DEEP
Norwegian Research School for Dynamics and Evolution of Earth and Planets

IGGL
Ivar Giæver Geomagnetic Laboratory

CEED
The Centre for Earth Evolution and Dynamics

As a part of the lecture series "Special Topics in Dynamics and Evolution of the Earth and Planets", the Research School DEEP and the Ivar Giæver Geomagnetic Laboratory present the intensive course:

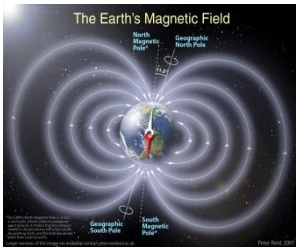
Earth Magnetism and Paleogeography

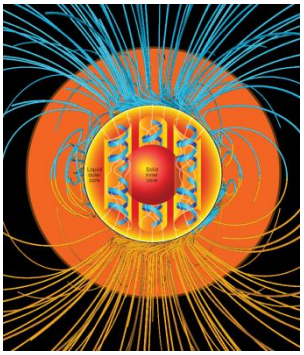
Instructors: Pavel V. Doubrovine, Mathew Domeier, Evgeniy Kulakov (CEED, UiO)

The course "Earth Magnetism and Paleogeography" is designed for graduate students (PhD and MS level) with a broad interest in geophysics, geology and planetary science. The main objective of the course is to give students a comprehensive overview of the Earth magnetism at the present time (geomagnetism) and in the geologic past (paleomagnetism), with the main focus on applications for reconstructions of paleogeography, which lays down the foundation for our understanding of the evolution and dynamics of the Earth at the planetary scale.

The course will be given at the Centre for the Earth Evolution and Dynamics (CEED), University of Oslo, during the fall semester of 2019 (October, exact dates TBA). The course consists of eight 1.5-hour lectures, laboratory exercises and training sessions with software for paleogeographic reconstructions (GPlates).

*The course includes **a featured lecture*** **by Prof. Trond H. Torsvik** (CEED, UiO):
Deep mantle structures as a reference for plate motions: Absolute longitude constraints for paleogeography back to the dawn of the Phanerozoic





Following topics will be covered in the course:

- **Geomagnetic field**
  You will learn about why the Earth has a strong planetary magnetic field, where and how it is generated, how we measure and describe the field, how it changes on a short and longer time scales, and how this information can help us to constrain the motions of lithospheric plates in the geologic past.

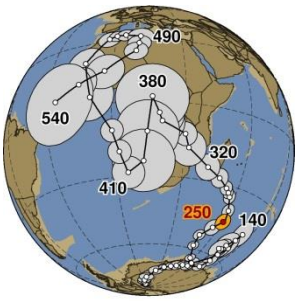
- **Geodynamo, dipole and multipole fields**
  You will learn why the geomagnetic field is dominantly dipolar, the fundamental dipole equations and the methods for testing whether the field is truly dipolar with paleomagnetic data. We will also discuss non-dipole fields and how we describe them using spherical harmonic analysis.

- **Magnetism of rocks and minerals**

  Here you will learn about most common magnetic minerals, how rocks get magnetized, types of magnetization, and laboratory procedures for measuring natural remanent magnetism of rocks.

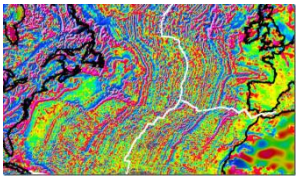
- **Paleomagnetism**

  You will learn the fundamentals of paleomagnetism, including data analysis, statistical methods, methods for isolating components of remanent magnetization, paleomagnetic poles, how we construct the paths of apparent polar wander, what they can tell us about paleogeography.



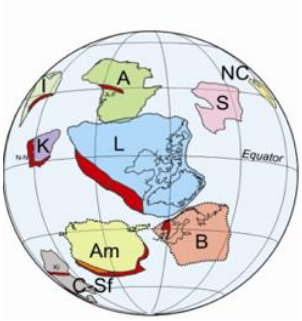
- **Common applications of paleomagnetism**

  You will learn about other useful applications of paleomagnetism, including magnetostratigraphy, geomagnetic reversals and polarity timescales, applications for local tectonics, interpretation of marine magnetic anomalies, constraining the intensity and variability of the geomagnetic field in the past, and what these data can tell us about the evolution of the Earth's core and geodynamo.



- **Paleogeographic reconstructions**

  You will learn about reference frames for reconstructing the past configurations of lithospheric plates (with respect to the paleoequator and with respect to the Earth's mantle), fundamentals of plate tectonics, techniques for constraining paleoconfigurations, true polar wander, why it occurs, and how we can estimate it. Here you will be given a primer on using computer software (GPlates) for producing your own paleogeographic reconstructions.



- **Supercontinents**

  We will talk about the concept of supercontinent cycle (Wilson cycle) and introduce the supercontinents that have existed in the Mesozoic-Paleozoic (Pangea) and Precambrian time (Rodinia, Columbia/Nuna, Kenorland), and discuss what we really know about them.

Grades and Credits:

The course is open to PhD candidates enrolled in the Norwegian Research School for Dynamics and Evolution of Earth and Planets (DEEP) and it gives 5 ECTS with a pass/fail grade upon completion.

We can offer the course as a 5 ECTS special curriculum (with an A to F grade) for master students enrolled at UiO. To master students enrolled at other institutions we can only offer documentation for participation.

For more information about the course please contact:

Pavel V. Doubrovine: paveld@geo.uio.no

For general questions regarding DEEP please contact: post-deep@geo.uio.no