

AG 211, Arctic Marine Geology Autumn 2011

General information and course syllabus

Focus of the course is on the Arctic Ocean. Uniqueness of the Arctic Ocean among the other world's oceans and the rapid changes it has been undergoing during the past few decades have signified its importance in the global climate system. However, our knowledge about its paleoceanography and climate history is relatively poor because of the harsh weather and sea-ice conditions impeding the marine geological investigations.

This course introduces main marine geological survey methods and proxies used in reconstruction of the Arctic Ocean paleoenvironments. Geological evolution of the Arctic Ocean and its role in the global oceanography and climate are discussed. The course is suitable for advanced undergraduate level students with interests in high-latitude marine geology, geophysics and paleoclimate.

Credits: 15 ECTS

Place: The University Centre in Svalbard (UNIS) in Longyearbyen, Svalbard.

Time: 29. August - 15. December 2011

Cruise: 5-15. September 2011

Evaluation: 3-hrs written exam (60% of final grade) and term project (40% of final grade), plus approved class assignments and cruise report (team-work)

Responsible for the course: Riko Noormets, Room A210, rikon@unis.no

**Please note that times and dates are subject to change. Up-to-date information is given during the course and accessible at UNIS through UNIS web page.*

The course consists of two parts: series of lectures given in blocks focusing on different topics of the Arctic marine geology (see the syllabus below), and individual term projects.

Lectures are given by invited speakers who are experts in their respective fields. Each lecture-block includes 'practical' part, either in the form of laboratory/computer exercises or as seminar presentations/discussions on previously given topics.

Term projects are students' individual work based on sedimentological (e.g. marine sediment core) or geophysical (e.g. bathymetric) dataset. The term projects will have a common theme of reconstructing past glacial sedimentary environments and processes based on geophysical and sedimentological data. Results should be summarized in a 10-15 pages long paper and presented in a 10-15 minute long presentation towards the end of the course.

Part of the course students spend on a modern marine research vessel Jan Mayen (<http://www.nfh.uit.no/hmenyvis.aspx?id=194>). During the cruise to the fjords and continental margin of Svalbard, students will participate in marine geological-

geophysical data collection, learn sampling procedures and selected data analysis methods aboard the vessel.

Cruise will take place 5-15. September 2011.



F/F Jan Mayen in Longyearbyen



Box-coring aboard F/F Jan Mayen

Syllabus

Introduction

Structure of the ocean basins

Sediment types, sources and transport mechanisms

Marine geological sampling methods

LAB: Core logging, sampling, selected analyses (water content, granulometry)

Marine geophysics & mapping of the Arctic Ocean

History of Arctic exploration

Physiography and mapping of the Arctic Ocean

Marine geophysical investigation methods and survey instruments

Marine acoustics/seismics

LAB: Bathymetric mapping using open source software

Glacial marine sedimentary environments and processes

Glacial sedimentary environments

Glacimarine processes

Past glaciations

Examples from the North Atlantic, Arctic and Antarctica

LAB: Seminar, glacial marine environments - scientific publication reading and presentation

Marine micropaleontology

Microfossils, their applications in paleo-studies of the Nordic and Arctic environments
Forams, their use as paleo-proxies, advantages and limitations
Transfer functions

LAB: IRD and microfossil content, identification of foram species and their paleoceanographic implications

Arctic Ocean's sediments, paleoceanography and role in global climate evolution

Stratigraphy

Sediment sources

Sedimentological and paleoceanographic proxies

Ocean-seaice-atmosphere-climate links

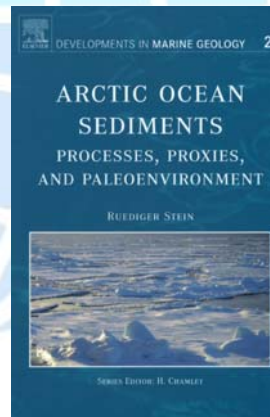
Arctic climate evolution, bi-polar links

LAB: Seminar - scientific publication reading and presentation

Literature

Central book for the course is

Stein, R., 2008. Arctic Ocean Sediments – Processes, Proxies and Paleoenvironment. Developments in Marine Geology, Elsevier, Amsterdam. 592 pp.



In addition, selected chapters from following text-books will be used:

Pinet, R.P., 2003. Invitation to Oceanography. 3rd Edition. Jones and Bartlett Publishers.

Bradley, R., 1999. Paleoclimatology – Reconstructing Climates of the Quaternary. International Geophysics Series, Vol 64.

Hambrey, M.J., 1994. Glacial Environments. UCL Press.

Mussett, A.E. & Khan, M.A., 2000. Looking into the Earth: an introduction to geological geophysics. Cambridge University Press,

Jones, E. J. W., 2004. Marine geophysics. Wiley.

All textbooks are available at the UNIS' library.

Literature includes small number of scientific publications that will be handed out during the course.



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