-sea gas transfer velocity

Goddijn-Murphy, L., Woolf, D. K., Callaghan, A., Nightingale, P. & Shutler, J., Jan 2016, In: Journal of Geophysical Research: Oceans. 121, 1, p. 818-835 18 p.

The OceanFlux Greenhouse Gases methodology for deriving a sea surface climatology of CO₂ fugacity in support of air-sea gas flux studies

Goddijn-Murphy, L. M., Woolf, D. K., Land, P. E., Shutler, J. D. & Donlon, C., 8 Jul 2015, In: Ocean Science. 11, 4, p. 519-541 23 p.

Science in support of governance of wave and tidal energy developments

Side, J., Davies, I. M., Johnson, K., Bell, M., Baston, S., Kerr, S., Woolf, D. & Harris, R. E., Oct 2014, In: Ocean and Coastal Management. 99, p. 1-2 2 p.

Better together: The implications of tidal resource interactions from resource calculation to policy and governance

Woolf, D. K. & Easton, M., 28 Apr 2014. 3 p.

Climate change and adaptation in the coastal areas of Europe's northern periphery region

McClatchey, J., Devoy, R., Woolf, D., Bremner, B. & James, N., 1 Jan 2014, In: Ocean and Coastal Management. 94, p. 9-21 13 p.

Improvements to estimating the air-sea gas transfer velocity by using dual-frequency, altimeter backscatter

Goddijn-Murphy, L., Woolf, D. K., Chapron, B. & Queffelec, P., Dec 2013, In: Remote Sensing of Environment. 139, p. 1-5 5 p.

The strength and phase of the tidal stream

Woolf, D. K., Dec 2013, In: International Journal of Marine Energy. 3-4, p. 3-13 11 p.

Sensitivity of Ferry Services to the Western Isles of Scotland to Changes in Wave and Wind Climate

Coll, J., Woolf, D. K., Gibb, S. W. & Challenor, P. G., May 2013, In: Journal of Applied Meteorology and Climatology. 52, 5, p. 1069-1084 16 p.

Current patterns in the Inner Sound (Pentland Firth) from underway ADCP data

Goddijn-Murphy, L., Woolf, D. K. & Easton, M., Jan 2013, In: Journal of atmospheric and oceanic technology. 30, 1, p. 96-111 16 p.

Climate change impacts on sea-air fluxes of CO₂ in three Arctic seas: a sensitivity study using Earth observation

Land, P. E., Shutler, J. D., Cowling, R. D., Woolf, D. K., Walker, P., Findlay, H. S., Upstill-Goddard, R. C. & Donlon, C. J., 2013, In: Biogeosciences. 10, 12, p. 8109-8128 20 p.

Sensitivity Analysis of the Turbulence Closure Models in the Assessment of Tidal Energy Resource in Orkney

Baston, S., Harris, R. E., Woolf, D. K., Hiley, R. A. & Side, J. C., 2013, *Proceedings of the 10th European Wave and Tidal Energy Conference*. Technical Committee of the European Wave and Tidal Energy Conference, (EWTEC conference proceedings).

The dynamics of an energetic tidal channel, the Pentland Firth, Scotland

Easton, M., Woolf, D. K. & Bowyer, P., 1 Oct 2012, In: Continental Shelf Research. 48, 1, p. 50-60 11 p.

Space-based retrievals of air-sea gas transfer velocities using altimeters: Calibration for dimethyl sulfide

Goddijn-Murphy, L., Woolf, D. K. & Marandino, C., 24 Aug 2012, In: Journal of Geophysical Research: Oceans. 117, C8, p. - 14 p., C08028.

The importance of whitecapping to air-sea interaction and Earth observation approaches to its retrieval

Woolf, D. K. & Goddijn-Murphy, L., Mar 2012, *Earth observation for ocean-atmosphere interactions science: proceedings of the ESA, SOLAS & EGU Joint Conference*. Ouwehand, L. (ed.). Noordwijk: ESA Communications, 7 p. (ESA SP; vol. 703).

Parameterizations and algorithms for oceanic whitecap coverage

Goddijn-Murphy, L., Woolf, D. K. & Callaghan, A. H., Apr 2011, In: Journal of Physical Oceanography. 41, 4, p. 742-756 15 p.

Marine renewable energy: The ecological implications of altering the hydrodynamics of the marine environment

Shields, M. A., Woolf, D. K., Grist, E. P. M., Kerr, S. A., Jackson, A., Harris, R. E., Bell, M. C., Beharie, R. A., Want, A., Gibb, S. W., Osalusi, E. & Side, J., Jan 2011, In: Ocean and Coastal Management. 54, 1, p. 2-9 8 p.

Characterisation of a tidal energy site: hydrodynamics and seabed structure

Easton, M., Woolf, D. K., Harendza, A. & Jackson, A., 2011, *9th European Wave and Tidal Energy Conference (EWTEC 2011)*. Sustainable Energy Research Group, University of Southampton, 10 p.

An operational hydrodynamic model of a key tidal-energy site: Inner Sound of Stroma, Pentland Firth (Scotland, UK)

Easton, M., Woolf, D. K. & Pans, S., 2010, *3rd International Conference and Exhibition on Ocean Energy*. Ente Vasco de la Energía, 6 p.

Tuning a physically-based model of the air-sea gas transfer velocity

Jeffery, C. D., Robinson, I. S. & Woolf, D. K., 2010, In: *Ocean Modelling*. 31, 1-2, p. 28-35 8 p.

Turning marine energy into reality: the Scottish experience

Smith, L., Woolf, D. & Mackay, D., Dec 2009, In: *Proceedings of the ICE - Maritime Engineering*. 162, 4, p. 197-201 5 p.

Advantages of high resolution mapping of tidal currents in the Pentland Firth, using underway ADCP measurements

Goddijn-Murphy, L. & Woolf, D. K., Oct 2009.

Strategic priorities for assessing ecological impacts of marine renewable energy devices in the Pentland Firth (Scotland, UK)

Shields, M. A., Dillon, L. J., Woolf, D. K. & Ford, A. T., Jul 2009, In: *Marine Policy*. 33, 4, p. 635-642 8 p.

Physical exchanges at the air-sea interface: UK-SOLAS field measurements

Brooks, I. M., Yelland, M. J., Upstill-Goddard, R. C., Nightingale, P. D., Archer, S., d'Asaro, E., Beale, R., Beatty, C., Blomquist, B., Bloom, A. A., Brooks, B. J., Cluderay, J., Coles, D., Dacey, J., DeGrandpre, M., Dixon, J., Drennan, W. M., Gabriele, J., Goldson, L., Hardman-Mountford, N. & 34 others, Hill, M. K., Horn, M., Hsueh, P-C., Huebert, B., de Leeuw, G., Leighton, T. G., Liddicoat, M., Lingard, J. J. N., McNeil, C., McQuaid, J. B., Moat, B. I., Moore, G., Neill, C., Norris, S. J., O'Doherty, S., Pascal, R. W., Prytherch, J., Rebozo, M., Sahlee, E., Salter, M., Schuster, U., Skjelvan, I., Slagter, H., Smith, M. H., Smith, P. D., Srokosz, M., Stephens, J. A., Taylor, P. K., Telszewski, M., Walsh, R., Ward, B., Woolf, D. K., Young, D. & Zemmeling, H., May 2009, In: *Bulletin of the American Meteorological Society*. 90, 5, p. 629-644 17 p.

Supplement to physical exchanges at the air-sea interface: UK-SOLAS field measurements

Brooks, I. M., Yelland, M. J., Upstill-Goddard, R. C., Nightingale, P. D., Archer, S., d'Asaro, E., Beale, R., Beatty, C., Blomquist, B., Bloom, A. A., Brooks, B. J., Cluderay, J., Coles, D., Dacey, J., DeGrandpre, M., Dixon, J., Drennan, W. M., Gabriele, J., Goldson, L., Hardman-Mountford, N. & 34 others, Hill, M. K., Horn, M., Hsueh, P-C., Huebert, B., de Leeuw, G., Leighton, T. G., Liddicoat, M., Lingard, J. J. N., McNeil, C., McQuaid, J. B., Moat, B. I., Moore, G., Neill, C., Norris, S. J., O'Doherty, S., Pascal, R. W., Prytherch, J., Rebozo, M., Sahlee, E., Salter, M., Schuster, U., Skjelvan, I., Slagter, H., Smith, M. H., Smith, P. D., Srokosz, M., Stephens, J. A., Taylor, P. K., Telszewski, M., Walsh, R., Ward, B., Woolf, D. K., Young, D. & Zemmeling, H., May 2009, In: *Bulletin of the American Meteorological Society*. 90, 5, p. ES9-ES16 8 p.

Calculating long-term global air-sea flux of carbon dioxide using scatterometer, passive microwave, and model reanalysis wind data

Fangohr, S., Woolf, D. K., Jeffery, C. D. & Robinson, I. S., 23 Sep 2008, In: *Journal of Geophysical Research: Oceans*. 113, C9, p. - 14 p., C09032.

A study of gas exchange during the transition from deep winter mixing to spring bloom in the Bay of Biscay measured by continuous observation from a ship of opportunity

Hydes, D. J., Hartman, M. C., Barger, C. P., Campbell, J. M., Cure, M. S. & Woolf, D. K., Aug 2008, In: *Journal of Operational Oceanography*. 1, 2, p. 41-50 10 p.

Radar altimetry: introduction and application to air-sea interaction

Woolf, D. K. & Gommenginger, C., 2008, *Remote sensing of the European seas*. Barale, V. & Gade, M. (eds.). Springer, p. 283-294 12 p.

The response to phase-dependent wind stress and cloud fraction of the diurnal cycle of SST and air-sea CO₂ exchange
Jeffery, C. D., Robinson, I. S., Woolf, D. K. & Donlon, C. J., 2008, In: *Ocean Modelling*. 23, 1-2, p. 33-48 16 p.

Application of new parameterizations of gas transfer velocity and their impact on regional and global marine CO₂ budgets
Fangohr, S. & Woolf, D. K., Jun 2007, In: *Journal of Marine Systems*. 66, 1-4, p. 195-203 9 p.

Modelling of bubble-mediated gas transfer: Fundamental principles and a laboratory test

Woolf, D. K., Leifer, I. S., Nightingale, P. D., Rhee, T. S., Bowyer, P., Caulliez, G., de Leeuw, G., Larsen, S. E., Liddicoat, M., Baker, J. & Andreae, M. O., Jun 2007, In: *Journal of Marine Systems*. 66, 1-4, p. 71-91 21 p.

Influence of energetic wind and waves on gas transfer in a large wind-wave tunnel facility

Rhee, T. S., Nightingale, P. D., Woolf, D. K., Caulliez, G., Bowyer, P. & Andreae, M. O., 16 May 2007, In: *Journal of Geophysical Research: Oceans*. 112, C5, p. 1-16 16 p., C05027.

One-dimensional modelling of convective CO₂ exchange in the Tropical Atlantic

Jeffery, C. D., Woolf, D. K., Robinson, I. S. & Donlon, C. J., 2007, In: *Ocean Modelling*. 19, 3-4, p. 161-182 22 p.

A regional analysis of new production on the northwest European shelf using oxygen fluxes and a ship-of-opportunity

Barger, C. P., Hydes, D. J., Woolf, D. K., Kelly-Gerreyn, B. A. & Qurban, M. A., Sep 2006, In: *Estuarine, Coastal and Shelf Science*. 69, 3-4, p. 478-490 13 p.

The influence of the North Atlantic Oscillation on the sea-level around the northern European coasts reconsidered: the thermosteric effects

Tsimplis, M. N., Shaw, A. G. P., Flather, R. A. & Woolf, D. K., 15 Apr 2006, In: *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*. 364, 1841, p. 845-856 12 p.

Waves and climate change in the north-east Atlantic

Wolf, J. & Woolf, D. K., 18 Mar 2006, In: *Geophysical Research Letters*. 33, 6, p. L06604-L06604 4 p.

Towards a vulnerability assessment of the UK and northern European coasts: the role of regional climate variability

Tsimplis, M. N., Woolf, D. K., Osborn, T. J., Wakelin, S., Wolf, J., Flather, R., Shaw, A. G. P., Woodworth, P., Challenor, P., Blackman, D., Pert, F., Yan, Z. & Jevrejeva, S., 15 Jun 2005, In: *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*. 363, 1831, p. 1329-1358 30 p.

Parametrization of gas transfer velocities and sea-state-dependent wave breaking

Woolf, D. K., Apr 2005, In: *Tellus B*. 57, 2, p. 87-94 8 p.

Waves and climate change in the Sea of the Hebrides

Wolf, J. & Woolf, D. K., 2005, *Proceedings of the Fifteenth (2005) International Offshore and Polar Engineering Conference*. Cupertino: International Society of Offshore and Polar Engineers, p. 100-107 8 p. (Proceedings of the International Offshore and Polar Engineering Conference).

Gas exchange and bubble-induced supersaturation in a wind-wave tank

Bowyer, P. & Woolf, D., Dec 2004, In: *Journal of atmospheric and oceanic technology*. 21, 12, p. 1925-1935 11 p.

Aeration due to breaking waves. Part I: Bubble populations

Graham, A., Woolf, D. K. & Hall, A. J., May 2004, In: *Journal of Physical Oceanography*. 34, 5, p. 989-1007 19 p.

Analysis of the relationship between the North Atlantic oscillation and sea-level changes in northwest Europe

Yan, Z. W., Tsimplis, M. N. & Woolf, D., May 2004, In: *International Journal of Climatology*. 24, 6, p. 743-758 16 p.

Measurements of the offshore wave climate around the British Isles by satellite altimeter

Woolf, D. K., Cotton, P. D. & Challenor, P. G., 15 Jan 2003, In: *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*. 361, 1802, p. 27-31 5 p.

Variability and predictability of the North Atlantic wave climate

Woolf, D. K., Challenor, P. G. & Cotton, P. D., Oct 2002, In: *Journal of Geophysical Research: Oceans*. 107, C10, p. 9-14 14 p.

Bubbles and their role in gas exchange

Woolf, D. K., 1997, *The Sea Surface and Global Change*. Liss, P. S. & Duce, R. A. (eds.). Cambridge, UK: Cambridge University Press, p. 173-206 34 p.

Report Group 1 - Physical processes in the microlayer and the air-sea exchange of trace gases

Liss, P. S., Watson, A. J., Bock, E. J., Jahne, B., Asher, W. E., Frew, N. M., Hasse, L., Korenowski, G. M., Merlivat, L., Phillips, L. F., Schluessel, P. & Woolf, D. K., 1997, *The Sea Surface and Global Change*. Liss, P. S. & Duce, R. A. (eds.). Cambridge University Press, p. 1-33 33 p.

Bubbles and the air-sea transfer velocity of gases

Woolf, D. K., Dec 1993, In: *Atmosphere-Ocean*. 31, 4, p. 517-540 24 p.

Some factors affecting the size distributions of oceanic bubbles

Thorpe, S. A., Bowyer, P. & Woolf, D. K., Apr 1992, In: *Journal of Physical Oceanography*. 22, 4, p. 382-389 8 p.

Bubbles and the air-sea exchange of gases in near-saturation conditions

Woolf, D. K. & Thorpe, S. A., Aug 1991, In: *Journal of Marine Research*. 49, 3, p. 435-466 32 p.

Temperature dependence of the charge and aerosol production associated with a breaking wave in a whitecap simulation tank

Bowyer, P. A., Woolf, D. K. & Monahan, E. C., Jan 1990, In: *Journal of Geophysical Research: Oceans*. 95, C4, p. 5313-5319 7 p.

Comments on "Variations of Whitecap Coverage with Wind stress and Water Temperature"

Monahan, E. C. & Woolf, D. K., May 1989, In: *Journal of Physical Oceanography*. 19, 5, p. 706-709 4 p.

Comprehensive model relating the Marine aerosol population of the atmospheric boundary layer to the bubble population of the oceanic mixed layer

Monahan, E. C. & Woolf, D. K., 1989, *Drops and bubbles: third international colloquium*. Wang, T. G. (ed.). New York: American Institute of Physics, p. 451-457 7 p. (AIP conference proceedings; vol. 197).

Discriminating between the film drops and jet drops produced by a simulated whitecap

Woolf, D. K., Bowyer, P. A. & Monahan, E. C., Jan 1987, In: *Journal of Geophysical Research: Oceans*. 92, C5, p. 5142-5150 9 p.

Marine condensation nucleus generation inferred from whitecap simulation tank results

Cipriano, R. J., Monahan, E. C., Bowyer, P. A. & Woolf, D. K., Jan 1987, In: *Journal of Geophysical Research: Oceans*. 92, C6, p. 6569-6576 8 p.