

Large igneous provinces and their environmental impacts

Intensive PhD course, 5 credit points (for course presentation and home exam)

Organized by Henrik H. Svensen (Centre for Earth Evolution and Dynamics) and the DEEP Research School

Open for international PhD students

Time: 11-15 September 2017

v.23.05.2017

Course description

This intensive PhD course will cover many of the key subjects related to the formation and evolution of Large igneous provinces. The students will learn about

- LIPs and mantle processes
- plate reconstructions
- how to date basaltic rocks
- volcanology of LIPs
- sill emplacement and geochemistry
- contact metamorphism and degassing
- global carbon and sulfur cycles
- atmospheric effects of degassing
- the usage of carbon isotopes and environmental proxies
- the relationships between LIPs and environmental changes based on case studies from events like the end-Permian, the end-Triassic, the Toarcian, and the PETM.

The course includes exercises in thermal modelling, rock displays, lab visits, and a field trip in Oslo. Lecturers will be given by CEED researchers and international collaborators, including Trond Torsvik, Hope Jahren, Dougal Jerram, Sara Callegaro, Clinton Conrad, Carmen Gaina, Lars Augland, Sverre Planke, Christian Tegner, Dani Schmid, Øyvind Hammer, Wolfram Kürschner, William Hagopian, and Henrik H. Svensen.

Schedule

Monday 11.09.2017

9:15-10:00 LIPs, climate change and extinctions: a short overview and intro to the course (Henrik H. Svensen)

10:15-11:00 Large igneous provinces in time and space (Trond Torsvik)

- 11:15-12:00 LIPs and mantle processes (Clinton Conrad)
- 12-13 Lunch
- 13:15-14:00 The structure and evolution of LIPs (Dougal Jerram)
- 14:15-15:00 Carbon isotopes: principles and proxies (Anne Hope Jahren)
- 15:15-16:00 LIPs and the global carbon, sulphur, and mercury cycles (Morgan Jones)

Tuesday

- 9:15-11:00 Student presentations (of their work relevant for the course)
- 11:15-12:00 Case: The PETM (Morgan Jones)
- 12:15-13 Lunch
- 13:15-14:00 Case: end-Permian and end-Triassic (Wolfram Kürschner)
- 14:15-15:00 Sills and contact metamorphism in sedimentary basins (Henrik Svensen)
- 15:15-17:00 Physical volcanology of LIPs with rock displays and examples (Dougal Jerram)

Wednesday

- 9:15-10:00 LIPs and volcanic basins: insight from seismic data (Sverre Planke)
- 10:15-11:00 Thermal modelling of sills and aureoles (Dani Schmid)
- 11:15-12:00 Thermal modelling exercise
- 12-13 Lunch
- 13:15-15:00 Exercise continued (+ participants make presentations of results)
- 15:00- Fieldtrip

Thursday

- 9:15-11:00 Group presentations of the thermal modelling
- 11:15-12:00 LIP chronologies and eruption tempo (Lars E. Augland)
- 12-13 Lunch
- 13:15-14:00 Oceanic LIPs (Carmen Gaina)
- 14:15-15:00 Geochemistry of sills and lavas: Key principles and the NAIP case (Christian Tegner)

15:15-16:00 Volatiles in melts and volcanic systems (Sara Callegaro)

17:00- Dinner at the university canteen

Friday

9:15-10:00 Principles of cyclostratigraphy (Øyvind Hammer)

10:15-11:00 How to analyse stable isotopes (C, N, O) in organic matter and carbonates (William Hagopian)

11:15-12:00 Final remarks, comments, course review, exam info (H. Svensen)

12-13 Lunch

Curriculum

Selected papers/chapters from:

- Advances in Volcanology book about LIPs (2016/2017)
- Volcanism and Global Environmental Change, edited by Schmidt, Fristad and Elkins-Tanton. Cambridge University Press.
- Palaeogeography, Palaeoclimatology, Palaeoecology, Volume 441 (1 January 2016): Impact, Volcanism, Global changes and Mass Extinctions. Edited by Eric Font, Thierry Adatte, Sverre Planke, Henrik Svensen and Wolfram Kuerschner
- Ernst, R.: Large igneous provinces.
- Summerhayes, C.P. Earth's climate evolution. Wiley Blackwell, 2015.