

Earth and planetary materials and dynamics, preliminary program, 2023

Daily schedule (CET in March and CEST in May): **1500-1900**, with a few 10 min breaks.

Blue-purple: Short (10 min) presentations. Black: presentations by R.G. Trønnes

To keep some flexibility, detailed time slots within each of the four-hour daily sessions are not specified. We will follow the listed sequence of the short presentations, and I will put in indicator slides within my lecture presentations, reminding me (and you) where to insert your short presentations. You can then share your screen and run your presentation. Examples of such indicator slides are already in the presentation "[EP-2-SS-materials-chron-planetary-diff](#)", covering the two topics "[Solar system materials: the meteorite record](#)" and "[Planetary accretion and core segregation: differentiation processes and chronology](#)" on Monday, March 20 with some overflow to Tuesday March 21. This and the later presentations are not completely finished, and the indicator slides are not there (or not changed from the 2021 sessions) yet.

We need to keep a **strict time limit of 10 minutes** for each of the student presentations. You should **NOT** try to give a comprehensive review of the selected topic, but rather **focus on one or a few main points** that you find interesting. You might, for instance, like to **focus on only one or two of the reference articles**. Make it as simple and basic as possible, keeping in mind that most of the other participants are probably **not** familiar with your topic. After each presentation, we will open for a few questions and comments. For my presentations, I will also encourage you to "raise a hand" or unmute yourself and break in to ask questions. I don't think this will be too disruptive, and if I find that there are too many interruptions, I will ask you to defer questions until the next break.

Monday and Tuesday, March 20-21

Short introduction to the course

Star evolution, nucleosynthesis and planetary accretion (ep-1)

Solar system materials: the meteorite record (ep-2a)

Planetary accretion, core segregation and early mantle differentiation: geochemical processes and chronology (ep-2a-b)

This topic with some of the short presentations will probably overflow to Tuesday.

[Elena Mamonova, CEED, Dept. Geosciences, Univ. Oslo: Accretion disk models](#)

[Georg Wilhelm Gabriel Zachén, Dept. Geology, Lund Univ., Sweden: Chronology of the early Solar system](#)

[Anders Plan, Dept. Geology, Lund Univ., Sweden: Earth-Theia-Moon composition – devolatilisation](#)

[Lan Zhang, Dept. Geosci. and Petroleum, Norw. Univ. Sci. Technology: The young Moon](#)

[Alexandra Ostroverkhova, Dept. of Earth and Planetary Sci., Rutgers Univ. USA: Late accretion, the "late veneer"](#)

[Nidha Eriyattukuzhiyil, Michigan State Univ., East Lansing, USA: Early mantle differentiation and the question about geochemically isolated reservoirs](#)

Principles of phase relations: the phase rule, phase diagrams and the lever rule (ep-3)

Equilibrium thermodynamics, Clapeyron slope analysis (ep-3)

Introduction to analysis of phase diagrams

[A set of training exercises in phase equilibrium analysis \(more background material will be presented on Thursday and Friday\)](#)

Wednesday, March 22

Earth structure: seismology, bulk and shear moduli, mineralogy, density, pressure and temperature (ep-4)

Planetary heat flow and thermodynamics: convection and thermal boundary layers (ep-5)

[Yi Xue, CEED, Dept. Geosciences, Univ. Oslo: Geodynamo evolution and inner core growth](#)

Thursday, March 23

Mineral physics: p-V-T equations-of-states and experimental techniques (ep-6)

Planetary melting and crust formation, phase relations (ep-7)

Vesta - Earth: Upper mantle melting and crustal differentiation at low and high pressures (ep-7)

[Maciej Fitt, Inst. of Geological Sci., Polish Acad. Sci: Vesta structure, composition and relation to the HED meteorites](#)

Friday, March 24

Upper mantle and transition zone melting: dry, hydrous, carbonated (ep-7)

[Ana Anzulović, CEED, Dept. Geosciences, Univ. Oslo: Kimberlites, carbonatites and diamonds in view of mantle redox conditions](#)

Composition and origin of Archean cratonic lithosphere (ep-7)

[More on the phase equilibrium exercises](#)

WEEK 2

Monday, May 8

More on the phase equilibrium exercises

More on seismology and mantle structure

Justin Leung, Dept. Earth Science, Univ. Oxford, UK: [Seismic structure, upper mantle to uppermost lower mantle](#)

Biao Wang, Dept. Earth Science, Univ. Oxford, UK: [Seismic structure, lowermost mantle](#)

Subsolidus mineralogy of peridotitic and basaltic compositions

Fe-spin state of lower mantle minerals

Héloïse Gendre, Cosmochem. Astrophys. Experimental Geophys, Inst. de Physique du Globe de Paris, France: [The controversy of Fe-spin state of bridgmanite](#)

Tuesday, May 9

Lower mantle melting relations, magma ocean crystallisation and differentiation

Regional and temporal T_p -variation, thermal evolution of the Earth, continental crustal growth, plate tectonics:

Bence Horanyi, Earth Sciences - Magma Group, Earth Sciences Inst. of Orléans (ISTO), France: [Initiation of plate tectonics](#)

Wednesday, May 10

Terrestrial planetary mantles and cores: oxygen fugacity, partitioning and solubility of light elements

Dariusz Marciniak, Inst. of Geological Sci., Polish Acad. Sci: [Mercury surface and volcanism](#)

Lauri Llado, Dept. Geology, Univ. Liège, Belgium: [Mercury redox state](#)

Emil Holtung Gulbransen, Natural History Museum, Univ. Oslo: [Sulphur incorporation and sulphide-silicate partitioning of key elements at variable oxygen fugacity](#)

Core-BMO exchange and BMO crystallisation: implications for BEAMS, LLSVPs and ULVZs

Thursday, May 11

Geochemical cycles: redox relations and transfer of O, C and H

Geochemical cycles: constraints on mantle reservoirs, Sr-Nd-Pb-Hf-isotopes

Tanushri Malviya, Dept. Geology, Banaras Hindu University, India: [Geochemical heterogeneities and mantle convection](#)

Friday, May 12

Continuation, Geochemical cycles: constraints on mantle and core reservoirs, noble gas and short-lived radioactive systems: He-Ne-Xe-Nd-W-isotopes

Bilateral asymmetric zoning of plume conduits

Martina Monaco, Dept. Geological Sciences, Univ. Florida, USA: [Asymmetrically zoned mantle plumes](#)

Summary, questions, opinions, discussions