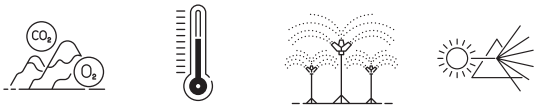
terraXcube
eurac research

Small Cube

Responses of mountain grassland ecosystems to climate change

The test in a nutshell



terraXcube

terraXcube is Eurac Research's extreme climate simulation centre at the NOI Techpark in Bolzano, South Tyrol, Italy.
Within its chambers, even the most extreme of all our Planet's environmental conditions can be created. By combining hypobaric and altitude technology with state-of-the-art environmental simulation, we aim to investigate the effects of extreme climate conditions on humans, ecological processes and industrial products.
The climate chambers differ in size and equipment and can accommodate people, plants and other living organisms for up to extended periods and have the space to accommodate large machines and products.
Each day our team breaks new ground with scientists and industry partners and prepares the path to gain discoveries.

Test description

Mountains are amongst the regions most sensitive to climate change. These ecosystems are critical for maintaining global patterns of biodiversity and ecosystem functioning. In order to meet the challenges of preserving biodiversity and the proper functioning of ecosystems in these regions, we need to understand and forecast how mountain ecosystems will respond to current and future changes. The extreme environment simulator enables us to construct complex ecosystems which resemble authentic conditions but with the additional possibility of eliminating or reducing the variance caused by unknown factors (e.g. by controlling environmental conditions) as well as the expedient monitoring of most of the variables influencing ecological processes. Consequently, this research project aims to demonstrate terraXcube's capacity to simulate a broad range of atmospheric and climatic conditions, and to support ecological experiments that can reveal the effects of climate change on the functioning of alpine ecosystems. Specifically, we will carry out (i) a hydrological experiment to gauge the reaction of vegetation to changes in water balance and (ii) a trophic manipulation experiment to reveal the bottom-up and top-down effects that changes in temperature have on alpine vegetation. In order to monitor these effects, mesocosms (soil monoliths) will be planted into so-called lysimeters and exposed to current and future temperature, radiation and moisture conditions, that are realistic and highly probable for alpine environments.

Main focus

To quantify the effects of long-term elevated temperatures on grassland ecosystems at two different elevations (montane zone and alpine zone).

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Small Cube – Control for Each Compartment

Internal dimensions	2.8 m x 3 m x 2.8 m (L x W x H)
Maximum simulated altitude	4,000 m ±10 m (~ 13,000 ft)
Maximum Rate of Climb (ROC)	6 m/s (~ 1,180 ft/min)
Minimum Rate of Climb (ROC)	0.1 m/s (~ 20ft/min)
Temperature Range According to IEC 60068-3-5	-20...+50°C (± 1°C in time ± 2°C in space)
Temperature Rate of Change According to IEC 60068-3-5	± 0,5 °C/min (cooling & heating)
Relative Humidity T > 4°C and according to IEC 60068-3-6	10...100% ± 3%
Humidity Rate of Change T > 4°C and according to IEC 60068-3-6	0.4%/ min cooling; 0.8%/ min heating
Precipitations	Rain: 0-20 mm/h (Rainwater too)
Light	Full solar spectrum 280-900 nm, intensity 2,500 µmol/m2s
CO_2 Control	400-1,000 ppm

Other Features

Power Supply	230Vac 1~ 50Hz
Data-acquisition equipment Smoke/Fire detection system + Fire suppression system CC cameras	
Network connection	Gigabit-Ethernet (1000BaseT) PoE