



Low-temperature thermochronology

Lesson 1.0 - General course information



Who are we?

- **Ilmo Kukkonen**, Professor of Solid Earth Geophysics
 - Geothermics
 - Borehole geophysics
- **David Whipp**, Associate Prof. of Geodynamic Modelling
 - Geodynamics of the lithosphere
 - Geodynamic and geomorphic process interactions



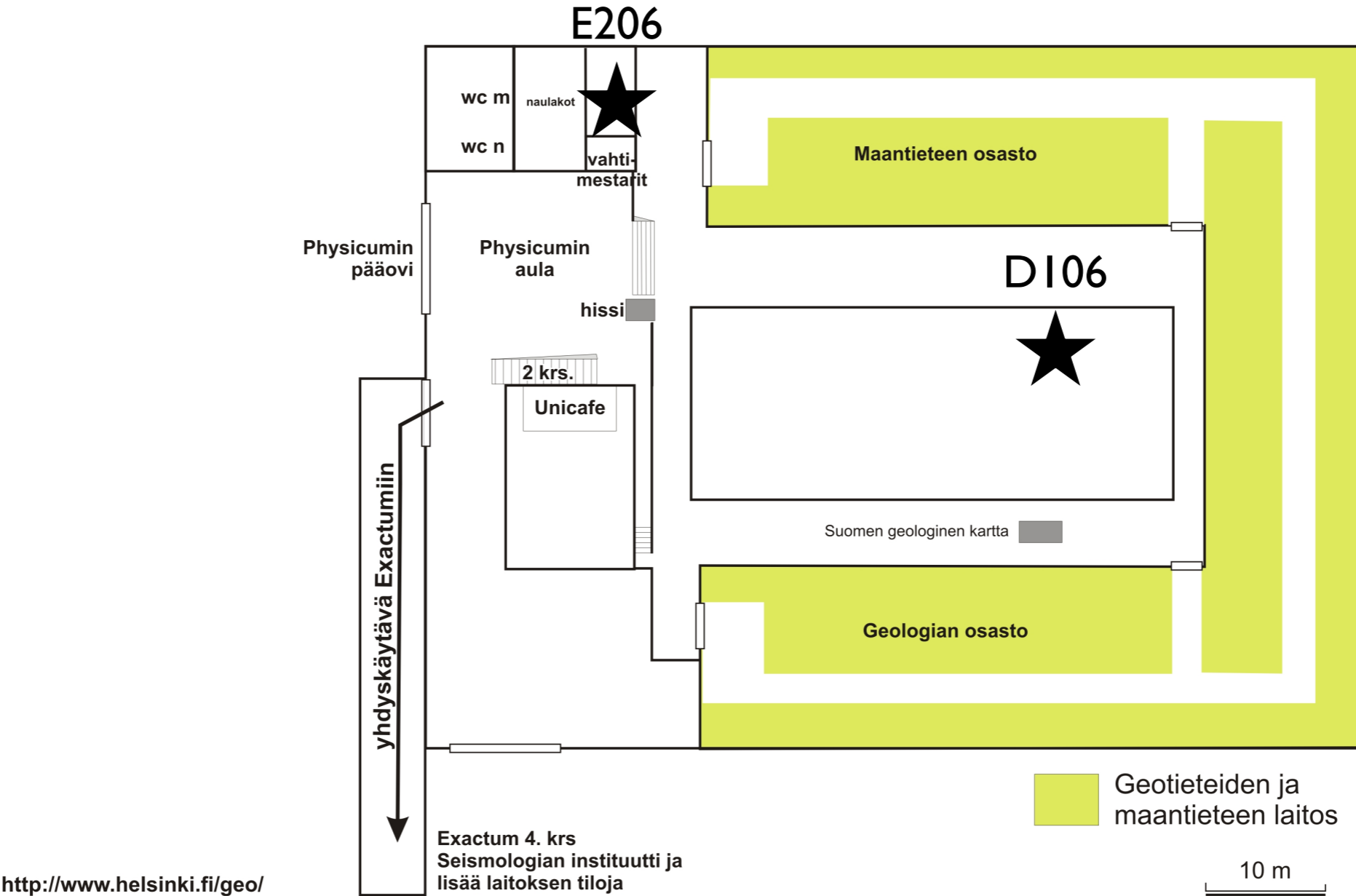
Who are you?



- To help us all get to know you, we'd like to hear a few things about you
 - Name
 - Home university/organization
 - Geoscience background/thesis topic
 - Why were you interested in the course?



Practical matters: Where are we?

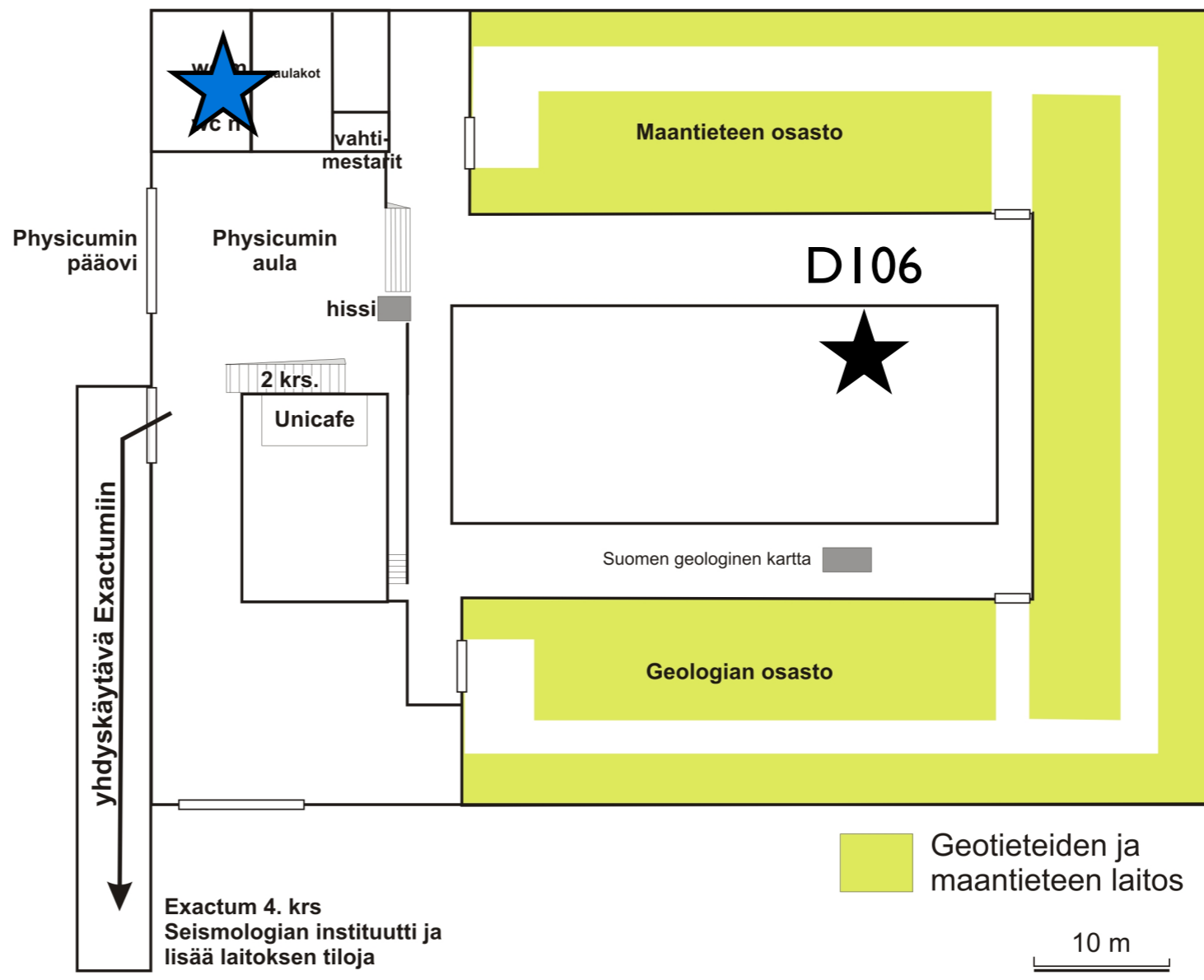


Monday-Thursday: D106

Friday: E206



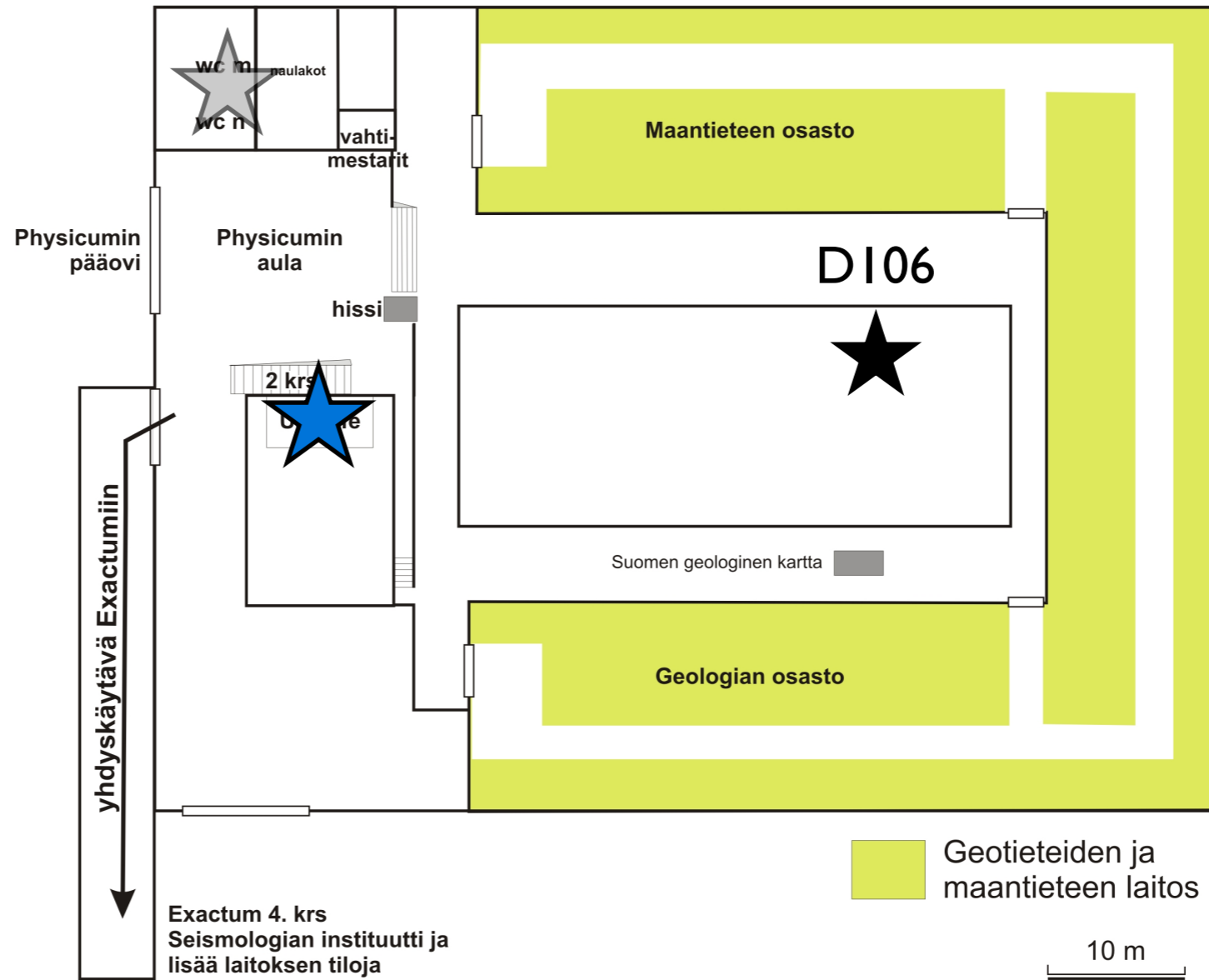
Practical matters: Toilets



<http://www.helsinki.fi/geo/>



Practical matters: Coffee/tea



Practical matters: Lunch



HELSINGIN YLIOPISTO
HELSINGFORS UNIVERSITET
UNIVERSITY OF HELSINKI

<http://helixs.physics.helsinki.fi/>

Low-temperature thermochronology


- There are numerous lunch options on the Kumpula science campus
- You can get a **full hot lunch** across the street in the Chemicum, in the basement of the Exactum next door, or slightly further away in the Dynamicum (food is pricier, but better).
- The Unicafe (coffee/tea spot) also has **sandwiches/paninis**

www.helsinki.fi/yliopisto

October 23, 2017

Course website

🏠 Thermochemistry course



2017

COURSE INFORMATION

- Course details
- Software installation
- Content licenses

[Docs](#) » Short course on low-temperature thermochronology

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Short course on low-temperature thermochronology



Low-temperature thermochronology is a geochronological method based on the temperature-sensitive retention of a radiogenically produced daughter product in mineral crystals. It is widely used to quantify long-term rates of tectonic and erosional processes in mountainous regions, but can also be applied to study erosional processes in ancient settings. In this course you will learn the fundamental concepts of thermochronology and its applications, be introduced to common mineral dating systems by European experts in thermochronology, and work with numerical tools for analyzing and interpreting thermochronometer data.

Course goals

This course aims to:


1. Introduce the basic concepts of thermochronology and thermal processes in the crust
2. Provide an in-depth view into the systematics of popular thermochronometer systems, including (U-Th)/He, fission-track, and $^{40}\text{Ar}/^{39}\text{Ar}$ dating in a variety of minerals
3. Support lecture-based knowledge with computational exercises from simple equations in Excel to sophisticated 3D thermal modelling

Target audience

<https://thermochron.github.io/>

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Course computing environment

Installing VirtualBox

1. Download and install a copy of [VirtualBox](#).
2. Download and install a copy of the [VirtualBox Extension Pack](#).

Installing the Linux image

You can download a copy of the virtual machine image from <https://filesender.funet.fi/?vid=3335246a-97c3-afc8-abd1-00005db02c43>. This image can be opened using VirtualBox and will allow you to run a Linux machine on your own personal computer. All of the course software is available in this environment.

In case you need them, the username and passwords for the virtual machine images are below:

- Username: osboxes
- Password: ThermoChron2017!

This is the easy way, if you get this working properly you'll have all the course software installed and available



Computing demo



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Learning outcomes

- At the end of this course you should be able to
 - Explain the concept of thermochronology and how it is applied to study rates of tectonic and erosional processes
 - Describe various low-temperature thermochronometer mineral systems, how they work, and some practical issues related to their use
 - Use several different methods for modelling thermochronometer ages to link them to rates of exhumation



Working methods

- The course involves a combination of lectures and computer-based exercises
- Because this course involves many new concepts for most of you, we will spend a bit more than half of the course in lectures
- For the computer exercises, you are welcome to work together with a partner and we will discuss solutions after you have completed each exercise



Credit points

- Those who attend the majority of each day of the course will receive 3 ECTS credit points
- An additional 2 ECTS credit points will be granted upon completion of a course research project and summary paper
- We can discuss what this might entail later in the course if you're interested



Course schedule - Day 1

Schedule subject to change

- **Morning (9 - 12-ish)**
 - Practical course information and introductions
 - Basics of thermochronology
 - Some applications of thermochronology
- **Lunch break (12 - 13)**
- **Afternoon (13 - 16-ish)**
 - Crustal thermal processes
 - Low-T thermochronology in Fennoscandia



Course schedule: Days 2, 3

Schedule subject to change

- **Day 2**
 - **AM:** Basics of $^{40}\text{Ar}/^{39}\text{Ar}$ thermochronology
 - **PM:** Recent advances in $^{40}\text{Ar}/^{39}\text{Ar}$ thermochronology

- **Day 3**
 - **AM:** Overview of fission-track thermochronology
 - **PM:** Modelling fission-track data with HeFTy



Course schedule: Days 4, 5

Schedule subject to change

- **Day 4**
 - **AM:** (U-Th)/He thermochronology
 - **PM:** (U-Th)/He thermochronology

- **Day 5**
 - **AM:** Data modelling and interpretation using Pecube
 - **PM:** Free time working with Pecube

Any questions?

