Dr. Robert Sparkes

CONTACT INFORMATION

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RESEARCH INTERESTS

Permafrost in a changing climate; Carbon cycle-climate feedbacks; Transport, burial and degradation of organic matter; Extreme event processes and consequences

ACADEMIC EMPLOYMENT

Manchester Metropolitan University **01.2016 - Present**

Lecturer in Environmental Science

Division of Chemistry and Environmental Science

Responsibilities:

- Establishing laboratory capabilities for organic biomarker extraction and analysis
- Developing inter-disciplinary collaborations using Raman Spectropscopy

Highlights:

- Successfully applied for start-up research funding

University of Manchester **03.2012 - 12.2015**

Post-Doctoral Research Associate

NERC grant NE/I024798/1 (03.2012 - 06.2015) P.I. Bart van Dongen
Effects of a warming climate on key organic carbon cycle processes in the Eurasian Arctic

Responsibilities:

- Investiging the impacts of climate change on Siberian permafrost carbon.
- Separating, identifying and quantifying molecular biomarkers using Liquid Chromatography- and Gas Chromatography-Mass Spectrometry.
- Developing a bespoke computer model to investigate the distribution of soil carbon in marine sediments across the East Siberian Arctic Shelf.
- Training users in a variety of techniques, including (pyrolysis)-GC-MS, Raman Spectroscopy and Infra-Red Spectroscopy.
- Managing laboratory Health, Safety and Environmental considerations via the Green Impact Award scheme.
- First point-of-contact for laboratory users, providing advice and technical support
- Managing project deliverables, liasing with international collaborators, reporting outcomes to funders.

Highlights:

- Produced the first large-scale dataset for GDGT biomarkers on the East Siberian Shelf.
- Two articles published in high-level journals, many more in preparation.
- Founding member of the "Cryosphere Research At Manchester" inter-departmental research group.

EPSRC grant EP/N00583X/1 (10.2015 - 12.2015) P.I. Alice Bows-Larkin
Water Energy Food: STEPPING UP

Responsibilities:

- Identifiying case-studies for upscaling water, energy and food sustainability ideas
- Co-ordinating communication between project partners in eight research institutions
- Designing and creating a project website

Highlights:

- Launched project website, ran Twitter account
- Assisted in designing and implementing data management strategy

University of East Anglia **07.2007 - 08.2007**

Visiting Fellow

Nuffield Undergraduate Research Bursary - Response of European groundwater resources in a changing climate

Responsibilities:

- Characterised the groundwater flow conditions of major European rivers.
- Used climate model results to predict the impacts of climate change on future groundwater resources.

Highlights:

- Showed how a changing climate will lead to severe drought in Southern Europe
- Published a well-received book chapter and several conference presentations

Education

University of Cambridge, Cambridge, UK

Ph.D., Materials Science **10.2008 - 03.2012**

Thesis Topic: *Marine Sequestration of Particulate Organic Carbon from Mountain Belts*
Supervisors: Vasant Kumar, Niels Hovius
Areas of Study: Materials chemistry, isotope geochemistry, surface processes, marine sedimentology, carbon cycling and burial

Responsibilities:

- Collected samples from ancient and modern marine sedimentary systems and analysed using a range of geochemical techniques.
- Characterised organic carbon particles using Raman Spectroscopy and Isotope Ratio Mass Spectrometry.
- Combined multi-disciplinary measurements to discover the sources of carbon in marine sediments.
- Managed project deliverables, large datasets and interacted with multi-national partners.

Highlights:

- Showed that large amounts of carbon are naturally sequestered in marine sediments following extreme weather events.
- Developed automated analysis software now implemented around the world.
- Four articles published, one submitted, more in preparation.
- Invited to talk at international conferences and seminars.

M.Sci, Natural Sciences (Geological Sciences) **10.2007 - 06.2008**

1^{st} Class Honours
Project Title: *What Makes Great Subduction Earthquakes Stop?*
Supervisors: Frederik Tilmann, John Hillier, Niels Hovius

Responsibilities:

- Investigated the cause of rupture termination in great ($M_w > 8.0$) earthquakes along the South American margin.
- Showed that there is a significant link between large subducted topography and the end-point of great earthquakes.
- Modelled earthquakes, using a Monte Carlo simulation, to test hypothesis

Highlights:

- One highly-cited first-author publication linking seamounts and earthquakes
- Several international conference presentations

B.A., Natural Sciences (Geological Sciences) **10.2004 - 06.2007**

1^{st} Class Honours
Project Title: *A Geological Study of the Vourinos Ophiolite*
Supervisor: Alan Smith

Teaching

Manchester Metropolitan Univeristy

Lecturer **01.2016 - Present**

- Unit co-ordinator for "Natural Resources and Pollution" 2016-2017.
- Demonstrated on field trips and in laboratory sessions.
- Devised new courses as part of the course review

University of Manchester

Sabbatical Cover Lecturer **01.2015 - 06.2015**

- Course-leader for "Organic Geochemistry" (EART30642).
- Co-convenor for "Global Environmental Change" (EART60492).
- Guest lecturer for "Reservoir and Production Chemistry" (EART20302).
- Delivered lectures and practical classes for undergraduate and PhD students.
- Set, marked and provided feedback for coursework and examinations.
- Introduced interactive teaching methods to enhance lecture material (e.g. smartphone-based quiz platform "Kahoot!").
- Received positive feedback from students and staff: "great explanations"; "very engaging"; "very accessible and clear".

Laboratory Demonstration **09.2012 - 06.2015**

- Supervised undergraduate project: demonstrated and supervised laboratory work; carried out mass spectrometry; assisted with data analysis.
- Provided co-supervision and technical assistance for PhD students and visiting researchers.

Field Demonstration **04.2014**

- Demonstrated on Liverpool Bay field course (EART10952).

University of Cambridge

Tutorial Teaching **10.2008 - 06.2011**

- Independently devised material for and taught small groups of first- and second-year undergraduates.
- Up to 12 students per year, seen weekly as groups of two or three, including courses in Geochemistry, Structural Geology, Sedimentology, Geophysics, and Petroleum Geology

Laboratory Demonstration **10.2008 - 06.2011**

- Teaching up to 30 first- and second-year undergraduates in all aspects of Earth Sciences.
- Head-of-class for a course on GIS, teaching spatial analysis and digital map-making to students with no prior experience. Provided follow-up technical assistance during project work.
- Head-of-class for a hands-on sedimentology session investigating bedforms and fluid flow.

Field Demonstrator **10.2008 - 10.2011**

- Responsibilities have included leading groups on hikes, summarising and explaining outcrops, fieldwork safety and first-aid training, and devising a GPS-based mapping demonstration.
- Developed a digital map to complement students' paper-based mapping exercises.

Student mentor **01.2008 - 06.2008**

- Small-group teaching with first-year undergraduates, especially focussed on strengthening practical skills.

Technical Expertise

Expert-level skills in a wide range of techniques. Responsibilities include maintenance, troubleshooting, method development and user-training.

- Gas Chromatography Mass Spectrometry, including pyrolysis
- Liquid Chromatography Mass Spectrometry
- Elemental Analysis - Isotope Ratio Mass Spectrometry
- Raman Spectroscopy
- Organic chemical extraction, separation and purification
- Statistical analysis
- Computer modelling

User-level skills in:
- Thermogravimetric Analysis
- Fourier Transform Infra-Red Spectroscopy
- Optical grainsize analysis
- Scanning Electron Microscopy
- X-ray diffraction

Field Techniques: Geological Mapping (hand-written and digital), field sedimentology, sample collection, fieldwork safety training undertaken.

Technical Software

ArcGIS, GMT (Generic Mapping Tools), Agilent Chemstation, GNUPlot, Origin, GNUOctave (MATLAB), R.

Programming Experience: Shell scripting, Excel, LaTeX, Python, HTML, CSS.

Impact and Outreach

University of Manchester **06.2013 - 06.2015**

Organised

- Developed a multimedia exhibit for "Siberia: At The Edge Of The World" at the Manchester Museum, attracting 120,000 visitors.
- Designed and delivered a "Big Saturday" hands-on event at the Manchester Museum with 1100 participants.
- Co-presented a video discussion about Siberia for a Massive Open Online Course.
- Set-up scientific outreach blog "Defrosting the Freezer" to communicate Arctic research to the general public. 35,000 visitors last year.

Delivered

- Group leader for a primary school outreach event, teaching soil science.

University of Cambridge **2007 - 2009**

Schools Officer and Demonstrator for "The Time Truck"

- Student-run outreach programme using hands-on geological and palaeontological exhibits to inspire primary-school children.
- Arranged the visit schedule for Science Week 2008, and was group-leader for one visit.
- Station leader for sedimentology practical during "Time Truck at the Sedgwick Museum"

Funding

ESRC Research Fund **01.2016**
- Start-up funding to establish a BHP analysis facility at MMU
- Award value £3230

MMU Jobs4Students **01.2016**
- Raman spectroscopy study of the East Siberian Arctic Shelf
- Award value £2000

SEAES Research Fund **12.2014**
- Travel grant awarded to develop an international collaboration in preparation for grant proposals
- Award value £325

NERC Life Sciences Mass Spectrometry Facility **11.2014**
- LSMSF proposal "Coupled pyrolysis-GC-IRMS of macromolecular material to investigate a terrestrial marine transition across the East Siberian Shelf"
- Award value £7967

Engineering and Physical Sciences Research Council **10.2008 - 03.2012**
- PhD Studentship, University of Cambridge

Nuffield Foundation **07.2007 - 08.2007**
- Nuffield Undergraduate Research Bursary
- Award value £1360

Awards

Postgraduate Research Conference, School of Earth, Atmospheric and Environmental Sciences, University of Manchester
- 1st Place Poster Prize, 2012

Department of Materials Science and Metallurgy, University of Cambridge
- Poster Prize, 2011

Downing College, University of Cambridge
- Unwin Scholarship, 2006
- Unwin Scholarship, 2007
- Whitlegg Scholarship, 2008
- Travel grants 2006, 2008

Positions of Responsibility

SEAES Faculty Researcher Development Ambassador **07.2013 - 06.2015**
- Arranged regular career-support sessions for Post-Doctoral researchers.
- Interacted with faculty- and university-level administrators to discuss issues relevant to the school and to pass on feedback from user surveys.
- Active role on school's Research Committee, interacting with senior management.
- Initiated, developed, implemented and judged departmental "Post Doctoral Researcher of the Year" award.

Downing College, University of Cambridge
- 2010 MCR (graduate community) Vice President
- 2009 MCR (graduate community) Social Secretary
- 2006-2007 Lacrosse Captain - league and cup winners

Professional Memberships

- Mineralogical Society
- British Organic Geochemistry Society
- Qualified English Lacrosse Umpire

Referees

Bart van Dongen
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PUBLICATIONS Total 178 citations, h-index = 6 (Google Scholar record: pEw9TpYAAAAJ)

2016 Lindgren, P., Lee, M.R., King, A.J., Greenwood, R.C., Franchi, I.A., and **Sparkes, R.B.**, *2016.* Elephant Moraine 96029, a CM carbonaceous chondrite that is very mildly aqueously altered, heated and unshocked: implications for understanding the drivers of parent body processing. *Geochimica et Cosmochimica Acta.*

Turowski, J.M., Hilton, R.G., and **Sparkes, R.B.**, *2016.* Decadal carbon export from a mountain stream dominated by coarse organic matter. *Geology.* 2 citations

2015 **Sparkes, R.B.**, Doğrul Selver, A., Bischoff, J., Talbot, H.M., Gustaffson, Ö., Semilitov, I.P., Dudarev, O.V., and van Dongen, B.E., *2015.* GDGT distribution in the East Siberian Sea: implications for organic carbon export, burial and degradation. *Biogeosciences.* 3 citations

Sparkes, R.B., Lin, I-T., Hovius, N., Galy, A., Liu, J-T., Xu, X. and Yang, R., *2015.* Redistribution of multi-phase particulate organic carbon in a marine shelf and canyon system during an exceptional river flood: effects of Typhoon Morakot on the Gaoping River system. *Marine Geology.* 2 citations

Doğrul Selver, A., **Sparkes, R.B.**, Bischoff, J., Talbot, H.M., Boult, S., Gustaffson, Ö., Semilitov, I.P., Dudarev, O.V., and van Dongen, B.E., *2015.* Distributions of bacterial and archaeal membrane lipids in surface sediments along a cross-shelf transect in central East Siberian Sea. *Organic Geochemistry.* 13 citations

2014 Kao, S-J., Hilton, R.G., Selvaraj, K., Dai, M., Zehetner, F., Huang, J-C., Hsu, S-C., **Sparkes, R.B.**, Liu, J.T., Lee, T-Y., Yang, J-YT., Galy, A., Xu, X., and Hovius, N., *2014.* Preservation of terrestrial organic carbon in marine sediments off shore Taiwan: mountain building and atmospheric carbon dioxide sequestration. *Earth Surface Dymanics.* 21 citations.

2013 **Sparkes, R.B.**, Kumar, R.V., Hovius, N. and Galy, A., *2013.* Automated analysis of carbon in powdered geological and environmental samples by Raman Spectroscopy. *Applied Spectroscopy*. 5 citations.

2012 **Sparkes, R.B.** *2012.* Marine sequestration of particulate organic carbon from mountain belts *PhD thesis, University of Cambridge*. 6 citations.

2011 West, A.J., Lin, C-W., Lin, T-C., Hilton, R.G., Tanaka, M., Chang, C-T., Lin, K-C., Galy, A., **Sparkes, R.B.**, and Hovius, N., *2011.* Storm-triggered transport of coarse woody debris to the oceans. *Limnology and Oceanography*. 67 citations.

Hiscock, K., **Sparkes, R.B.**, and Hodgson, A, *2011.* Evaluation of future climate change impacts on European groundwater resources. In *Climate Change Effects on Groundwater Resources: A Global Synthesis of Findings and Recommendations*. 14 citations.

Hovius, N., Galy, A., Hilton R.G., **Sparkes, R.B.**, Smith, J.C., Kao, S-J., Chen, H., Lin, I-T., and West, A.J., *2011.* Erosion-driven drawdown of atmospheric carbon dioxide: The organic pathway. *Applied Geochemistry.* 7 citations.

2010 **Sparkes, R.B.**, Tilmann, F.J., Hovius, N., and Hillier, J.K., *2010.* Subducted seafloor relief stops rupture in South American great earthquakes: Implications for rupture behaviour in the 2010 Maule, Chile earthquake *Earth and Planetary Science Letters*. 34 citations.

PUBLICATIONS IN PREP/REVIEW: Bischoff, J., **Sparkes, R.B.**, Doğrul Selver, A., Spencer, R.G.M., Gustaffson, Ö., Semilitov, I.P., Dudarev, O.P., Wagner, D., Rivkina, E., van Dongen, B.E., and Talbot, H.M., *in review.* Source, transport and fate of soil organic matter inferred from microbial biomarker lipids on the East Siberian Arctic Shelf. *Published in Biogeosciences Discussions.*

Sparkes, R.B., Doğrul Selver, A., Talbot, H.M., Gustaffson, Ö., Semilitov, I.P., Haghipour, N., Wacker, L., Eglinton, T.I., Talbot, H.M., and van Dongen, B.E., *in review.* Macromolecular composition of terrestrial and marine organic matter in sediments across the East Siberian Arctic Shelf. *Published in The Cryosphere Discussions.*

COMMUNICATIONS (SELECTED)

van Dongen, B.E., **Sparkes, R.**, Doğrul Selver, A., Bischoff, J., Gustaffson, Ö., Semilitov, I.P., Vonk, J., Spencer, R., and Talbot, H.M., Using Microbial Biomarker Signature from Permafrost Environments as Markers for Terrestrial Transport Across the East Siberian Arctic Shelf, *International Meeting on Organic Geochemistry, 2015.*

Sparkes, R., Land-Ocean carbon transfer: mountain belts, Siberia and beyond, *SUERC, East Kilbride, 2015.*

Sparkes, R., Doğrul Selver, A., Bischoff, J., Talbot, H.M., and van Dongen, B.E., Modelling OC and biomarker export and degradation in Siberia *Bristol University, 2014.*

Sparkes, R., Doğrul Selver, A., Bischoff, J., Talbot, H.M., Gustaffson, Ö., Semilitov, I.P., Dudarev, O.V., and van Dongen, B.E., GDGT distribution across the East Siberian Shelf, *Gordon Research Conference - Organic Geochemistry, 2014.*

Sparkes, R., Doğrul Selver, A., Bischoff, J., Gustaffson, Ö., Semilitov, I.P., Dudarev, O.V., Talbot, H.M., and van Dongen, B.E., Terrestrial organic carbon and biomarker export from East Siberian Permafrost to the Arctic Ocean, *Goldschmidt, 2014.*

Sparkes, R., Doğrul Selver, A., Bischoff, J., Talbot, H.M., Gustaffson, Ö., Semilitov, I.P., Dudarev, O.V., and van Dongen, B.E., GDGT distribution across the East Siberian Shelf, *British Organic Geochemical Society, 2014.*

Sparkes, R., Doğrul Selver, A., Bischoff, J., Talbot, H.M., and van Dongen, B.E., Biomarkers on the East Siberian Shelf *University of Manchester, 2014.*

Sparkes, R., Doğrul Selver, A., Bischoff, J., Talbot, H.M., Gustaffson, Ö., Semilitov, I.P., Dudarev, O.V., and van Dongen, B.E., GDGT distribution across the East Siberian Shelf, *GDGT Workshop, Texel, Netherlands, 2014.*

Sparkes, R., Doğrul Selver, A., Bischoff, J., Talbot, H.M., and van Dongen, B.E., Organic carbon cycling in Arctic permafrost *Newcastle University, 2014.*

Sparkes, R., Doğrul Selver, A., Bischoff, J., Talbot, H.M., Gustaffson, Ö., Semilitov, I.P., Dudarev, O.V., and van Dongen, B.E., Soil Biomarker Distribution Across The East Siberian Shelf A Story Of Carbon Liberation, Distribution And Degradation, *International Meeting on Organic Geochemistry, 2013.*

Sparkes, R., Hovius, N., Galy, A., and van Dongen, B.E., Applications of Raman Spectroscopy: A Rapid, Automated, Non-Destructive Tool for Identifying and Tracking Organic Matter, *International Meeting on Organic Geochemistry, 2013.*

Sparkes, R., Doğrul Selver, A., Bischoff, J., Talbot, H.M., Gustaffson, Ö., Semilitov, I.P., Dudarev, O.V., and van Dongen, B.E., Soil Biomarker Distribution Across The East Siberian Shelf, *British Organic Geochemical Society, 2013.*

Sparkes, R., Hovius, N. and Galy, A., Extreme events leading to carbon sequestration: The erosion and submarine burial of organic carbon from mountain belts, invited talk, *University of Manchester, 2012.*

Sparkes, R., Galy, A., Hovius, N., and Kumar, R.V., Preservation of Particulate Organic Carbon from an active mountain belt in offshore sediments, *British Organic Geochemical Society, 2012.*

Sparkes, R., Hovius, N., Galy, A., Kumar, R.V., and Beyssac, O., Automated processing of Raman spectra from organic carbon to investigate sedimentary processes, *EGU, 2012.*

Sparkes, R., Kumar, R.V., Hovius, N., Galy, A., Beyssac, O., and Liu, J.T., Characterisation of sedimentary carbon using Raman Spectroscopy, *Euromat, 2011.*

Sparkes, R., Hovius, N., Galy, A., Kumar, R.V., and Liu, J.T., Preservation of Particulate Organic Carbon from an active mountain belt in shallow marine sediments, *International Meeting on Organic Geochemistry, 2011.*

Sparkes, R., Hovius, N., Galy, A., Kumar, R.V., and Liu, J.T., Particulate Organic Carbon Deposition Offshore Taiwan Following Typhoon Morakot, *Goldschmidt, 2011.*

Sparkes, R., Tilmann, F., Hovius, N., and Hillier, J., Subducted sea floor relief stops rupture in South American great earthquakes: Implications for rupture behaviour in the 2010 Maule, Chile earthquake, *BGA New Advances in Geophysics, 2011.*

Sparkes, R., Hovius, N., Galy, A., Liu, J.T., Kumar, R.V., and West, A.J., Transfer and Storage of Particulate Organic Carbon during typhoon Morakot flood event in Western Taiwan, *International Conference on Carbon Cycles, Biological Pumping and CO2 Sequestration in Coastal Oceans, 2010.*

Sparkes, R., Hovius, N., Galy, A., Liu, J.T., Kumar, R.V., and West, A.J., Transfer and Storage of Particulate Organic Carbon during typhoon Morakot flood event in Western Taiwan, *American Geophysical Union - Western Pacific Meeting, 2010.*

Sparkes, R., various invited talks, Department of Materials Science and Metallurgy, University of Cambridge, UK *June 2009, February 2010, December 2010, June 2011.*

Sparkes, R., various invited talks, *University of Cambridge, 2010, 2011.*

Sparkes, R., invited talk, *National Cheng Kung University, Taiwan, 2009.*

Sparkes, R., invited talk, *National Sun Yat-Sen University, Taiwan, 2009.*

Sparkes, R., Tilmann, F., Hovius, N., and Hillier, J., Subduction of high seafloor topography restricts great earthquake rupture, *European Geosciences Union, 2009.*

Sparkes, R., Tilmann, F., Hillier, J., and Hovius, N., Topographic controls on the rupture area of great subduction earthquakes, *European Geosciences Union, 2008.*

Hovius, N., Galy, A., Calmels, D., Meunier, P., Hilton, R., Bickle, M., West, J., Chen, H., and **Sparkes, R.**, Erosion and Weathering in Taiwan, *Goldschmidt, 2009.*

Hiscock, K., **Sparkes, R.**, Hodgson, A., Martin, J.L., Taniguchi, M., Evaluation of future climate change impacts in Europe on potential groundwater recharge, *European Geosciences Union, 2008.*