Keziah Blake-Mizen
CEMPS, University of Exeter Penryn Campus, Penryn, Cornwall TR10 9FE
Tel: +447963 962 886 E-mail: krb210@exeter.ac.uk

Current Educational Status

2014 – Present	University of Exeter PhD in Palaeoclimatology and Palaeoceanography Primary supervisor: Dr. Ian Bailey Secondary supervisor: Prof. Stephen Hesselbo Funding type: University of Exeter PhD Scholarship

No other sources of funding have been applied for.

Academic Qualifications

2010 – 2014	Cardiff University, School of Earth and Ocean Sciences MESci Earth Science – First Class Honours Awards: 2014 Evan Llewelyn Davies Prize for best overall performance in final-year MESci Geology and Earth Science

Training Received

November 2014	Health and Safety (COSHH) training

Researcher Development Programme seminars

October 2014	Basic Project Management, Effective Use of Library Tools and Resources
November 2014	Introduction to EndNote, Research Data Management, Presentation Skills
November 2015	Publishing Your Research

Learning and Teaching in Higher Education courses

January 2015	LTHE Stage 1 (enrolled on Stage 2 in February/March 2016)

Relevant Skills

Practical	Core sediment sampling, cleaning and preparation for analysis Light and polarising microscopy for petrographic study Stable isotope (carbon and oxygen) mass spectroscopy Laser-ablation MC-ICP-MS for lead-isotope analysis Scanning electron microscope imaging of sediment grains U-channel magnetometry for palaeomagnetic stratigraphy U-channel X-ray fluorescence for elemental analysis } Carried out during a month of labwork at Oregon State University
IT/Analytical	Microsoft Office (Excel, PowerPoint, Word) Analyseries: core-splicing using multiple proxies Kaleidograph, Grapher: plotting data Illustrator, Photoshop: figure and poster construction QEMSCAN: petrographic analysis
Teaching	42 hours (to date) practical demonstrating in First-Year Geology mapping and palaeontology/stratigraphy modules

Professional Memberships

Geological Society of London – Fellow
International Association of Sedimentologists – Student Member
European Geosciences Union – Student Member

Conferences Attended

September 2014	Multiproxy Approach to the Reconstruction of Pliocene Climate, Barcelona
March 2015	Exploring Research in Cornwall, Penryn Campus

Budget Breakdown for EGU2016 Conference Attendance (17th – 22nd April 2016)
Keziah Blake-Mizen, University of Exeter

Expense	**Estimated/absolute cost**
Conference registration fee	€210 (currently £160)
Accommodation (6 nights budget hotel/apartment)	£220 - £280
Transport	Covered
Other subsistence (food, etc.)	Covered
Total requested	**£280 - £340**

The EGU2016 registration fee for PhD student members is €210 (currently £160).
http://egu2016.eu/registration.html

Budget accommodation options at hotels/apartments within a 2-mile radius of the conference centre (Austria Center Vienna, Bruno-Kreisky-Platz 1, 1220 Wien, Austria), for 6 nights between 17th and 22nd April 2016, range from £220 to £280 for the whole duration, for one adult.

Transportation (rail and flights) and subsistence costs will be covered by my own University of Exeter PhD research/travel budget and personal funds, which cannot stretch to cover the registration fee or accommodation. No other sources of funding have been applied for at this stage.

Many thanks for your consideration.
Keziah Blake-Mizen

PhD Title: **Reconstructing the Greenland Ice Sheet during the Plio-Pleistocene**

Keziah Blake-Mizen, University of Exeter. Primary supervisor: Dr. Ian Bailey

Research Outline

PhD goals: Reconstruct: **1)** southern Greenland Ice Sheet extent during the Late Pliocene intensification of Northern Hemisphere glaciation (iNHG) and **2)** the history of Nordic Seas Overflow waters at this time.

Background

Greenland is home to the only polar ice-sheet in the Northern Hemisphere and is situated in one of the fastest-warming regions on Earth, the Arctic (Bindoff *et al*., 2013). If the Greenland Ice Sheet (GIS) were to melt completely it would raise global sea-level by ~7 metres (Meehl *et al*., 2007), and through enhanced input of freshwater to the Labrador and Nordic Seas likely modify the strength Atlantic Meridional Overturning Circulation (AMOC; McManus *et al*., 2004). Understanding how the GIS and AMOC will likely respond to anthropogenic warming is therefore an important goal. Central to achieving this goal is building a picture of the range of natural variability in the GIS for a variety of past warmer- and colder-than-present climate states. Little is known in detail, however, about its history prior to the Last Glacial Maximum (LGM). Glacial ice has existed on Greenland since at least latest Eocene (~38 millions of years ago, Ma; Eldrett *et al*., 2007). A persistent, major GIS did not become a feature of the Northern Hemisphere cryosphere until the Late Pliocene when large ice sheets also grew on North America and Scandinavia during iNHG from ~2.7–2.5 Ma (Bailey *et al*., 2013). In detail, however, the pattern of GIS expansion during this time is poorly constrained. Recently, it has been shown for the first time that major changes in the deep waters bathing North Atlantic Ocean occurred in response to obliquity-paced glacial expansions from 2.7 Ma (Lang *et al*., in review for Nature Geoscience). Yet the response of AMOC during this reorganisation is unresolved. My research will help address these important gaps in our knowledge by applying terrigenous sediment provenance and palaeomagnetic techniques to International Ocean Discovery Program (IODP) marine cores drilled off Southern Greenland.

Since land-based geological evidence of the pre-LGM history of the GIS has largely been eroded by repeated Quaternary glaciations, much of what we know about its Cenozoic evolution comes from the record of ice-rafted debris (IRD) deposition in the Greenland-proximal marine realm (Thiede *et al*., 2011). IRD is composed of clay- through boulder-sized continental rock that has been glacially eroded on land and transported out to sea in icebergs calved from outlet glaciers. Based on an analysis of spatial differences in the onset and magnitude of IRD deposition in high-latitude Northern Hemisphere marine sediments, we know that a minor ice-cap first grew on Greenland as early as the Late Eocene (since ~38 Ma; Eldrett *et al*., 2007), and that ice may have existed more-or-less continuously on this landmass from ~18 Ma (Thiede *et al*., 2011). During the mid-Piacenzian warm period (mPWP; ~3.3–3 Ma), when global temperatures were ~3.5˚C higher than today – and up to 10°C warmer at the poles – sea level was up to 25 m above present, and atmospheric CO_2 concentrations were comparable to today (Raymo *et al*., 1996), the GIS underwent significant volume loss; conditions that may serve as a future analogue for anthropogenically-induced global warming. A wide range of evidence (e.g. Lawrence *et al*., 2009; Lunt *et al*., 2010; Thiede *et al*., 2011; Bierman *et al*., 2014) indicates, however, that a continent-wide GIS was not a persistent feature of the high northern latitudes until from ~2.7 Ma, when atmospheric CO_2 concentrations first fell (Martínez-Botí *et al*., 2015) below the ~280 ppmv threshold for extensive NHG (DeConto *et al*., 2008).

To tackle the questions highlighted above I have been studying Late Pliocene and earliest Pleistocene sediments (~3.4 to 2.2 Ma) deposited at IODP Site U1307 on Eirik Drift off the southern tip of Greenland. First I needed to build a continuous splice and orbital-scale chronology for my target stratigraphy (work that has not previously been carried out on this site). I have achieved this goal by generating a high-resolution record of IRD concentration in my stratigraphy, and by generating XRF scanning data, a complete palaeomagnetostratigraphy and record of Relative Palaeointensity (RPI) from 37 u-channels that I sampled in person at the start of my PhD at the IODP Bremen core repository in

Germany. These analyses were carried out in September 2015 during a month-long visit to the laboratories at Oregon State University where my international collaborators on this project are primarily based (Anders Carlson, Rob Hatfield and Joe Stoner). These data have allowed me to generate the first independent orbital-scale age model for high-latitude North Atlantic sediments deposited proximal to Greenland during iNHG. Terrigenous sediments shed from the eastern and southern coastline of Greenland are delivered to Eirik Drift by icebergs, sea ice and Denmark Strait overflow bottom currents. Following established techniques (Anders *et al*., 2008) XRF scanning data can therefore be used to track the relative importance of terrigenous sediments shed from these regions of Greenland (e.g. the basalt-rich Geikie plateau and gneiss- and granite-rich Archean Basement and Ketilidian Mobile Belt) during the mPWP and during the onset of major glaciation on Greenland across 2.7 Ma. I can also use magnetic grain size proxies (e.g. ARM/magnetic susceptibility, k) measured on my u-channels to track past changes in the relative speed of bottom-currents over Site U1307. By comparing these data to other published records of bottom current speed (aligned by RPI stratigraphies) from the Northeast Atlantic Ocean (e.g. from Gardar Drift, Site U1314; Sato *et al*., 2015) I have been able to infer that the speed of Nordic Seas overflows may have reduced during glacials from 2.7 Ma onwards.

My new stratigraphy for Site U1307 and palaeomagnetic/XRF data will be presented at the 2016 European Geosciences Union (EGU) General Assembly conference (17–22nd April, 2016) on a poster. I will also submit a manuscript on my palaeomagnetic data to EPSL by the end of 2016. Over the coming months I will use my independent orbital-scale age model to pick out key (inter)glacial stages to measure this summer the Pb isotope composition of many individual iceberg-rafted coarse sand-sized feldspars at Southampton University using laser MC-ICP-MS following a proven technique (Bailey *et al*., 2013). This approach will allow me track the evolution of U1307 IRD sources from southern Greenland, which is now well documented (White *et al*., 2015). These data will be complemented by my ongoing efforts to document the sedimentology of my IRD using state-of-the-art QEMSCAN SEM techniques at Exeter University.

Why Fund Me?

If successful, I will use the funding to cover registration and accommodation costs for EGU 2016. My poster abstract has been accepted by the EGU Committee. My participation at this conference will benefit greatly both my personal development and professional academic experience. The session I will contribute to, *Processes and Impacts of climate change in the Arctic realm: from past to future*, is a nice fit for my PhD and I am eager to meet, discuss with and learn from interacting with the international leaders in my field. I am particularly keen to meet one of the session organisers (Anne de Vernal) because she has has a PhD student working on U1307 during my study interval and it is important that we discuss my data and the new RPI age model that I have generated. As an early-career researcher in the second year of my PhD, attending conferences with a specific focus on my research interests is crucial to my development as an academic and will arm me with important professional and personal experience that will be of great use at future conferences, broaden my research opportunities, and connect me with others in the field. I have benefited greatly from collaborating internationally with colleagues from OSU and Southampton University. With one eye on post-doctoral positions, I am eager to get my face and my research more widely known and to exploit the opportunity of face-to-face discussions to foster future research collaborations.

References

Anders, A.E. *et al*., 2008. *Geology* **36**, 359–362. Bailey, I. *et al*., 2013. *EPSL* **341–344**, 222–233. Bierman, P.R. *et al*., 2014. *Science* **344**, 402–405. Bindoff, N.L. *et al*., 2013. In: Stocker, T.F. *et al*. (eds.): *IPCC WG1 AR5*. DeConto, R.M. *et al*., 2008. *Nature* **455**, 652–656. Eldrett, J.S. *et al*., 2007. *Nature* **446**, 176–179. Lang, D.C., Bailey, I. *et al*., 2016. In review (2nd revision) in *Nat. Geosci*. Lawrence, K.T. *et al*., 2009. *Paleoceanog.* **24**, PA2218. Lunt, D.J. *et al*., 2008. *Nature* **454**, 1102–1006. Martínez-Botí, M.A. *et al*., 2015. *Nature* **518**, 219–222. McManus, J. F. *et al*., 2007. In: Solomon, S. *et al*. (eds.): *IPCC WG1 AR4.* Raymo, M.E. *et al*., 1996. *Mar. Micropaleontol.* **27**, 313–326. Sato, M., *et al*., 2015. *Geophys. Res. Lett.* **42**, 4949–4955. Thiede, J. *et al*., 2011. *Polarfors.* **80(3)**, 141–159. White, L.F. *et al*., 2015. *EPSL* **433**, 192–203.