CLIMBING MOUNTAINS

Plants under pressure

J. Ecol. https://doi.org/10.1111/1365-2745.13736 (2021)

Credit: konradlew/E+/Getty

Altitudinal gradients may be seen as a proxy for temperature gradients, and thereby can be used in climate change studies to understand an organism's response to different temperature conditions. However, altitudinal change is also associated with changes in atmospheric pressure and oxygen and carbon dioxide partial pressures, which for plants, can lead to physiology and growth impacts.

To better understand the influence of pressure on plant growth and fitness, Carla Arce from the University of Neuchâtel and Zoe Bont from the University of Bern, both in Switzerland, and colleagues in Switzerland and Brazil grew and observed common dandelion (*Taraxacum officinale*) under otherwise controlled conditions at four experimental stations situated between 526 and 3,450 m above sea level. Their work revealed reduced root growth and root:shoot ratios under lower pressure, as well as higher production of the defence metabolite TA-G under higher pressure, which was particularly pronounced in populations originating from low-altitude environments.

Overall, the work has important implications for the interpretation of climate change studies that assess plant responses to temperature across altitude gradients, while suggesting potential challenges for species that track warming by migrating up mountains. *TAM*

https://doi.org/10.1038/s41558-021-01145-z

CLIMATE RESPONSE

The year 2020

Geophys. Res. Lett. **48**, e2021GL093841 (2021)

Levels of particulates in the atmosphere can affect the surface temperature, as a high particulate load reduces warming. In 2020, two events had an effect on the particulate load; the end of 2019 and start of 2020 saw large parts of Australia burning as severe wildfires swept across the land, pumping emissions and particulate matter into the atmosphere, whereas the pandemic-related lockdowns reduced emissions.

Using the Community Earth System Model v2, John Fasullo and colleagues from the National Center for Atmospheric Research, Boulder, CO, USA, estimate the climate response to these events. The 50-member ensemble simulations show that the Australian fires resulted in a brightening of clouds, peaking in late 2019, and an associated global cooling of 0.06 ± 0.04 °C by mid-2020; a more gradual response was seen from COVID-19-related reductions, with warming of 0.05 ± 0.04 °C by the end of 2022.

These results show the impact of these different events on top of atmospheric radiative balance and resultant responses in temperature, offering insight into how global and regional climate respond to particulate and emission changes. *BW*

https://doi.org/10.1038/s41558-021-01146-y

LAND–ATMOSPHERE INTERACTIONS

Drought-related warming

J. Geophys. Res. Atmos. https://doi.org/10.1029/2021JD034646 (2021)

Soil moisture conditions have a key role in driving summertime surface air temperature variability through impacts on latent and sensible heat fluxes. However, large-scale climate drivers — including pressure patterns, winds and sea surface temperature — also exert a strong influence. These effects complicate the interpretation of individual heatwave events, as well as the attribution of longer-term temperature trends.

Annemiek Stegehuis from LSCE/IPSL, France, and the Czech University of Life Sciences Prague, Czech Republic, and co-authors use regional climate model simulations with forced large-scale atmospheric circulation and variable soil moisture conditions to investigate the causes of contemporary warming trends in Europe. In western Europe, encompassing France and Germany, they find that early summer soil moisture deficits explain warming of ~0.1–0.2 °C per decade from 1980–2011, thus accounting for a large component of observed summertime warming trends. In eastern Europe, by contrast, warming of ~1 °C per decade can be linked to large-scale climate drivers, with a comparatively minimal influence from

Credit: LEREXIS/Moment/Getty

antecedent soil moisture. At least in western Europe, retaining spring-time soil moisture therefore offers a key strategy to minimize and mitigate summertime heat. *GS*

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URBAN PLANNING

Framing resilience

Landsc. Urban Plan. **214**, 104173 (2021)

Recent unprecedented extreme weather events, including record-breaking rainfall, wildfire and heat waves, highlight the importance of the capacity of cities to survive and adapt to the accelerating climate threats. Thus, resilience has emerged as one of the central objectives in urban planning. However, the concept is framed differently across a diverse set of urban contexts and by actors who engage in practical resilience building.

Tischa A. Muñoz-Erickson, of USDA Forest Service, and co-authors used survey data to examine resilience framing across nine cities in the US, Latin America and Caribbean, and also across multiple sectors. They find that the cities generally still define resilience as the ability to resist, cope with and bounce back from previous disturbances. However, sustainability, equity and social–ecological–technological systems perspectives are rarely associated with resilience. This framing will probably fall short in providing the type of large-scale fundamental changes that many cities need to overcome persistent challenges and inequalities in the face of climate change. The authors argue that, regardless of definition, resilience should be designed in transformative ways so that it is more anticipatory, systemic and equitable than existing practices. *LY*

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