University of Birmingham

# Professor Tim Reston

Professor of Geology
Head of Geosystem Research Group

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## About

Tim Reston is a geologist and a geophysicist with interests in the use of geophysics to study geological problems, especially tectonics. He specialises in the seismic imaging and tectonics of rifted continental margins and of slow-spreading mid-ocean ridges, with particular emphasis on detachment tectonics and the effects of mantle serpentinization.

## Qualifications

BA Cambridge in Geology (1983)

MSc Oxford in Geophysics (1984)

PhD London in Geophysics (1988)

## Biography

**Biography**

NERC NATO postdoc in Cornell 1988-1990

1990-1996. Lecturer in Marine Geodynamics, GEOMAR, Kiel, Gemany

1997-1999 Mobil Lecturer in Structural Geology, Aberdeen University

1999-2006 Professor in Marine Geophysics, IFM-GEOMAR, Kiel , Germany

2006- Professor of Geology, School of Geography, Earth and Environmental Sciences, University of Birmingham

## Research

**Research Cluster / Group Affiliation**

**Geosystems (file:///C:/research/clusters/geosystems/index.shtml)**

**Current / Recent Research**

***Continental extension leading to breakup – the case of the west Iberia rifted margin (http://www.birmingham.ac.uk/research/activity/geosystems/projects/west-galicia-rifted-margin.aspx)***

The west Iberian margin is a classic magma-poor rifted margin, dominated by extensional tectonics, mantle serpentinization and the development of a detachment faults. Current investigations of this margin include a NERC-funded project (NE/E015883/1 and NE/E016502/1 in collaboration with NOC Southampton) together with US and German partners (funding awaited) to collect 3D seismic reflection profiles across the margin.

***Mantle serpentinization at rifted margins***

At most magma-poor rifted margins, the highly thinned feather edge of the continental crust is underlain by a layer up to 6 km thick with seismic velocities of 7.0-7.7 km/s, intermediate between those of crust and mantle. This layer can be traced out beyond the edge of the continental crust where it has been sampled by submersible, by dredging and by drilling and found to comprise partially serpentinized mantle peridotites. As a result, it is extremely likely that the 7.0-7.7 km/s layer beneath the crust also consists of serpentinized peridotites. I investigate how these serpentinites formed, and how they influence the tectonics of rifted margins.

***Formation of the Porcupine Basin west of Ireland***

Work on the structure and evolution of this basin is ongoing. The V-shaped geometry of the basin (little extension in the north, in effect two rifted margins in the south) offers an excellent opportunity to investigate the evolution of a rifted margin as the amount of extension increases.

***Tectonics and structure of the Mid-Atlantic Ridge (http://www.birmingham.ac.uk/research/activity/geosystems/projects/detachment-faulting.aspx)***

At the slow-spreading Mid-Atlantic Ridge, domal expanses of plutonic and mantle rocks are found. These massifs are termed oceanic core complexes and are through to result from the unroofing of footwall of large-offset normal faults. My research here consists of using a variety of imaging techniques to determined the geometry, extent and mechanics of these normal faults and their role in slow-seafloor spreading.  In 2014-15, in collaboration with the Universities of Durham amd Cardiff, we will carry out

geophysical investigations of oceanic core complexes at and around 13N in the Atlantic.

***Seismic imaging of thermohaline fine-structure in the ocean***

I was involved in the conception and initiation of the **GO project (http://www.dur.ac.uk/eu.go/)** when in IFM-GEOMAR. Geophysical oceanography is a new and developing tool to exploit the contrast in physical properties between different water bodies by using seismic to map them out and in particular to study the mixing between them at very high spatial resolution. This work continues in collaboration with Dr Steve Jones.

## Other activities

**Administrative Responsibilities**

Natural Sciences Tutor

## Publications

**Key Publications since 2006**


**Reston TJ** and McDermott K. 2011. Successive detachment faults and mantle unroofing at magma-poor rifted margins. **Geology**, 39, 1071-1074.

**Reston TJ,** Manatschal, G. 2011. Rifted margins: building blocks of later collision. In “Arc-continent collision” edited by D Brown and P Ryan; Frontiers in Earth Sciences, Springer, p. 3-21

**Reston TJ** and Ranero CR.3D geometry of detachment faulting at mid-ocean ridges.$G^3$, vol. 12, Number 7, Q0AG05, doi:10.1029/2011GC003666.

**Reston, TJ**, 2010. The Opening of the Central Segment of the South Atlantic: Symmetry and the Extension Discrepancy.Petroleum Geoscience, Vol. 16, pp. 199–206, DOI 10.1144/1354-079309-907

Planert L, Flueh ER, Tilmann F, Grevemeyer I, **Reston T** (2010), Crustal structure of a rifted oceanic core complex and its conjugate side at the MAR at 5°S: implications for melt extraction during detachment faulting and core complex formation,Geophys. J. Int., 14p., DOI: 10.1111/j.1365-246X.2010.04504.x 14p., DOI: 10.1111/j.1365-246X.2010.04504.x

Schofield N, Stevenson C**, Reston, T**,2010, Magma fingers and host rock fluidization in the emplacement of sills.Geology, 38; no. 1; p. 63–66; doi: 10.1130/G30142.1

Planert L, Flueh E, **Reston, TJ**.,2009. Along and across-axis variations in crustal thickness and structure at the Mid-Atlantic Ridge at 5° South obtained from wide-angle seismic tomography: Implications for ridge-segmentation.J. Geophys. Research, 114, B09102, doi:10.1029/2008JB006103,

**Reston T.J**. 2009The extension discrepancy and synrift subsidence deficit at rifted margins.Petroleum Geoscience, 15, 217-237.

**Reston, TJ**., 2009. The structure, evolution and symmetry of the magma-poor rifted margins of the North and Central Atlantic: a Synthesis.Tectonophysics, 468, 6-27.

Krahmann G, Brandt P, Klaeschen D, **Reston TJ**. 2008. Mid-Depth Internal Wave Energy off the Iberian Peninsula estimated from Seismic Reflection Data," J. Geophys. Res – Oceans, 113, C12016, doi:10.1029/2007JC004678

Westbrook GK, Chand S, Rossi G, Long C, Buenz, S, Camerlenghi, A, Carcione, J. M., Dean, S, Foucher, J. –P, Flueh, E, Gei, D, Haacke, R. R, Madrussani, G, Mienert, J, Minshull, T. A, Nouze, H, Peacock, S, **Reston, T. J**, Vanneste, M, Zillmer, M., 2008. Estimation of gas hydrate concentration from multi-component seismic data at sites on the continental margins of NW Svalbard and the Storegga region of Norway.Mar Petrol Geology, 25, 744-758.

Booth-Rea G, Klaeschen D, Grevemeyer I, **Reston, T**,2008.Heterogeneous deformation in the Cascadia convergent margin and its relation to thermal gradient (Washington, NWUSA).Tectonics, 27, TC4005, DOI: 10.1029/2007TC002209

Talukder, A.R., Bialas, J., Klaeschen, D., Brueckmann, W., **Reston, T**., Petersen, J., 2008.Tectonic framework of the mud mounds, associated BSRs and submarine landslides off shore Nicaragua pacific margin, J. Geol Soc London, 165, 167-176.

**Reston TJ**, Pérez Gussinyé M, 2007. Lithospheric extension from rifting to continental breakup at magma-poor margins: rheology, serpentinisation and symmetry.Int J Earth Sci, DOI 10.1007/s00531-006-0161-z

Talukder, A.R., Bialas, J., Klaeschen, D., Buerk, D., Brueckmann,W., **Reston, T**., Breitzke, M., 2007, High-resolution, deep tow, multichannel seismic and sidescan sonar survey of the submarine mounds and associated BSR off Nicaragua pacific margin, Marine Geology(2007), doi: 10.1016/j.margeo.2007.03.002(2007), doi: 10.1016/j.margeo.2007.03.002

**Reston, T.J**, 2007.The extension discrepancy at North Atlantic non-volcanic rifted margins: depth-dependent stretching or unrecognised faulting?Geology, 35, 367-370.

**Reston TJ**, Leythaeuser T, Booth-Rea G, Sawyer D, Klaeschen D, Long C. 2007. Movement along a low-angle normal fault. The S reflector west of Spain.Geochem. Geophys. Geosyst., 8, Q06002, doi:10.1029/2006GC001437.





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