

Monitoring of air temperature, humidity, and CO₂ concentration

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Monitoring exercise; instructions

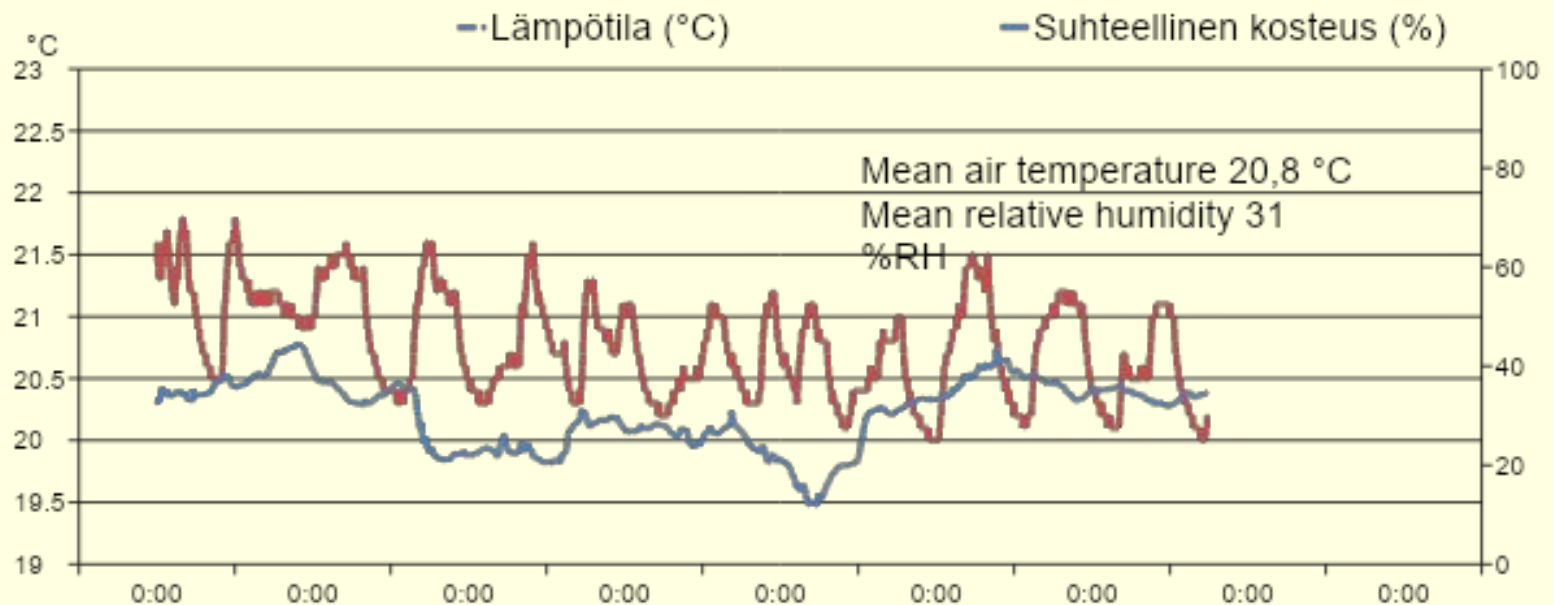
- Aim:
 - To learn to design, perform, and report a monitoring activity
- Physical quantities to be measured:
 - Air temperature and relative humidity
 - **Absolute humidity should be calculated**
 - Optional: CO₂ concentration
- Alternative 1: Using data loggers for monitoring:
 - Data logger EBI 20, that should be programmed by means of a PC
 - Monitoring of air temperature and humidity
 - You should use at least two data loggers
- Alternative 2: Using a Grant squirrel multichannel data logger
 - Monitoring air and surface temperatures at 8 locations
 - The data logger is used together with a portable PC (available in the lab)
- Sampling duration:
 - At least 24 hours
- Groupwork:
 - One or two students in the group (monitoring of temperature and humidity)
 - Two students in the group (monitoring of temperature, humidity and CO₂ concentration)

Optional

- We will study air flow rates and CO₂ concentrations later in this course
- You could measure the air flow rates in the room in which you do the monitoring, however you need to learn how to measure
- You could compare the measured air flow rates to the design values in D2
- If you monitor also CO₂ concentrations, and know the number of persons present, you could do some further analysis of the ventilation in the room

Example of monitoring in an office room

- * Think what kind of variation you could expect in temperature and humidity
- * Constant values are not very interesting results



Memory capacity of the EBI 20 data loggers

- 8000 measured data (temperature and humidity takes two)

- The unit provides different recording modes
- The desired recording mode is set by the PC
 1. Endless measurement
 2. Immediate measurement until memory is full
 3. No measurement/start by pressing key
 4. Start/stop measurement

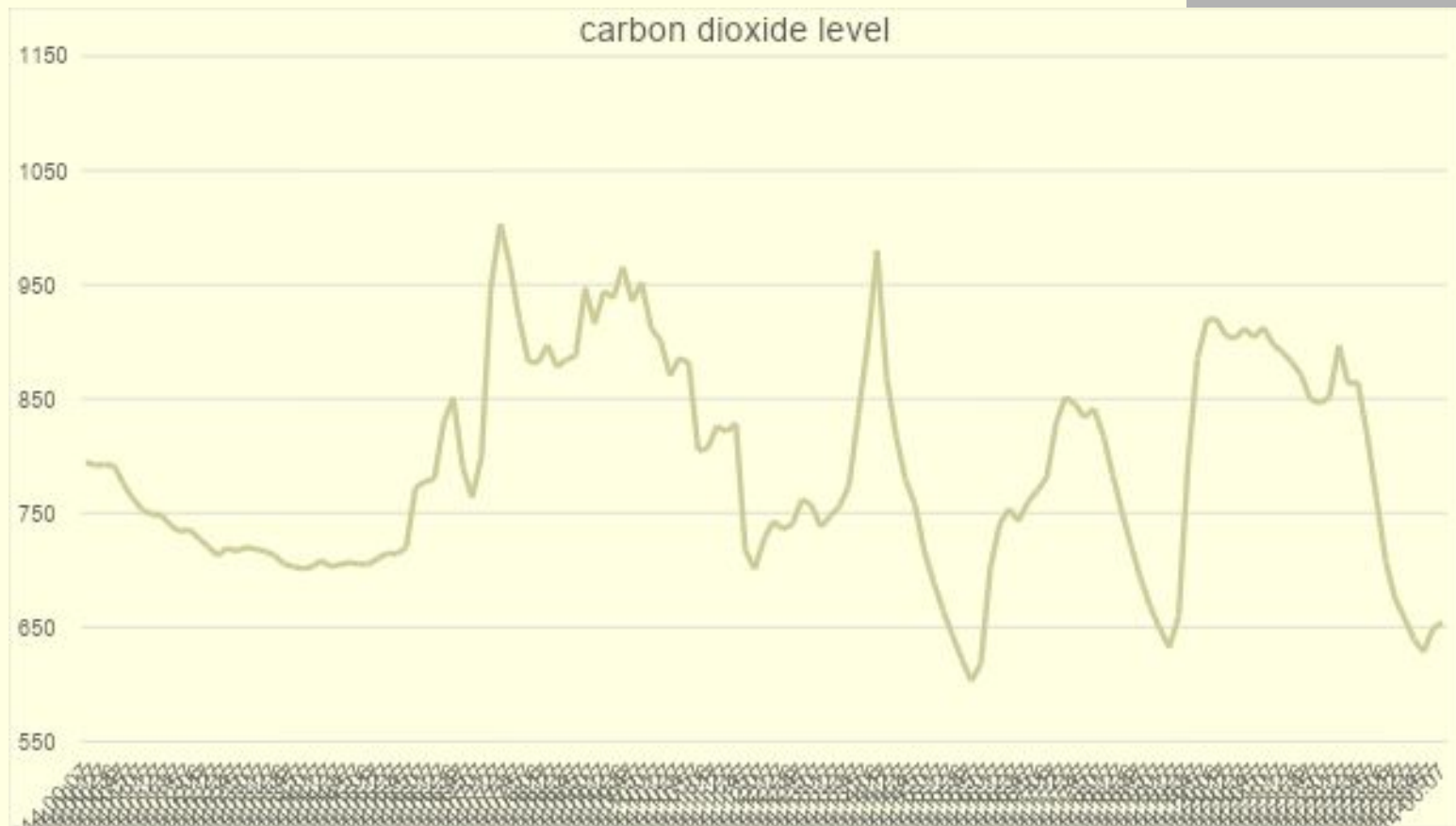
Comparison of the two EBI 20 data loggers

- The data loggers that you have, may show different values for temperature and humidity
 - You should correct for that difference, when you analyze your sampling data
- This is how you should do:
 - When you are starting your sampling, put the loggers first at the same location (at a table side by side) and let them be there for an hour
 - Use this data to correct the results so that your loggers show the same results at the same location

Grant squirrel multichannel data logger

- Each sensor has a long cable
- Suggestions for measuring activities:
 - Do a comparison of the sensors, since this data logger is new and we do not yet have information about its characteristics.
 - Study operative temperature, since one of the sensors could be installed inside a globe thermometer.
 - Study the efficiency of the heat recovery of Building A by monitoring the temperatures in various locations in the air handling unit.

Measuring CO₂ concentration



What are the reasons for the variations?

Selecting the topics and reserving the instruments

- Tuesday 7th of February:
 - Each group tells, what and where they are going to monitor
- Reserving the data loggers:
 - Send an e-mail to the laboratory engineer keijo.pirainen@xamk.fi to reserve the loggers. Tell in the e-mail about which instruments you need, when you want to get the instruments and instructions to use them, and when you will return them.
 - Save the monitoring results to your own memory stick
- You need to do a PowerPoint file which has to be returned on the 19th of March in Moodle (detailed instructions for the report will be given later)

Oral presentations

- Presentations should be in a PowerPoint file
- Oral presentations are held on Tuesday the 21st of February
- The data should be shown in averages and in graphs (done with Excel)
- Absolute humidities should be calculated and shown together with the air temperature and relative humidity
- CO₂ concentrations should be shown
- Photos of the monitoring are desirable

Suggestions for monitoring

- Residence, indoor and outdoor conditions
- Residence, conditions in different rooms
- Residence, conditions at different heights
- Conditions inside a refrigerator or freezer
- Class room, conditions during the day, at different heights or at different locations in the room
- Something else that interests you? Swimming hall, gym, department store...
- Conditions inside a car

When you put the data logger outside, make sure that it does not get wet (snow, rain...) or stolen.

Start with these questions:

- With whom do you work?
- The aim of the measurements?
- When do you measure?
- Where do you measure?
- Which data loggers you are going to use?
- How many loggers do you need?
- For how long do you monitor? (at least 24 hours)
- How often do you store the data (s, min, h)?
- What kind of results do you expect to get?
- How would you analyze the results?
- Comparison of the results to D2, standards etc.?