Impact of the forest type on humidity, temperature and brightness with Cobra SMARTsense

Biology | Ecology & environment | Air analysis & meteorology

Difficulty level	Group size	Preparation time	Execution time
easy	2	10 minutes	45+ minutes

This content can also be found online at:

http://localhost:1337/c/5f4596769a658b00033e02da

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Teacher information

Application

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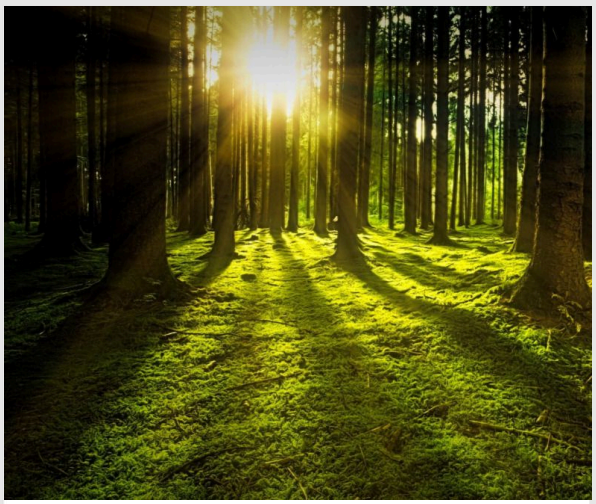

sunlight in a coniferous forest

Different types of forest have different climate data. Temperature, humidity and light intensity are not only dependent on meteorological factors but also on vegetation.

But how exactly does the forest species influence these parameters?

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Other teacher information (1/5)

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Prior knowledge

The density of a forest's canopy determines the incidence of light and thus also influences the temperature. The low vegetation density of a managed high forest (in our latitudes mostly beech forests) in turn additionally influences wind movements in the forest, which in turn affects the humidity.

Scientific principle

In this field experiment we carry out measurements of different forest types on the same day and at about the same time in order to exclude meteorological deviations as far as possible.

Other teacher information (2/5)

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Learning objective

The students should recognize that the forest species can have an influence on the temperature, humidity and light intensity in the forest.

Tasks

Students will use Cobra SMARTsense sensors to measure and record temperature, humidity and light intensity.

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Other teacher information (3/5)

Interpretation of results (1/4)

- The forest types presented and measured in the experiment are:
  - Beech high forest (Fig. 1),
  - beech growth (Fig. 2),
  - spruce plantation (Fig. 3) and a
  - Mountain rainforest in Ecuador (Fig. 4).
- The data of the first three mentioned above were recorded at the same time, the latter example only serves to illustrate a natural forest ecosystem.

Other teacher information (4/5)

Interpretation of results (2/4)

The results clearly show a light gradient that continuously decreases from high forest to rain forest (table, first line). The high forest is mainly dominated by high-stemmed trees, which form a canopy, but in contrast to the denser vegetation of a growth still allow much light to pass through. Accordingly, a herb layer can also form. The spruce monoculture is, as expected, even darker, as the trees are planted close together and hardly any light can get through. A tropical mountain rain forest has almost no herb layer on the ground, but in the crown area (epiphyticism).

Measured value	Beech forest	Beech growth	Spruce forest	Mountain rainforest
Light (lx)	1184	848	324	279
Rel. humidity (%)	54,8	63,0	57,6	57,5
Temperature (°C)	24,8	23,3	23,1	19,8
Altitude above sea level (m)	394	361	278	2650

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Other teacher information (5/5)

Interpretation of results (3/4)

The relative humidity also varies in the different types of forest (table, line 2). There is almost no wind in beech growth and moisture is better retained than in the windier and warmer high forest. Spruce cultivation has no herb layer at all, so only the soil, which releases water into the environment, can contribute to the relative humidity. One would expect a higher humidity in the rainforest. It should be noted that no rain fell for days before the measurement and in addition the forest is located on a slope and is exposed to strong winds.

Interpretation of results (4/4)

At first glance, the temperature (table, line 3) also seems too low for a forest in tropical latitudes. However, it is a mountain rainforest at about 2650 m above sea level. For every hundred metres of altitude difference, the temperature usually decreases by about 0.2°C. The European forest types again clearly show a temperature drop from high forest to spruce forest, which correlates with the light values.

Safety instructions

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- The general instructions for safe experimentation in science teaching apply to this experiment.

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Student Information

Motivation

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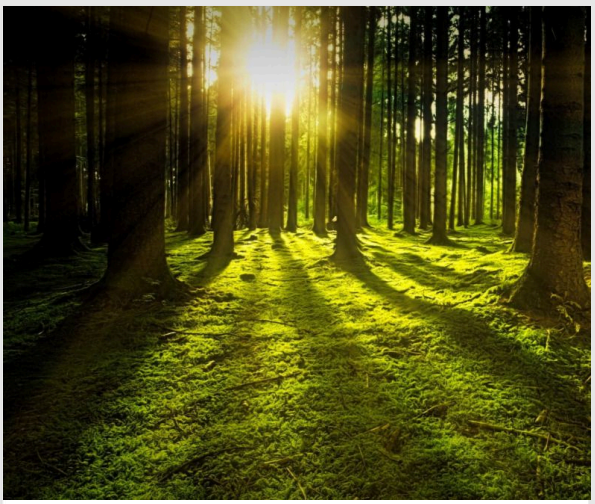

sunlight in a coniferous forest

If you are out cycling in summer and ride from the open field into a shady forest, you will often feel relatively cool, if not cold, and damp.

You are certainly familiar with this phenomenon, but why is this actually so?

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Tasks

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Beech high forest in the vegetation period

Measure temperature, humidity and light intensity with Cobra SMARTsense sensors in different types of forests and compare the results.

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Equipment

Position	Material	Item No.	Quantity
1	Cobra SMARTsense - Temperature, - 40 ... 120 °C (Bluetooth)	12903-00	1
2	Cobra SMARTsense - Light, 1 ... 128 kLx (Bluetooth + USB)	12906-01	1
3	Cobra SMARTsense - Relative Humidity, 0 ... 100 % (Bluetooth + USB)	12931-01	1
4	measureAPP - the free measurement software for all devices and operating systems	14581-61	1

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Set-up

Structure of the experiment

- Make sure that Bluetooth is activated on the mobile device.
- Switch on the "Cobra SMARTsense" sensor by pressing the power button.
- Open the PHYWE measureAPP and select the required sensor.

Spruce plantation with hardly any herb layer

Procedure

Performing the measurement

- The measurement is carried out during the vegetation period, ideally in early summer.
- In order to minimize edge effects, you should walk at least 25 m from the path into the forest.
- In order to ensure the reproducibility of the light measurement, always measure in one direction (e.g. always north) and horizontally at approximately hip height. Measure the values for temperature and humidity) at the same place. These are easier to reproduce, but it should be noted that the measured values only become constant after some time. If the measuring device is swivelled back and forth, the measured values adjust more quickly.
- Measured values for temperature, humidity and light intensity are read in the PHYWE measureAPP. The values are transferred into a table.

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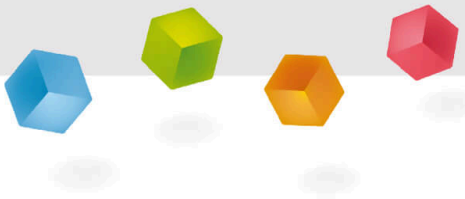

Report

Task 1

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Which statements are correct?

- [ ] The herb layer in a typical rainforest is located in a light-exposed place, the crown area (epiphyticism).
- [ ] In a growing forest (a young forest in growth) less light can be measured at ground level than in a high forest.
- [ ] A spruce forest occurring in Germany is comparatively darker at ground level than a beech forest.

Check

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Task 2

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Which statement is correct?

- Managed beech high forests are very dense and let little light through.
- The density of a crown space determines the incidence of light and thus also influences the temperature.
- The ground vegetation is not important for the humidity of a forest.
- Rainforests have the most light at ground level, otherwise not so many plants could be found in the rainforest.

Task 3

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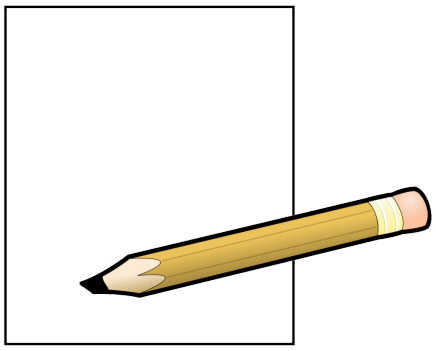
Compares the different results of the forest types and interprets the results. Then discuss in class what consequences the results may have on forest growth.



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Slide	Score / Total
Slide 16: Soil and forest species	0/3
Slide 17: Forest species	0/1

Total amount 0 / 4

Solutions Repeat

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