Daniel Buscombe

Research Geologist,
United States Geological Survey,
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http://dbuscombe-usgs.github.com

Personal Details

Place of Birth: Greenwich, London, UK (3 December 1981)
Nationality: British

Contact Information

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Research Interests

I am a geomorphologist/sedimentologist with a principal research interest in sediment dynamics, which includes the physical and biochemical makeup of sediment beds in a range of aquatic environments, the role of sediment heterogeneity in the physics of sediment transport, and the morphodynamics (both micro- and macro-scale) that result from sediment transport, sedimentation, stratigraphy and geomorphological forms. I study the complex inter-relations between fluid flows, geomorphology, sediment transport and sedimentology. I investigate these processes by developing novel field-deployed optical and acoustic imaging systems, and computational algorithms for small-scale sediment hydroacoustics, in-situ particle and bed imaging and flow-field/turbulence measurements.

Education

Ph.D. (2008), Coastal Geomorphology/Nearshore Oceanography, University of Plymouth, Plymouth, UK. *Morphodynamics, Sediment Dynamics and Sedimentation of a Gravel Beach.* Advisor: Prof. Gerhard Masselink.

BSc (Hons), 1st class (2003), Physical Geography with Minors in Environemntal Sciences and Biology, Lancaster University, Lancaster, UK. *Morphodynamics of a Ridge-and-Runnel System on a Macrotidal Beach.* Advisor: Dr Suzanna Ilic.

Employment History

November 2012 – present. *Research Geologist, Grand Canyon Monitoring and Research Center, U.S. Geological Survey, Flagstaff, AZ, USA.*

October 2009 – November 2012. *Post-doctoral Research Fellow, School of Marine Science & Engineering, University of Plymouth, UK.*

September, 2008 – 2011. *Computer Programming Contractor, Marine Biology & Ecology Research Centre, University of Plymouth, UK.*

October, 2008 – October 2009. *Post-doctoral Research Scholar, United States Geological Survey, Santa Cruz, California, USA.*

June, 2008 – September, 2008. *Research Assistant, School of Geography, University of Plymouth, UK.*

December, 2007 – April, 2008. *Research Assistant, School of Earth, Ocean & Environmental Science, University of Plymouth, UK.*

October, 2004 – July 2008. *Associate Lecturer and Demonstrator (part-time), School of Geography, University of Plymouth, UK.*

August 2003 - September, 2004. *Assistant tutor, Field Studies Council, Castle Head, Grange-over-Sands, UK.*

Professional Activities

Membership

British Society for Geomorphology; International Association of Sedimentologists (IAS); American Geophysical Union (AGU); Coastal Zone Network (COZONE); The Challenger Society for Marine Science.

Journal Review

Arctic; Continental Shelf Research; Earth Surface Processes and Landforms; Geo-Marine Letters; Geophysical Research Letters; Journal of Hydraulic Engineering; Journal of Mountain Science; Journal of Sedimentary Research; Marine Geology; Sedimentology; Sedimentary Geology; Water Resources Research.

Conferences Organised

On the organising committee for:

1 *The Quaternary Research Association's 4th International Postgraduate Symposium*, hosted by the School of Geography at the University of Plymouth 31st August - 2nd September 2005.
2 *Young Coastal Scientist and Engineers Conference, 2007* (YCSEC 2007) hosted by the School of Geography at the University of Plymouth 19-21 April 2007.
3 *American Geophysical Union Fall Meeting*, December 2007: H60. Linking sediment supply, bed-sediment particle size, sediment transport, and bed morphology in fluvial, marine, and aeolian settings. Co-convened with David Rubin (USGS), David Topping (USGS), and Scott Wright (USGS).
4 *American Geophysical Union Fall Meeting*, December 2013: EP010. Fluvial sediment budgets: Can we do better? Co-convened with David Topping (USGS), Paul Grams (USGS), and Susannah Erwin (USGS).

Skills

1 Community models: General Ocean Turbulence Model (GOTM, `http://www.gotm.net/index.php`); Simulating Waves Nearshore (SWAN; `http://www.swan.tudelft.nl/`); Simulating Waves 'til Shore (SWASH; `http://swash.sourceforge.net/features/features.htm`).
2 Linux. High performance and distributed computing.
3 Programming Languages: Python, shell scripting, Matlab (proficient); Fortran (experienced); HTML, C, R (beginner).
4 Full UK driving licence. Arizona State driving licence. LANTRA sit-astride ATV qualification.
5 Other interests: instrument control, machine vision, LaTeX

Selected Publications

Journals

1 **Buscombe, D.**, and Masselink, G. (2006) Concepts in Gravel Beach Dynamics. *Earth Science Reviews* 79, 33-52.
2 Masselink, G., **Buscombe, D.**, Austin, M.J, O'Hare, T., Russell, P. (2008) Sediment Trend Models Fail to Reproduce Small Scale Sediment Transport Patterns on an Intertidal Beach. *Sedimentology* 55, 667-687.
3 Austin, M.J., and **Buscombe, D.** (2008) Morphological Change and Sediment Dynamics of the Beach Step on a Macrotidal Gravel Beach. *Marine Geology* 249, 167-183.
4 **Buscombe, D.** (2008) Estimation of Grain Size Distributions and Associated Parameters from Digital Images of Sediment. *Sedimentary Geology* 210, 1-10.
5 Masselink, G., and **Buscombe, D.** (2008) Shifting gravel: A case study of Slapton Sands. *Geography Review* 22 (1), 27-31.
6 **Buscombe, D.**, and Masselink, G. (2009) Grain Size Information from the Statistical Properties of Digital Images of Sediment. *Sedimentology* 56, 421-438
7 Warrick, J.A., Rubin, D.M., Ruggiero, P., Harney, J., Draut, A.E., and **Buscombe, D.** (2009) Cobble Cam: Grain-size measurements of sand to boulder from digital photographs and autocorrelation analyses. *Earth Surface Processes and Landforms* 34, 1811-1821.
8 Williams, J., Masselink, G., **Buscombe, D.**, Turner, I., Matias, A., Ferreira, O., Meltje, N., Bradbury, A., Albers, T., and Pan, S. (2009) BARDEX (Barrier Dynamics Experiment): taking the beach into the laboratory. *Journal of Coastal Research* SI 56, 158-162.
9 **Buscombe, D.**, Rubin, D.M., and Warrick, J.A. (2010) Universal Approximation of Grain Size from Images of Non-Cohesive Sediment. *Journal of Geophysical Research - Earth Surface* 115, F02015.
10 Williams, J.J., **Buscombe, D.**, Masselink, G., Turner, I., and Swinkels, C. (2012) Barrier Dynamics Experiment (BARDEX): Aims, Design and Procedures. *Coastal Engineering* 63, 3-12.
11 **Buscombe, D.**, and Conley, D.C. (2012) Effective Shear Stress of Graded Sediment. *Water Resources Research* 48, W05506.

12 **Buscombe, D.**, and Rubin, D.M. (2012) Advances in the Simulation and Automated Measurement of Granular Material, Part 1: Simulations. *Journal of Geophysical Research - Earth Surface* 117, F02001.
13 **Buscombe, D.**, and Rubin, D.M. (2012) Advances in the Simulation and Automated Measurement of Granular Material, Part 2: Direct Measures of Particle Properties. *Journal of Geophysical Research - Earth Surface* 117, F02002.
14 Lacy, J.R., Rubin, D.M. and **Buscombe, D.** (2012) Currents and sediment transport induced by a tsunami far from its source. *Journal of Geophysical Research - Oceans* 117, C09028.
15 **Buscombe, D.** (2013) Transferable Wavelet Method for Grain Size-Distribution from Images of Sediment Surfaces and Thin Sections, and Other Natural Granular Patterns. *Sedimentology* 60, 1709–1732. DOI: 10.1111/sed.12049
15 Puleo, J., Blenkinsopp, C., Conley, D., Masselink, G., Turner, I., Russell, P., **Buscombe, D.**, Howe, D., Lanckriet, T., McCall, R., and Poate, T. (2013) A Comprehensive Field Study of Swash-Zone Processes, Part 1: Experimental Design with Examples of Hydrodynamic and Sediment Transport Measurements. *J. Waterway, Port, Coastal, Ocean Eng.*, 140, 2942. 10.1061/(ASCE)WW.1943-5460.0000210.
16 **Buscombe, D.**, Rubin, D.M., Lacy, J.R., Storlazzi, C., Sherwood, C., Hatcher, G., Chezar, H., and Wyland, R.. (2014) Autonomous bed-sediment imaging-systems for revealing temporal variability of grain size. *Limnology and Oceanography: Methods, in press*
17 **Buscombe, D.**, Grams, P.E., Kaplinski, M.A., in review, Characterizing riverbed sediment using high-frequency acoustics 1: Spectral properties of scattering. *Journal of Geophysical Research - Earth Surface*.
18 **Buscombe, D.**, Grams, P.E., Kaplinski, M.A., in review, Characterizing riverbed sediment using high-frequency acoustics 2: Scattering signatures of Colorado River bed sediment in Marble and Grand Canyons. *Journal of Geophysical Research - Earth Surface*.
19 **Buscombe, D.**, Grams, P.E., Smith, S., in prep., An automated approach to riverbed sediment classification using low-cost sidescan sonar. Intended for *Earth Surface Processes and Landforms*.
20 Davies, E.J., **Buscombe, D.**, Graham, G.W., Nimmo-Smith, W.A.M., (in prep.), An evaluation of the performance of autonomous digital holographic image processing for characterising suspended particles, Intended for *Journal of Atmospheric & Oceanographic Technology*.

International Conferences

1 **Buscombe, D.**, Austin, M.J., and Masselink, G. (2007) Field observations of step dynamics on a macrotidal gravel beach. In Kraus, N., and Rosati, J., (Eds) *Proceedings of Coastal Sediments 2007 (Volume 1)*, ASCE, USA (oral).
2 **Buscombe, D.**, and Masselink, G. (2007) The relationship between sediment properties and sedimentation patterns on a macrotidal gravel beach over a semi lunar tidal cycle. *Eos Transactions American Geophysical Union Fall Meeting*, Abstract H53L-02 (oral).
3 **Buscombe, D.**, Masselink, G., and Rubin, D.M. (2008) Granular Properties from Digital Images of Sediment: Implications for Coastal Sediment Transport Modelling. *International Conference on Coastal Engineering (ICCE)*, Hamburg, 2008 (oral).
4 Ruiz de Alegria, A., Masselink, G., Kingston, K., Williams, J., and **Buscombe, D.** (2008) Storm Impacts on a Gravel Beach Using the ARGUS video system. *International Conference on Coastal Engineering (ICCE)*, Hamburg, 2008 (oral).
5 Austin, M.J., Masselink, G., Turner, I., **Buscombe, D.**, and Williams, J. (2008) Groundwater seepage between a gravel barrier beach and a freshwater lagoon. *International Conference on Coastal Engineering (ICCE)*, Hamburg, 2008 (oral).
6 **Buscombe, D.**, Ruiz de Alegria, A., and Masselink, G. (2008). The relative importance of cross- and along-shore sediment transport in planform and profile adjustments of a gravel barrier beach: Slapton, Devon, UK. *American Geophysical Union Fall Meeting*, San Francisco, Dec 2008 (poster).
7 Williams, J.J., Masselink, G., **Buscombe, D.**, and 7 others (2009). BARDEX (Barrier Dynamics Experiment): taking the beach into the laboratory. Abstract submitted for oral presentation at the *10th International Coastal Symposium (ICS)*, Lisbon, Portugal 2009 (oral).
8 **Buscombe, D.** Lacy, J.R., and Rubin, D.M. (2010) Fractional resuspension and sediment flux on a wave-dominated, non-cohesive, inner continental shelf. *Ocean Sciences 2010*, Portland (poster)
9 Rubin, D.M., **Buscombe, D.**, Lacy, J.R., Chezar, H., Hatcher, G., and Wyland, R. (2010) Seafloor sediment observatory on a cable and a shoestring. *Ocean Sciences 2010*, Portland (oral)
10 **Buscombe, D.**, and Conley, D.C. (2010) Modeling sand resuspension and stratification in turbulent nearshore flows: sensitivity to grain size distribution. *Ocean Sciences 2010*, Portland (oral)
11 Lacy, J.R., **Buscombe, D.**, and Rubin, D.M. (2010) Tsunami-enhanced sediment resuspension on the inner shelf in northern Monterey Bay, California. *Ocean Sciences 2010*, Portland (oral)
12 Conley, D.C., and **Buscombe, D.** (2010) Effects of Grain Size Distributions on Fluid-Sediment Feedback. *European Geosciences Union General Assembly 2010*, Vienna (oral)
13 **Buscombe, D.**, Rubin, D. M., and Warrick, J. A. (2010) An automated and 'universal' method for measuring mean grain size from a digital image of sediment. *9th Federal Interagency Sedimentation Conference*, Las Vegas June 2010 (oral).
14 Rubin, D.M., Chezar, H., **Buscombe, D.**, Warrick, J.A., Barnard, P.L., Lacy, J.R., Hatcher, G., Wyland, R., Storlazzi, C., Conaway, C.H., Topping, D.J., Melis, T.S., and Grams, P.E. (2010) New technology for in-situ grain-size analysis from digital images of sediment, and resulting insights regarding sediment transport. *9th Federal Interagency Sedimentation Conference*, Las Vegas June 2010 (oral).
15 **Buscombe, D.**, Rubin, D.M., and Lacy, J.R. (2010) Hourly Measurements of Grain-Size from the Inner Continental Shelf Seabed Using a Fully-Automated, Hydraulically-Controlled Underwater Video Microscope. *Particles in Europe 2010*, Villefranche-Sur-Mer, France. (oral)
16 Williams, J.J., Masselink, G., **Buscombe, D.**, and 10 others (2010) BARDEX (Barrier Dynamics Experiments):

a laboratory study of gravel barrier response to waves and tides. *Proceedings of Hydralab III Joint User Meeting*, Hannover, p. 4 (oral)

17 **Buscombe, D.**, and Conley, D.C. (2011) Formula for Motion Threshold per Grain Size for Graded Sediments in Steady Flows. *European Geosciences Union General Assembly 2011*, Vienna (poster).

18 **Buscombe, D.**, and Rubin, D.M. (2011) How do you tell how big something is without direct measurement? Estimating grain size using an images spectrum. *American Geophysical Union Fall Meeting*, San Francisco, Dec 2011 (oral).

19 Conley, D.C., **Buscombe, D.**, and Nimmo-Smith, A. (2012) New understandings of sediment suspension in the nearshore from cross-comparisons of diverse sensors. *Ocean Sciences 2012*, Salt Lake City (poster).

20 **Buscombe, D.**, Conley, D.C., and Rubin, D.M. (2012, accepted) Co-variation of intertidal morphology, bedforms and grain size on a macrotidal sand beach: Praa Sands, UK. *Ocean Sciences 2012*, Salt Lake City (oral).

21 Puleo, J.A., Conley, D.C., Masselink, G., Russell, P., Turner, I.L., Blenkinsopp, C., **Buscombe, D.**, Lanckriet, T., McCall, R., and Poate, T. (2012) Comprehensive study of swash-zone hydrodynamics and sediment transport. *International Conference on Coastal Engineering*, Santander, July 2012 (oral).

22 **Buscombe, D.**, and Conley, D.C. (2012) Schmidt number of sand suspensions under oscillating-grid turbulence. *International Conference on Coastal Engineering*, Santander, July 2012 (oral).

23 Conley, D.C., **Buscombe, D.**, and Nimmo-Smith, A. (2012) Use of digital holographic cameras to examine the measurement and understanding of sediment suspension in the nearshore. *International Conference on Coastal Engineering*, Santander, July 2012 (oral).

24 Nimmo-Smith, A., **Buscombe, D.**, and Conley, D.C. (2012) Use of digital holographic cameras to examine the measurement and understanding of sediment suspension in the nearshore. *Particles in Europe*, Barcelona, October 2012 (oral).

25 Kaplinski, M.A., Hazel, J.E., Grams. P.E., **Buscombe, D.**, Hadley, D., and Kohl. K. (2013) Constructing a morphologic sediment budget, with uncertainties, for a 50-km segment of the Colorado River in Grand Canyon. *American Geophysical Union Fall Meeting*, San Francisco, Dec 2013 (poster).

26 Grams. P.E., **Buscombe, D.**, Hazel, J.E., Kaplinski, M.A., and Topping, D.J. (2013) Reconciliation of Flux-based and Morphologic-based Sediment Budgets. *American Geophysical Union Fall Meeting*, San Francisco, Dec 2013 (oral).

27 **Buscombe, D.**, Grams. P.E., Kaplinski, M.A. (2013) Acoustic Scattering by an Heterogeneous River Bed: Relationship to Bathymetry and Implications for Sediment Classification using Multibeam Echosounder Data. *American Geophysical Union Fall Meeting*, San Francisco, Dec 2013 (oral).

28 Davies, E.J., **Buscombe, D.**, Graham, G., Nimmo Smith, W.A.M. (2013) Evaluating Unsupervised Methods to Size and Classify Suspended Particles Using Digital Holography *American Geophysical Union Fall Meeting*, San Francisco, Dec 2013 (poster).

29 Rubin, D., Topping, D., Grams, P., Tusso, R., Schmidt, J., **Buscombe, D.**, Melis, T., Wright, S. (2014) What sediment grain size reveals about suspended-sediment transport in the Colorado River in Grand Canyon. *International Conference on the Status and Future of the World's Large Rivers*, Brazil (oral).

30 Grams. P.E., **Buscombe, D.**, Hazel, J.E., Kaplinski, M.A., and Topping, D.J. (2015, submitted) Reconciliation of Flux-based and Morphologic-based Sediment Budgets. *10th Federal Interagency Sedimentation Conference*, Reno, April 2015.

31 **Buscombe, D.**, Grams. P.E., Kaplinski, M.A. (2015, submitted) Hydroacoustic signatures of Colorado riverbed sediments in Marble and Grand Canyons using multibeam sonar. *10th Federal Interagency Sedimentation Conference*, Reno, April 2015.

32 **Buscombe, D.**, Grams. P.E., Melis, T.S., Smith, S. (2015, submitted) Considerations for unsupervised riverbed sediment characterization using low-cost sidescan sonar: Examples from the Colorado River, AZ and the Ponobscot River, ME. *10th Federal Interagency Sedimentation Conference*, Reno, April 2015.

Reports

1 **Buscombe, D.**, and Scott, T.M. (2008) *Coastal Geomorphology of North Cornwall: St Ives to Trevose Head*. Internal report for Wave Hub Impacts on Seabed and Shoreline Processes, University of Plymouth. 170pp.

2 **Buscombe, D.**, Williams, J. J., and Masselink, G. (2008) *BARDEX (Barrier Dynamics Experiment): experimental procedure, technical information and data report*. Technical report for the European Union Hydralab III, 219pp.

Software

1 **Digital Grain Size.** Software for automated analyses of grain size from images of sediment. Source code currently available in Matlab and Python. Webpage `http://dbuscombe-usgs.github.com`

2 **PyHum.** Software for reading, processing and analysis of Humminbird sidescan data. Source code available in Python. Webpage `http://dbuscombe-usgs.github.com`

3 **Benthic Analysis Tool.** Software for the semi-automation of species identification and measurement in deep-sea ROV/drop frame images. Source code available in Matlab.

4 **Sand Simulation Toolbox.** Software for generating 3D discrete particle models consisting of realistic particles (with a size- and shape-distribution) with user-defined properties. Source code available in Matlab. Webpage `http://dbuscombe-usgs.github.com`

5 **MATSCAT.** Software for analysis of multiple-frequency acoustic backscatter for suspended sediment concentration and particle size. Source code available in Matlab.

6 Generic software for serial data acquisition and real-time display. Source code available in Python.

7 Software for interfacing with machine-vision ethernet video cameras. Source code available in C.

Invited Talks

1 *Slapton Research Seminar, Field Studies Council, Slapton Ley*, 4th December 2004. Talk entitled 'A tale of two storms'.

2 *Slapton Research Seminar, Field Studies Council, Slapton Ley*, 18th November 2006. Talk entitled 'A view from the beach'

3 *Centre for Coastal Dynamics and Engineering (C-CoDE)*, University of Plymouth, 6th December 2006. Talk entitled 'Field observations of morphological change and sediment dynamics from the nearshore of a gravel beach'

4 *Slapton Research Seminar, Field Studies Council, Slapton Ley*, 3rd November 2007. Talk entitled 'A year in the life of Slapton Sands - but was it a typical year?' with Tom Deacon (SLFC).

5 *Lancaster University Environmental Imaging Network*, 20th May 2008. Talk entitled 'Optical sensing of gravel sediment transport and characteristics: recent advances and future challenges'.

6 *Coastal and Marine Geology, United States Geological Survey, Santa Cruz*, 28th January 2009. Talk entitled 'Morphodynamics and sediment dynamics of a macrotidal gravel beach'.

7 *Centre for Coastal Science and Engineering, University of Plymouth*, 17th February 2009. Talk entitled 'Turbulence, Sediment Stratification and Altered Resuspension under Waves'.

8 *Grand Canyon Monitoring and Research Center, Flagstaff, Arizona*, 27th February 2012. Talk entitled 'Nearshore Sediment Transport Through the Looking Glass'.

9 *British Geological Survey, Marine Geosciences Division, Edinburgh*, 13th July 2012. Talk entitled 'Digital Grain Size'.

10 *Multibeam in Rivers Summit, Utah State University, Logan, Utah*, February 2014. Talk entitled 'Bed Sediment Classification Using High-Frequency Acoustic Backscatter'.