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Dr Sebastian Watt DPhil

NERC Research Fellow

School of Geography, Earth and Environmental Sciences (/schools/gees/index.aspx)

Contact details

Email s.watt@bham.ac.uk (mailto:s.watt@bham.ac.uk)

School of Geography, Earth and Environmental Sciences
University of Birmingham
Edgbaston
Birmingham
B15 2TT
UK

About

Dr Watt's research investigates the physical and chemical processes that control the behavior and long-term development of volcanoes. Most of this work focuses on volcanism in subduction zones. Current projects include tephrochronological reconstructions of past explosive eruptions, studies of large-scale volcanic landslides and their associated hazards, and the chemistry and evolution of monogenetic volcanic systems.

Qualifications

BA MSci (2006) – University of Cambridge, Natural Sciences (Physical/Geological)
DPhil (2010) – University of Oxford, Department of Earth Sciences

Biography

2006-2010 DPhil, Oxford University Department of Earth Sciences

2010-2011 Postdoctoral Fellow in Geophysics, University of Southampton

2011-2014 NERC Postdoctoral Research Fellow (U. Southampton/U. Birmingham)

Awards

2014 EGU Arne Richter Award

Postgraduate supervision

Those interested in postgraduate research are encouraged to contact me via email to discuss potential projects and opportunities. Projects in topics covering volcanology and igneous petrology are also advertised on the School of Geography, Earth and Environmental Sciences web page.

Research

Research interests

- Tephrochronology and long-timescale volcanic eruption records
- Volcanic edifice collapse, landslide processes and associated hazards
- Feedbacks between volcanic construction/destruction and magmatic processes, and the influence of external (e.g. climatic) processes on volcanism.
- Mafic and monogenetic arc volcanism
- Environmental impacts of volcanic eruptions
- The application of statistical methods to geological datasets

Current Projects

Volcanic flank collapse: diversity of behaviour, hazard generation and controls on volcano evolution (NERC Postdoctoral Fellowship *NE/I02044X/1*). This project explores the processes involved during the collapse of volcanic edifices. Volcano instability can generate extremely large landslides (among the largest on Earth). Although these are rare, they can cause widespread devastation to the surrounding region, and on volcanic islands these events may generate large tsunamis. This project aims to improve our understanding of the controls on the magnitude of collapse and subsequent landslide behaviour, and to also explore how edifice destruction, which removes a large load from above the magma storage system, may impact the subsequent eruptive behaviour of a volcano. Current results suggest that large-scale collapse plays a key role in the long-term evolution of volcano behaviour, and such events can thus be used to understand why the style and type of activity at a volcano changes through time, and to obtain clearer insights into volcano plumbing systems. This project combines field studies in Chile, Mexico and Montserrat with geophysical modelling of magma storage systems.

Emplacement dynamics of debris avalanches and submarine landslides at Soufrière Hills volcano, Montserrat (NERC New Investigator Grant *NE/K000403/1*). This project specifically investigates landslide processes around the island of Montserrat. Recent results have shown that multiple large collapses have occurred on Montserrat in the past. Several of these occurred in multiple stages, reducing the overall magnitude of associated tsunamis. This project seeks to improve our understanding of landslide emplacement, by combining geophysical data with analyses of IODP core samples. It also investigates the timing of the largest landslide from Soufriere Hills, the currently active volcano on Montserrat, and how this impacted on subsequent landslide behaviour. Associated research is exploring the history of older volcanoes on Montserrat, using both IODP core data and subaerial field samples (including Ar-Ar dates funded via the NERC Argon Isotope Facility).

Other activities

2013- Subject Editor in Igneous Geology and Physical Volcanology, Journal of the Geological Society

Publications

Cassidy, M, J Trofimovs, **SFL Watt**, MR Palmer, RN Taylor, TM Gernon, PJ Talling, A Le Friant, 2013. Multi-stage collapse events in the South Soufrière Hills, Montserrat as recorded in marine sediment cores. *Geological Society Memoir, The Eruption of Soufrière Hills Volcano, Montserrat from 2000 to 2010*, in press.

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Watt, SFL, DM Pyle, TA Mather, 2013. Evidence of mid- to late-Holocene explosive rhyolitic eruptions from Chaitén volcano, Chile. *Andean Geology* 40, 216–226.

Cassidy, M, J Trofimovs, MR Palmer, PJ Talling, **SFL Watt**, SG Moreton, RN Taylor, 2013. Timing and emplacement dynamics of newly recognised mass flow deposits at ~8-12 ka offshore Soufrière Hills volcano, Montserrat: how submarine stratigraphy can complement subaerial eruption histories. *Journal of Volcanology and Geothermal Research* 253, 1–14.

Crutchley, GJ, J Karstens, C Berndt, PJ Talling, **SFL Watt**, ME Vardy, V Hühnerbach, M Urlaub, S Sarkar, D Klaeschen, M Paulatto, A Le Friant, E Lebas, F Maeno, 2013. Insights into the emplacement dynamics of volcanic landslides from high-resolution 3D seismic data offshore Montserrat, Lesser Antilles. *Marine Geology*, 335, 1-15.

Karstens, J, GJ Crutchley, C Berndt, PJ Talling, **SFL Watt**, V Hühnerbach, A Le Friant, E Lebas, J Trofimovs, 2013. Emplacement of pyroclastic flow deposits offshore Montserrat from 3D seismic data. *Journal of Volcanology and Geothermal Research* 257, 1–11.

Trofimovs, J, PJ Talling, JK Fisher, RSJ Sparks, **SFL Watt**, MB Hart, C Smart, A Le Friant, M Cassidy, SG Moreton, MJ Leng, 2013. Timing, origin and emplacement dynamics of mass flows offshore of SE Montserrat in the last 110 ka: implications for landslide and tsunami hazards, eruption history, and volcanic island evolution. *Geochemistry, Geophysics, Geosystems* 14, 385-406.

Watt, SFL, PJ Talling, ME Vardy, DM Masson, TJ Henstock, V Hühnerbach, TA Minsull, M Urlaub, E Lebas, A Le Friant, C Berndt, GJ Crutchley, J Karstens, 2012. Widespread and progressive seafloor-sediment failure following volcanic debris avalanche emplacement: landslide dynamics and timing offshore Montserrat, Lesser Antilles. *Marine Geology*, 323–325, 69–94.

Watt, SFL, PJ Talling, ME Vardy, V Heller, V Hühnerbach, M Urlaub, S Sarkar, DG Masson, TJ Henstock, TA Minshull, M Paulatto, A Le Friant, E Lebas, C Berndt, GJ Crutchley, J Karstens, AJ Stinton, F Maeno, 2012. Combinations of volcanic-flank and seafloor-sediment failure offshore Montserrat, and their implications for tsunami generation. *Earth and Planetary Science Letters* 319–320, 228–240.

Martin, RS, MLI Witt, GM Sawyer, HE Thomas, **SFL Watt**, E Bagnato, S Calabrese, A Aiuppa, P Delmelle, DM Pyle, TA Mather, 2012. Bioindication of volcanic mercury (Hg) deposition around Mt. Etna (Sicily). *Chemical Geology* 310–311, 12–22.

Watt, SFL, DM Pyle, TA Mather, 2011. Geology, petrology and geochemistry of the dome complex of Huequi volcano, southern Chile. *Andean Geology* 38, 335–348.

Watt, SFL, DM Pyle, JA Naranjo, G Rosqvist, M Mella, TA Mather, H Moreno, 2011. Holocene tephrochronology of the Hualaihue region (Andean southern volcanic zone, ~42° S), southern Chile. *Quaternary International* 246, 324–343.

Alfano, F, C Bonadonna, ACM Volentik, CB Connor, **SFL Watt**, DM Pyle, LJ Connor, 2011. Tephra stratigraphy and eruptive volume of the May, 2008, Chaitén eruption, Chile. *Bulletin of Volcanology* 73, 613–630.

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Watt, SFL, DM Pyle, TA Mather, 2009. The influence of Great Earthquakes on volcanic eruption rate along the Chilean subduction zone. *Earth and Planetary Science Letters* 277, 399–407.

Watt, SFL, DM Pyle, TA Mather, RS Martin, NE Matthews, 2009. Fallout and distribution of volcanic ash over Argentina following the May 2008 explosive eruption of Chaitén, Chile. *Journal of Geophysical Research* 114, B04207.

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