CIRCUM-ACTIC LITHOSPHERE EVOLUTION (*CALE*)
– A proposal to establish a new ILP Task Force

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1. Motivation

The geological evolution of the Arctic region is one of the last unknowns in global plate tectonics. The Arctic Ocean basins (Fig. 1) are relatively inaccessible to direct sampling and known mostly from 'remote' geophysical methods; for example the Amerasia Basin at c. 3800 meters below sea level is virtually unexplored and its age and spreading history unknown. On-shore, the Arctic region represents remote wilderness areas far from supporting infrastructure and consequently is mapped mostly at a reconnaissance scale; the lack of age control on units, structural fabrics, timing of fold and thrust belts, etc., makes it difficult to correlate geology from one region to another, to extrapolate geology from on-shore to off-shore, or to constrain the development of Arctic ocean basins using circum-Arctic geologic data.

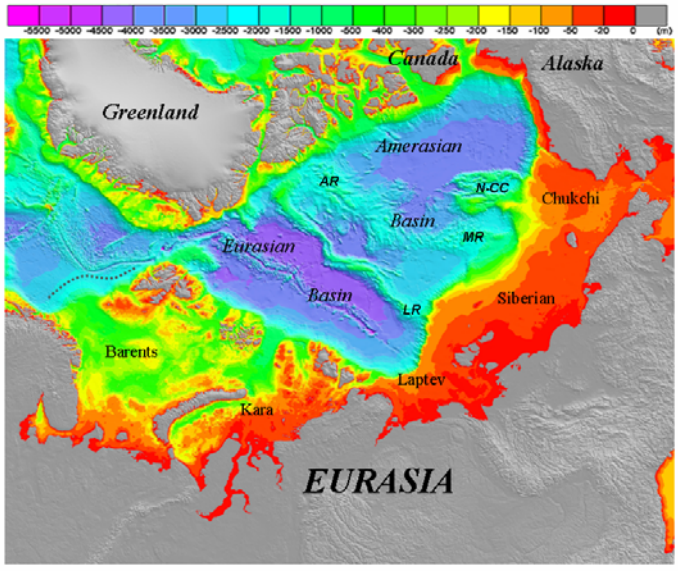

Figure 1. Enhanced false color image of the International Bathymetric Chart of the Arctic Ocean, (Jakobsson et al., 2000) showing the sea bottom. Colors match depth below sea-level in meters. AR, Alpha Ridge; LR, Lomonosov Ridge; MR, Mendeleev Ridge; N-CC, Northwind-Chukchi Cap.

The tectonic evolution of Arctic lithosphere is of relevance not only for our understanding of global tectonics, but also for understanding the framework of the

known and estimated oil and mineral resources of the Arctic, understanding Earth's climate system, the distribution of flora, fauna, and ultimately the historic distribution of humans on Earth. The origin of the vast Arctic continental shelves with their associated oil and gas potential, are directly relevant for claims to extend sovereign economic zones under Article 76 of the United Nations Law of the Sea (a.k.a. UNCLOS-76; MacNab, 2006) and highlights the importance of establishing the basic geologic framework of these shelf regions. Furthermore, under UNCLOS-76 the circum-arctic nations are obliged to conduct extensive surveys to document their claims; such surveys are currently underway and represent a vast potential resource for all future Arctic investigations.

Logistical difficulties associated with working in the polar Arctic have impeded both on-shore and off-shore investigations, including scientific drilling of the seafloor. Recent political and technological developments (e.g., the end of the Cold War, the prospective availability of nuclear submarines and powerful icebreakers as research platforms) provide remedies to some of these obstacles: IODP drilling of Lomonosov Ridge in 2004 was a proof-of-concept cruise for Arctic drilling, producing a number of important, high-impact papers concerning the Cenozoic history of the Arctic Ocean. Since then, numerous groups[1] are prioritizing research programs into the geologic framework and tectonic evolution, the sedimentary record and environmental history, and geological processes and environmental indicators of the Arctic Ocean basins and their margins.

2. The project

In the past decade a number of campaigns in the Arctic region have focused on marine, aerogeophysical and geological investigations: two seasons of aerogeophysical work by the US Naval Research Lab the Amerasia Basin (Fig. 1), the Amore cruise to investigate the petrology of the slow spreading Gakkel Ridge, the USCGC Healy and Swedish Oden cruises to the Bering Strait region, the Chukchi Borderland and the Mendeleev Ridge regions, as well as the IODP drilling of Lomonosov Ridge. However, very few of these initiatives actually integrate on-shore and off-shore geology. Furthermore, in recent years new methods and surveys, such as the International Bathymetric Chart of the Arctic Ocean (Jakobsson et al., 2000; see Fig. 1), have become available which allow us to test existing, and confidently formulate new, hypotheses regarding various submarine features of the Arctic, such as:

- *Where are the plate boundaries associated with the Amerasia Basin?*
- *How did the Canada Basin open?*
- *What was the pre-drift setting of the Chukchi Borderland?*
- *How did the major ridges in the Amerasian Basin form?*
- *Where are the Early Tertiary plate boundaries in the Arctic?*
- *What is the relationship between segmentation of the Gakkel Ridge and ultra-slow spreading processes?*
- *Has the axial geometry of the Gakkel Ridge changed since rifting? If not, why?*

1 – e.g., **2009 GSA Penrose Conference** 'Tectonic Development of the Amerasia Basin' (Banff, Canada, http://www.geosociety.org/penrose/09banff.htm); **2008 Arctic Drilling Workshop** (Bremerhaven, Germany, http://www.aosb.org/mtgs/2009/arctic_drilling_workshop.pdf); **2004 NSF-funded workshop** 'Amerasian Basin and its margins' (Washington, D.C.; http:www.geo-prose.com/amerasian/info.html)

- *What structures connect seafloor spreading on the Gakkel Ridge to continental extension on the Laptev Shelf?*
- *Where are the continuations of pre-Eocene orogens in the Arctic?*
- *How do these crustal-scale discontinuities influence Arctic tectonic evolution?*

By definition, *CALE* is multinational and multi-disciplinary. *CALE* identifies a number of on-shore to off-shore transects around the Arctic in regions critical to answering the most important questions currently associated with circum-Arctic lithosphere evolution (Fig. 2). These transects are specifically designed to integrate the on-shore and off-shore environments through combined geological and geophysical investigations, including the possibility of drilling. These combined transects address each of ILPs four themes (see below), but each transect is a 'stand-alone' initiative that builds upon independent data sets. Thus each transect is dedicated to addressing the most important questions of a specific region, has unique scientific objectives that will require the acquisition of different types of new data, and is associated with a team of independent but integrated researchers including both geophysicists and geologists, and covering both land and marine environments. Through *CALE* the individual transects will be integrated such that the sum of the whole will be greater than the individual components with the combined results allowing us to address some of the most pressing and topical issues related to the tectonic development of circum-Arctic lithosphere evolution today.

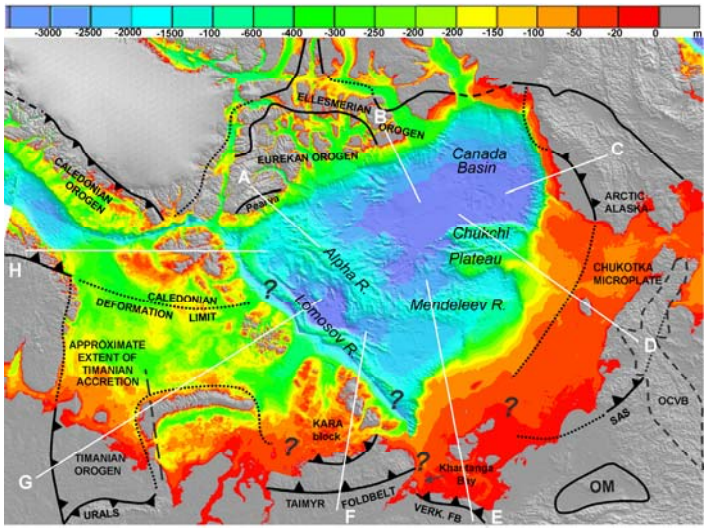

Figure 2. *CALE* Transects shown on a c. 55 Ma Arctic reconstruction. The Eurasia Basin has not yet opened, Svalbard restores adjacent to N. Greenland. Tectonic elements of the circum-Arctic region indicated. OCVB, Ohotsk-Chukotka Volcano-plutonic Belt; OM, Omolon Massif; SAS, South Anyui Suture.

3. ILP themes & *CALE*

Understanding the tectonic evolution of Arctic lithosphere encompasses all four of ILP's programmatic themes:

1. *Geoscience of global change.* All evidence indicates that a complex suite of interrelated atmospheric, oceanic, and terrestrial changes are now underway in the Arctic, affecting every part of the polar environment. Understanding and quantifying these changes is complicated by sparse oceanographic and geophysical data from the circum-Arctic region. While numerous consortia exist to address the effects of global warming on the Arctic region (e.g., APEX http://www.apex.geo.su.se/), without oceanographic and geophysical data it is not possible to understand contemporary processes, or to predict future change and

the consequences of change. *CALE* emphasizes understanding the tectonic development of the basins, ridges, plateau, and shelves of the Arctic Ocean and its Seas, which influence and control ocean circulation. A full understanding of climate change requires an integrated and comprehensive geological and geophysical study of sea-floor and northern continents.

2. *Circum-Arctic continental dynamics and deep processes.* Tectonic activity created the Arctic basins and modified their internal structure and architecture over time. Tectonic motion between crustal blocks has influenced the physiography of the polar basins. With drilling on Lomonosov Ridge (Shipboard Scientific Party, 2005) there is now an observational record spanning much of the history of the Eurasian Basin. Far less is known about the oldest Arctic basin, the Amerasian Basin, partly due to lack of recognized plate boundaries. These boundaries must exist to explain the basin history. *CALE* seeks to identify these structures in order to reconstruct the development of the basin, substantially improving how the history of the surrounding continents is understood.

3. *Circum-Arctic continental lithosphere*. The sedimentary basins of the circum-Arctic land areas and continental shelves are important for understanding crustal rheology, for inferring basin modeling parameters, and for testing hypotheses for the evolution of Arctic lithosphere. It is also necessary to understand the structure and composition of the basement beneath these mostly late Paleozoic and younger basins, and to understand their relationships to the deeper ocean basins. This is directly relevant to a number of key contemporary issues related to continental mantle lithosphere including: *a)* compositional and structural heterogeneity, its nature and origin; *b)* mechanical anisotropy, its nature and origin; *c)* the role of tectonic processes in the formation of modern topography of continents; and *d)* the long-term mechanical strength of continental lithospheric mantle (mantle rheology) and its sustainability through geologically long periods of time. *CALE*, in combining i) bathymetry, potential field data, seismic reflection data, and cores with ii) geologic mapping and field studies to understand the sedimentary, structural, thermal, and magmatic histories, will provide an integrated record of the tectonic evolution of Arctic continental lithosphere.

4. *Arctic ocean lithosphere.* Mapping the deep Arctic Ocean basins, collecting multi-channel seismic reflection data, and sampling the sedimentary record by drilling are the primary means to determine the strength, evolution, deformation, response to surface processes, etc., of Arctic Ocean lithosphere. Several geophysical expeditions have been successfully conducted over the last decades. The resulting data provide a first insight into sediment distribution and the tectonic evolution of the Arctic Ocean's basins and ridges, but continued acquisition of these data is necessary to realize a unifying tectonic model. For example, over 1000 sediment cores have been raised from the deep basin, but only a few are longer than 10 m (Kristoffersen and Mikkelsen, 2004) and few have sampled 'basement'. *CALE* seeks to initiate new geophysical data acquisition campaigns and, with today's technology, even inspire the direct sampling of Arctic submarine crust via ocean drilling projects, in order to make the necessary advances required for understanding the tectonic development of the Amerasian Basin.

4. Proposed transect teams

The organizing committee for *CALE* is in the process of identifying the Leaders for each Transect Team (Table 1 and Fig. 2). The organizing committee and Team Leaders will meet in October 2009 at the Geological Society of America Penrose Conference on the Tectonic Development of the Amerasia Basin to finalize the members of each Transect Team and its scientific goals. The meeting will host many key researchers in Arctic geology and geophysics, including industry representatives. It provides an excellent forum for identifying current problems, and facilitating coordination and planning of cooperative Arctic research into the next decade.

Table 1. CALE Transects *

Transect	Region	Team Leader
A	Canada/Alpha Ridge	R. Stephenson
B	Canada/Canada Basin	?
C	Alaska/North Slope/Canada Basin	M. Wartes?
D	East Russia/Wrangel/Chukchi Plateau/Canada Basin	B. Coakley
E	Moma/New Siberian Islands/Mendeleev Ridge	W. Jokat
F	Taimyr/Severnya Zemlya/Lomonosov Ridge	V. Pease
G	Western Russia/Franz Josef Land/Lomonosov Ridge	R. Scott
H	Norway/Svalbard/Lomonozov Ridge	J-I. Faleide?

*To be finalized by end-2009.

4. Proposed management structure, project schedule, and funding

The organizing committee defining the Transect Teams for the Task Force comprises four persons, each an expert in their field with a long record of Arctic research (CVs attached). The multinational, multidisciplinary Task Force will comprise c. 60-80 researchers currently from eight different countries, including Canada, Denmark, Germany, Norway, Russia, Sweden, the United Kingdom, and the USA.

CALE is a timely and ambitious project. Although some Transect Teams are already underway (e.g. Team A has plans for acquisition of geophysical data in 2010) and others have yet to confirm the Team Leader, we expect all Transects Teams to be established by end-2009. Some Transects need geophysical data which requires a long led-in time to coordinate and fund. Some Transects need detailed field campaigns, which may require multiple field-seasons. Given the differences between national funding schemes and timescales, as well as the necessary 1-3 years of led-in for individual researchers to garner project funding, *CALE* is seen as a 5-10 year program. We initially seek 5-years of support for *CALE*, to begin in 2010.

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Employment history

2004 *to present*	*Research Council Associate Professor in* Lithosphere Evolution & Orogen Dynamics Dept. of Geology and Geochemistry, Stockholm University, Sweden
2001 to 2004	*Assistant Professor* Dept. of Geology and Geochemistry, Stockholm University, Sweden
1999 to 2001	*Research Fellow* Dept. of Geophysics, Uppsala University, Sweden
1997 to 1999	*EU Marie Curie Post-doctoral Fellow* Dept. of Geophysics, Uppsala University, Sweden
1990	*Researcher* Dept. of Geology, University of Oslo, Norway
1982 to 1989	*Paleomagnetic Laboratory Manager/Physical Science Technician* United States Geological Survey 345 Middlefield Road Menlo Park, CA 94025 United States

Awards & organizations

2008	Lithos most cited paper for the years 2003-2007
2008 *to present*	Member of the European Association of Geochemistry
1983 *to present*	Member of the American Geophysical Union.
1997 – 1999	Recipient of the EU Marie Curie Individual Post-doctoral Fellowship
1994 - 1997	Volunteer geologist at the U.S. Geological Survey Dr. Jack Hillhouse supervisor
1994 - 1997	Volunteer geologist at the U.S. Bureau of Land Management Mr. Phil Damon, supervisor
1996	School of Earth Sciences in the Faculty of Science and Technology, La Trobe Universtiy , Melbourne, Australia
1990	Recipient of a Marshall Fund Research Grant University Of Oslo, Norway
1988	Recipient of the M.J. Crittenden Scholarship San Jose State University

Committees, symposia, & editorial responsibilities

2009 *to present*	Chair, National Committees, International Lithosphere Program (ILP)
2009 *to present*	Advisory Editor, Journal of the Geological Society (London)
2007 *to present*	Editorial Board, GFF
2006 *to present*	Swedish Natural History Museum Advisory Committee- Laboratory for Isotope Geochemistry (LIG)
2005 *to present*	Swedish Research Council Committee - Large Scale Infrastructure (major expenditures)
2004 *to present*	Swedish Research Council Representative - International Lithosphere Program (ILP)
2005 - 2007	Swedish Research Council Committee - International Geoscience Program (IGCP)
2009	International Penrose Conference (Arctic Tectonics)
2008	International Workshop, Egypt (Trans-Red Sea Correlation)
2008	Invited Expert (Arctic Tectonics), US Federal Task Force UNCLOS 76
2007	International Workshop, Egypt (Trans-Red Sea Correlation)
2007	Guest editor, Geological Society of America
2006, 2007	NSF proposal reviewer (tectonics)
1999 - 2006	Swedish representative of IGCP 440- Assembly and break-up of Rodinia
2004	Guest editor, Geological Society (London)

Guest Researchers

2008	Dr. J. Scarrow, University of Granada, Spain; 4 month sabbatical
2007	Prof. M.H. Shalaby, Nuclear Materials Authority, Egypt; 3 month sabbatical
2006	Prof. W. Bohrson, Central Washington University, USA; 1 month sabbatical

Publications

Books

2008 *Condie, K.. and Pease, V. (eds.*). When did plate tectonics begin? Geological Society of America Special Paper 440, Boulder, Colorado. 294 pp.

2004 *Gee, D. and Pease, V. (editors*), The Neoproterozoic Timanide Orogen of Eastern Baltica. Geological Society, London, Memoirs, 30, 252pp.

Articles

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1982-1985 Louisiana State University, Baton Rouge, Louisiana
M.S. Geology June 1988; supervisor: Dr. Jeffrey A. Nunn
1976-1980 University of Michigan, Ann Arbor, Michigan
B.S. Geology December 1981
1974-1976 Michigan State University, East Lansing, Michigan

Appointments:

05/06-present Department of Geology and Geophysics - chairman
05/02-present Geophysical Institute University of Alaska; Associate Professor
tenured July 2005

01/99-05/02 Tulane University; Assistant Professor
10/94-12/98 Lamont-Doherty Earth Observatory; Associate Research Scientist
08/93-10/94 Lamont-Doherty Earth Observatory; Post Doctoral Research Scientist
04/91-07/93 University of Wisconsin-Madison, Wisconsin; Research Associate

Field Experience:

2005 USCGC Healy - co-chief scientist on Arctic Ocean transect. (8/1 – 9/30)
1999-2001 *R/V Acad*iana and *R/V Eugenie* - co-chief scientist - 43 days mapping in the Mississippi River during five different campaigns
1999 *USS Hawkbill* – co-chief scientist SCICEX 99 – Arctic Ocean (4/16 - 5/20)
1995 *USS Cavalla* - SCICEX 95 cruise - Arctic Ocean basin (3/6 - 5/28)
1994 SEDCO/BP 471 - ODP Leg 157; Canary Islands (7/29 - 9/23)
1994 *R/V Atlantis-II* - Underway gravimetry with Alvin on the EPR (4/6 - 5/25)
1993 *USS Pargo* - SCICEX 93 cruise - Arctic Ocean basin (8/11 - 9/22)

Synergistic Activities:

- Basin Research - Editorial Board
- Editorial Board for the International Bathymetric Chart of the Arctic Ocean
- IASC/IAG/NIMA - project committee on Arctic Gravity Data Compilation
- Nansen Arctic Drilling Program - Chair
- Arctic Icebreaker Coordinating Committee - Member

- International Conference on Arctic Research Planning II (ICARP II) - Deep Basin Working Group Chair
- Barrow Arctic Science Consortium - Digital Working Group; Science Advisory Group (Chair)
- North American Gravity Database Standards/Format Working Group

Graduate Advisees:

Christina Williams (MS 2006), Dayton Dove (MS 2007) and Kelley Brumley (MS 2009).

Publications:

Dove, D.H., B.J. Coakley, Y. Kristoffersen and J. Hopper, submitted, Structure of the Mendeleev Ridge from Seismic Reflection, Seismic Refraction and Gravity data, ***Geophysical Journal International***, January 2009.

Bruvoll, V., Y. Kristoffersen, B.J. Coakley, J.R. Hopper and Healy 2005 Seismic Team, submitted, Hemi-pelagic deposits on the main submarine ridges in the Arctic Ocean: acoustic stratigraphy, inter-ridge correlation and a paleo-circulation conundrum, ***Marine Geology***, January 2009

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Cochran J.R., M.H. Edwards, and B.J. Coakley, 2006. Morphology and structure of the Lomonosov Ridge, Arctic Ocean, ***Geochem. Geophys. Geosyst***., 7, Q05019, doi:10.1029/2005GC001114.

Chayes, D., A. Chave, B.J. Coakley, A. Proshutinsky, and T. Weingartner, 2007, Concept Design for a Cabled Seafloor Observatory at Barrow, Alaska, *IEEE* ***Conference Proceedings SSC'06 Scientific Submarine Cable 2006***, 8-10 February 2006, Dublin, Ireland.

Coakley, B., D. Chayes, A. Proshutinsky, T. Weingartner, 2005, Objectives for a Cabled Observatory in Alaska's Beaufort Sea, ***Eos Trans. AGU***, 86(18), 177, 10.1029/2005EO180005.

Hinze, W.J., C. Aiken, J. Brozena, B. Coakley, and many others, 2005. New standards for reducing gravity data: The North American gravity database, ***Geophysics***, *70*, J25-J32.

Kristoffersen, B. Coakley, W. Jokat, M. Edwards, H. Brekke, and J. Gjengedal, 2004. Seabed erosion on the Lomonosov Ridge, central Arctic Ocean: A tale of deep draft icebergs in the Eurasia Basin and the influence of Atlantic water inflow on iceberg motion?, ***Paleoceanography*** *19*, doi:10.1029/2003PA000985.

Cochran, J.R., G.J. Kurras, M.H. Edwards, and B.J. Coakley, 2003. The Gakkel Ridge: Bathymetry, gravity anomalies, and crustal accretion at extremely slow spreading rates, ***J. Geophys. Res.***, *108*(B2), doi 10.1029/2002JB001830.

Edwards, M.H. and B.J. Coakley, 2003, SCICEX Investigations of the Arctic Ocean System, Chemie der Erde, 63, 281-392.

Coakley, B.J., 2002, The Plate Tectonic Revolution (a review of two related books), ***American Scientist***, 385-386.

Polyak, L., M.H. Edwards, B.J. Coakley and M. Jakobsson, 2001, Glacigenic bedforms in the deep Arctic Ocean: Evidence of Pleistocene Arctic Ice Shelves. **Nature** 410, 453-457.

Edwards, M.H., G.J. Kurras, M. Tolstoy, D. Bohnenstiehl, B.J. Coakley and J.R. Cochran, 2001, Evidence of recent volcanic activity on the ultra-slow spreading Gakkel Ridge. ***Nature*** 409, 808-812 .

Jakobsson, M., N.Z. Cherkis, J. Woodward, R. Macnab and B. Coakley, 2000, New Grid of Arctic Bathymetry Aids Scientists and Mapmakers. ***EOS Trans. AGU*** 81, 89.

Cochran, J.R., D. Fornari, B.J. Coakley, R. Herr and M.A. Tivey, 1999, Continuous Near-Bottom Gravity Measurements made with a BGM-3 Gravimeter in DSV Alvin on the East Pacific Rise Crest near 9o 30' N and 9o 50' N, ***J. Geophys. Res.,***104, 10841-10862.

Coakley, B.J., and J.R. Cochran,1998, Gravity evidence of very thin crust at the Gakkel Ridge (Arctic Ocean), ***EPSL*** 162, 81-95.

Pyle, T., M. Ledbetter, B.J. Coakley and D. Chayes, 1997, Arctic Ocean Science, ***Sea Technology*** 39, 10-15.

Pratson, L., and B.J. Coakley, 1996, A model for the headward erosion of submarine canyons induced by downslope-eroding sediment flows. ***Geol. Soc. Am. Bull.,*** 107, 225-234.

Coakley, B.J., and M. Gurnis, 1995, Far-field tilting of Laurentia during the Ordovician and constraints on the evoluton of a slab under an ancient continent. ***J. Geophys. Res.,*** 100, 6313-6327.

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Ten Brink, U., Z. Ben-Avraham, R. Bell, M. Hassouneh, D. Coleman, G. Andreasen, G. Tibor, and B. Coakley, 1993, Structure of the Dead Sea Pull-Apart Basin From Gravity Analyses, ***J. Geophys. Res.***, 98(B12), 21877-21894.

Rees, B.A., Detrick, R.S., and B.J. Coakley, 1993, Seismic stratigraphy of the Hawaiian flexural moat, ***Geol. Soc. Am. Bull.,*** 105, 189-205.

Bell, R.E., B.J. Coakley, D.D. Blankenship, S.M. Hodge and J.M. Brozena, 1992, Airborne Gravimetry from a Light Aircraft: CASERTZ 1990-1991, in **Recent Progress in Antarctic Earth Science**, Y. Yoshida ed., Terra Scientific Publishing Company, Tokyo, 571-577.

Bell, R.E., B.J. Coakley and R.W. Stemp, 1991, Airborne Gravimetry from a small twin engine aircraft over the Long Island Sound, ***Geophysics*** 56, 1486-1493.

Reynolds, D.J., M.S. Steckler, and B.J. Coakley, 1991, The role of sediment load in sequence stratigraphy: The influence of flexural isostasy and compaction, ***J. Geophys. Res.,*** 96, 6931-6949.

Sinclair, H., B.J. Coakley, P.A. Allen, and A.B. Watts, 1991, Stratigraphic simulation of the Molasse basin, Central Switzerland, ***Tectonics*** 10, 599-620.

Coakley, B.J., and A.B. Watts, 1991, Tectonic controls on the development of unconformities, North Slope Alaska, ***Tectonics*** 10, 101-130.

Grey Literature Reports:

Coakley, B.J., J. Hopper and Y. Kristoffersen, 2007, Cruise Report for Underway Geophysics Program HLY 05-03, 85 p, (Available at www.icefloe.net).

Coakley, B.J., 2005, ICARP II Science Plan 4; Deep Central Basin of the Arctic Ocean, ICARP II Meeting, Copenhagen, Denmark, 10-12 November, 23 p, (Available at www.icarp.dk).

Coakley, B., 2000, White Paper on the Renewal of Dedicated Data Collection Cruises by US Navy Nuclear Submarines in the Arctic, Report from an ONR-funded Workshop, 29 p.

Edwards, M.H., B. Coakley, D. Chayes, S. Okonnen, D. Stockwell, T. Whitledge and M. Rognstad, 1999, Cruise Report SCICEX 1999, unpublished 30 p.

Selected Recent Abstracts:

McAdoo, D.C., S.L. Farrell, S.W. Laxon, H.J. Zwally, D. Yi, B. Coakley and J.R. Cochran, 2008, Satellite Altimetric Mappings of Arctic Sea Surface Topography: An Evaluation, **Eos Trans. AGU**, *89*(53), Fall Meet. Suppl., Abstract C31E-0569.

Brumley, K., L. Mayer, E.L. Miller and B. Coakley, 2008, I: Dredged Rock Samples from the Alpha Ridge, Arctic Ocean: Implications for the Tectonic History and Origin of the Amerasian Basin, **Eos Trans. AGU**, *89*(53), Fall Meet. Suppl., Abstract T43B-2013.

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Arrogoni, V., J.R. Hopper, B.J. Coakley, Y. Kristoffersen and the Healy 2005 Sesimic Team, 2007, Is There Evidence for Recent Compression Along the Northwind Ridge and Chucki Borderlands?, **Eos Trans. AGU**, 88(52), Fall Meet. Suppl., Abstract T13D-1577.

Brumley, K., B. Coakley, D. Stone and W. Wallace, 2007, Kinematic History and Tectonic Evolution of the Amerasian Basin: Investigating Palaeo-Plate Boundaries around the Chukchi Borderlands, **Eos Trans. AGU**, 88(52), Fall Meet. Suppl., Abstract T11E-05.

Sheehan, G., J. Brown, B. Coakley and B. Zak, 2007, Facilities Enhancement for IPY at Barrow, **Eos Trans. AGU**, 88(52), Fall Meet. Suppl., Abstract GC13A-0943.

Hopper, J.R., B.J. Coakley and Y. Kristoffersen, 2006, Structural Style of the Chukchi Borderlands From Marine Seismic Data Collected on the USCGC Healy in 2005, **Eos Trans. AGU**, 87(52), Fall Meet. Suppl., Abstract OS53B-1119.

Dove, D., B.J. Coakley and J.R. Hopper, 2006, Stratigraphy, Structure, and Origin; A Geophysical Survey of the Mendeleev Ridge, **Eos Trans. AGU**, 87(52), Fall Meet. Suppl., Abstract OS53B-1117.

Cochran, J.R., M.H. Edwards and B.J. Coakley, 2005, Constraints on the Origin and Development of the Amerasian Basin of the Arctic Ocean from the Morphology and Structure of the Lomonosov Ridge, **Eos Trans. AGU**, 86(52), Fall Meet. Suppl., Abstract T51E-04.

Williams, C.C., and B.J. Coakley, 2005, Spectral Analysis and Isostasy of the Alpha-Mendeleev Ridge, Arctic Ocean, **Eos Trans. AGU**, 86(52), Fall Meet. Suppl., Abstract T13D-0496.

Coakley, B., Y. Kristoffersen, J. Hopper, T. Artun, H. Berge, G. Brass, H. Breien, V. Bruvoll, D. Dove, E. Grindheim, P. Henkart, N. Ivanova, F Ludvigsen, K. Monsen and W. Reynoso-Peralta, 2005, A Cross-Arctic Geophysical Transect Collected from US Coast Guard Icebreaker Healy, **Eos Trans. AGU**, 86(52), Fall Meet. Suppl., Abstract T13D-0510.

Edwards, M.H., L. Polyak, J.L. Engels and B.J. Coakley, 2004, Seafloor Surveys Provide Circum-Basin Evidence for Thick Pleistocene Ice in the Arctic Ocean, **Eos Trans. AGU** 84(46), Fall Meet. Suppl., Abstract PP42A-0851.

Cochran, J.R., M.H. Edwards and B.J. Coakley, 2003, Differing Forms of Continental Rifting on the Eurasian and Amerasian Margins of the Lomonosov Ridge, Arctic Ocean, **Eos Trans. AGU** 84(46), Fall Meet. Suppl., Abstract T12A-0450.

Coakley, B., Y. Kristoffersen, M. Edwards and L. Johnson, 2003, Opportunities and Challenges for Arctic Geosciences in the IPY (International Polar Year), **Eos Trans. AGU** 84(46), Fall Meet. Suppl., Abstract C32C-06.

Curriculum Vitae

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PERSONAL:
Date of birth: 29th August 1953
Place of birth: Essen, Germany
Nationality: German

EDUCATION: Education as merchant (1970-1973)
University of Berlin (1976-1981)
Diploma Thesis (Programming and seismic refraction interpretation)
University of Kiel (1983-1986)
Ph D (Design of adaptive filters for seismic refraction data).

PROFESSIONAL
Employment

1970-1973	Employee as merchant (import/export)
1981-1982	Geophysist with seismic contractor Prakla Seismos.
1983-1986	Ph. D. position at the University of Kiel
1987-1990	Post-Doctoral Research Associate, Department of Geophysics at Alfred Wegener Institute, Bremerhaven
1991-recent	Senior Research assistant at AWI, Bremerhaven;
2005-recent	Head of Geophysical department

Additional posts held

- Member of the Interridge Working Group on Arctic Ridges
- Member of the Regional NAD Working Group on the Lomonosov Ridge
- Regional Coordinator for the Weddell Sea within ANTOSTRATMember of the ODP working group this "Arctic's Role in Global Change Program Planning Group" (APPG) (2000 - 2001)
- Member of the ODP DPG Arctic Drilling (DPG) (2001)
- Member of the Marine Arctic Sediment Thickness (MAST) Project

Reviewer for journals

Journal of Geophysical Research
Geophysical Journal International
Marine Geology
Polarforschung
Science
Terra Antarctica
Tectonophysics

Reviewer for national and international research organisations

- *Reviewer of national and international research proposals for the German Ministery of Education and Research (BMBF) and Deutsche Forschungs-gemeinschaft (DFG)*
- *Natural Environment Research Council (NERC, UK)*
- *National Science Foundation (NSF, USA)*
- *National Research Council (NRC, Norway)*

MAJOR RESEARCH INTERESTS

East/North Greenland:	Crustal structure of the continent and the adjacent shelf areas
High Arctic:	Structure and evolution of the major ridge systems (Gakkel, Lomonosov, Alpha and Mendeleev ridges) in the central Arctic Ocean; Basin evolution in Cenozoic and Mesozoic times, sedimentary processes
***Antarctica*:**	Early breakup of the Gondwana supercontinent; Paleobathymetry and basin evolution along the East Antarctic Margin; Glacial stratigraphy in the southern Weddell Sea.

PARTICIPIANT OF POLAR EXPEDITIONS (NATIONAL/INTERNATIONAL)

East/North Greenland:	1988, 1990, 1994, 1997, 1999 (Chief Scientist) 2002 (Chief Scientist); 2003 (Chief Scientist), 2004, 2009 (Chief Scientist)
High Arctic:	1991, 1996, 1998 (Chief Scientist), 2001, 2008 (Chief Scientist)
Antarctica:	1987, 1988, 1990, 1992, 1995 (Chief Scientist), 1996 (Co-Chief Scientist), 1997 (Chief Scientist), 2000, 2002 (Chief Scientist), 2005 (Chief Scientist), 2006 (Chief Scientist)

PROFESSIONAL SOCIETIES

European Geophysical Society EGS (since 1997)
American Geophysical Union AGU (since 1992)
Deutsche Polarforschungsgesellschaft (since 1996)
Deutsche Geophysikalische Gesellschaft (since 2005)

PUBLICATIONS

Seventy papers in international, peer-reviewed journals and books, 53 papers in non-reviewed journals, 210 abstracts and conference proceedings.

Peer Reviewed Publications (Last 7 years)

2009

Bayer, B., Geissler, W.H., Eckstaller, A., Jokat, W.(2009).Seismic imaging of the crust beneath Dronning Maud Land, East Antarctica, Geophysical Journal International, doi:10.1111/j.1365-246X.2009.04196.x .

Berger, D., Jokat, W.(2009).Sediment deposition in the northern basins of the North Atlantic and characteristic variations in shelf sedimentation along the East Greenland Margin, Marine Petroleum Geology, doi:10.1016/j.marpetgeo.2009.04.005 .

Ehlers, B.-M., Jokat, W.(2009).Subsidence and crustal roughness of ultra-slow spreading ridges in the northern North Atlantic and the Arctic Ocean, Geophysical Journal International, 177(2), 451-462, doi:10.1111/j.1365-246X.2009.04078.x .

Mann, U., Stein, R., Knies, J., Jokat, W., Zweigel, J.(2009).Evaluation and modelling of Tertiary source rocks in the central Arctic Ocean, Marine and Petroleum Geology, doi:10.1016/j.marpetgeo.2009.01.008 .

Voss, M., Schmidt-Aursch, M.C., Jokat, W.(2009).Variations in magmatic processes along the East Greenland volcanic margin, Geophysical Journal International, 177(2), 755-782, doi:10.1111/j.1365-246X.2009.04077.x .

Voss, M., Jokat, W.(2009).From Devonian extensional collapse to Early Eocene continental break-up: an extended transect of the Kejser Franz Joseph Fjord of the East Greenland margin, Geophysical Journal International, 177(2), 743-754, doi:10.1111/j.1365-246X.2008.04076.x .

2008

Berger, D., Jokat, W.(2008).A seismic study along the East Greenland margin from 72◦N to 77◦N, Geophysical Journal International, 174(2), 733-748., doi:10.1111/j.1365-246X.2008.03794.x .

Breitzke, M., Boebel, O., El Naggar, S., Jokat, W., Werner, B.(2008).Broad-band calibration of marine seismic sources used by R/V Polarstern for academic research in polar regions, Geophysical Journal International, 174, 505-524, doi:10.1111/j.1365-246X.2008.03831.x .

Cooper, A.K., Brancolini, G., Escutia, C., Kristoffersen, Y., Larter, R., Leitchenkov, G., O'Brien, P., Jokat, W.(2008).Cenozoic climate history from seismic reflection and drilling studies on the Antarctic continental margin, Antarctic climate evolution / edited by Fabio Florindo and Martin Siegert. Amsterdam : Elsevier, 115-234. (Development in earth and environmental sciences ; 8), doi:10.1016/S1571-9197(08)00005-0 .

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Jokat, W., Geissler, W., Voss, M.(2008).Basement structure of the north-western Yermak Plateau, Geophysical Research Letters, 35, L05309, doi:10.1029/2007GL032892 .

2007

Bayer, B., Müller, C., Eaton, D. W., Jokat, W.(2007).Seismic anisotropy beneath Dronning Maud Land, Antarctica, revealed by shear wave splitting, Geophysical Journal International., doi:10.1111/j.1365-246X.2007.03519.x

Golynsky, A., Blankenship, D., Chiapini, M., Damaske, D., Ferraccioli, S., Finn, C., Golynsky, D., Goncharov, A., Ishihara, T., Ivanov, S., Jokat, W., Kim, H.R., König, M., Masolov, V., Nogi, Y., Sand, M., Studinger, M.(2007).New Magnetic Anomaly

Map of East Antarctica and Surrounding Regions, Antarctica: A Keystone in a Changing World—Online Proceedings for the Tenth International Symposium on Antarctic Earth Sciences / Edited by Alan Cooper, Carol Raymond, and the ISAES Editorial Team (U.S. Geological Survey Open-File Report ; 2007-1047)

Jakobsson, M., Backman, J., Rudels, B., Nycander, J., Mayer, L., Sangiorgi, F., Brinkhuis, H., O'Regan, M., Jokat, W., Frank, M., King, J., Morane, K. (2007). The Early Miocene Onset of a Ventilated Circulation Regime in the Arctic Ocean, Nature. 447, 987-990., doi:10.1038/nature05924

Jokat, W., Schmidt-Aursch, M. C. (2007). Geophysical characteristics of the ultra-slow spreading Gakkel Ridge, Arctic Ocean, Geophysical Journal International, 168(3), 983-998. doi:10.1111/j.1365-246X.2006.03278.x

Schlindwein, V., Müller, C., Jokat, W. (2007). Microseismicity of the ultraslow-spreading Gakkel ridge, Arctic Ocean: a pilot study, Geophysical Journal International, 169(1), 100-112. doi:10.1111/j.1365-246X.2006.03308.x

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2006

König, M., Jokat, W. (2006). The Mesozoic breakup of the Weddell Sea, Journal of geophysical research, 111, B12102. doi:10.1029/2005JB004035

Moran, K., Backman, J., Brinkhuis, H., Clemens, S. C., Cronin, T., Dickens, G. R., Eynaud, F., Gattacceca, J., Jakobsson, M., Jordan, R. W., Kaminski, M., King, J., Koc, N., Krylov, A., Martinez, N., Matthiessen, J., McInroy, D., Moore, T. C., Onodera, J., ORegan, A. M., Pälike, H., Rea, B., Rio, D., Sakamoto, T., Smith, D. C., Stein, R., St. John, K., Suto, I., Suzuki, N., Takahashi, K., Watanabe, M., Yamamoto, M., Frank, M., Jokat, W., Kristoffersen, Y. (2006). The Cenozoic palaeoenvironment of the Arctic Ocean, Nature, 441, 601-605. doi:10.1038/nature04800

Winkelmann, D., Jokat, W., Niessen, F., Stein, R., Winkler, A. (2006). Age and extent of the Yermak Slide north of Spitsbergen, Arctic Ocean, Geochemistry Geophysics Geosystems, 7(6), Q06007. doi:10.1029/2005GC001130

2005

Czuba, W., Ritzmann, O., Nishimura, Y., Grad, M., Mjelde, R., Guterch, A., Jokat, W. (2005). Crustal structure of northern Spitzbergen along the deep seismic transect between the Molloy Deep and Nordaustlandet, Geophysical Journal International, 161(2), 347-364. doi:10.1111/j.1365-246X.2005.02593.x

Jokat, W. (2005). The sedimentary structure of the Lomonosov Ridge between 88°N and 80°N: Consequences for tectonic and glacial processes, Geophysical Journal International, 163, 698-726. doi:10.1111/j.1365-246X.2005.02786.x

Schlindwein, V., Mueller, C., Jokat, W. (2005). Seismoacoustic evidence for volcanic activity on the ultraslowspreading Gakkel Ridge, Arctic Ocean, Geophysical Research Letters, 32, L18306. doi:10.1029/2005GL023767

Schmidt-Aursch, M. C., Jokat, W. (2005). The crustal structure of central East Greenland - I: From the Caledonian orogen to the Tertiary igneous province, Geophysical Journal International, 160,736-752. doi:doi:10.1111/j.1365-246X.2005.02514.x

Schmidt-Aursch, M. C., Jokat, W. (2005). The crustal structure of central East Greenland - II: From the Precambrian shield to the recent mid-oceanic ridges, Geophysical Journal International, 160(2), 753-760. doi:doi:10.1111/j.1365-246X.2005.02515.x

2004

Geissler, W., Jokat, W. (2004). A geophysical study of the northern Svalbard continental margin, Geophysical Journal International, 158, 50-66. doi:10.1111/j.1365-246X.2004.02315.x

Jokat, W., Micksch, U. (2004). Sedimentary structure of the Nansen and Amundsen basins, Arctic Ocean, Geophysical Research Letters, Vol. 31, L02603, 4 S. doi:10.129/2003GL018352

Ritzmann, O., Jokat, W., Czuba, W., Guterch, A., Mjelde, R., Nishimura, Y. (2004). A deep seismic transect in northwestern Svalbard at Kongsfjorden (Ny Alesund) and the implications for the Cenozoic break-up from Greenland: A sheared margin study, Geophysical Journal International, 157,683-702. doi:10.1111/j.1365-246X.2004.02204.x

2003

Jokat, W., Boebel, T., Koenig, M., Meyer, U. (2003). Timing and geometry of early Gondwana breakup, Journal of Geophysical Research, 108(B9), 2428. doi:10.1029/2002JB001802

Jokat, W. (2003). Seismic investigations along the western sector of Alpha Ridge, Central Arctic Ocean, Geophysical Journal International, 152(1), 185-201. doi:10.1046/j.1365-246X.2003.01839.x

Jokat, W., Ritzmann, O., Schmidt-Aursch, M. C., Drachev, S., Gauger, S., Snow, J. (2003). Geophysical evidence for reduced melt production on the Arctic ultra-slow Gakkel mid-ocean ridge, Nature, 423, 962-965.

Michael, P. J., Langmuir, C. H., Dick, H. J. B., Snow, J. E., Goldstein, S. L., Graham, D. W., Lehnert, K., Kurras, G., Jokat, W., Mühe, R., Edmonds, H. N. (2003). Magmatic and amagmatic seafloor generation at the ultraslow-spreading Gakkel ridge, Arctic Ocean, Nature, 423(6943), 956-961. doi:10.1038/nature01704

Ritzmann, O., Jokat, W. (2003). Crustal structure of northwestern Svalbard and the adjacent Yermak Plateau: Evidence for Oligocene simple shear rifting and non-volcanic break-up., Geophysical Journal International,152,139-159.

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Qualifications

Randell Stephenson received his Ph.D. at Dalhousie University, Canada, in tectonic modelling and has published widely (120+ publications) mainly on topics in which regional geological and geophysical data are integrated into a tectonic synthesis. He worked for six years in the Canadian Arctic while based at the Geological Survey of Canada in Calgary, publishing numerous papers on sedimentary basin development, structure of the Canadian polar margin, and the tectonics of the Sverdrup Basin and Eurekan Orogen. He supervised the Ph.D. thesis of Gordon Oakey on the Cenozoic evolution and dynamics of the Baffin Bay-Nares Strait region of Arctic Canada and Greenland (2005). After 19 years at the VU University Amsterdam, he recently took up the position of Reader of Geophysics at the University of Aberdeen, UK (from January 2009). He is Honorary Professor in the Department of Earth Sciences of Aarhus University, appointed 1 May, 2008.

Role in Project

Randell Stephenson has developed new projects at the University of Aberdeen (for UK NERC and other financing, including the Geological Survey of Canada). These include a multidisciplinary (seismology, modelling, structural geology) project focused on the inherited and recent relief of Ellesmere Island, Arctic Canada, the geology of which is in part analogous to the Caledonian topography of Scandinavia/Scotland and a joint PhD project (Aberdeen/Aarhus) focused on the onshore-offshore development of sedimentary basins on the Canadian Labrador Sea-Baffin Bay continental margin and its west Greenland conjugate. These are complementary to and will be carried out in collaboration with projects based at Aarhus University dealing with tectonic and climate controls on the origin and evolution of Arctic topography on Greenland and northern Canada.

Relevant Publications (Arctic intra-plate tectonics)

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