Correspondence

Society and history imprint climate data

Long-term climate observations that are highly processed can obscure the context in which the data were collected. Yet such background can provide important information about how climate and society interact, and could contribute to the design of climate services.

Many historical measurements were part of colonialism: describing and explaining the world according to European ideas. Polar explorations left their traces on climate records, and wars stimulated measurements in strategic locations while interrupting others or destroying archives. Cold-war geopolitics shaped modern global networks for collecting climate information and prompted the creation of World Data Centers to disseminate it. Trade and whaling were entwined with marine climate data. Restrictive policies can still impose omissions on data maps. And commercial aviation generates weather records from flight corridors.

In our view, such context dependence could inform climate services. In developing countries, for instance, farming practices that use traditional knowledge of local climates might need adjusting in response to global warming.

Scientists working with climate data currently try to minimize the effect of context on their estimates of physical variables. In our view, policy decision-making should be based on both.

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Roots out of sight, not out of mind

Using genomics and imaging to understand plants' physical traits does not stop above ground (see *Nature* **553,** 396–398; 2018). The architecture of plant root systems growing in opaque soil is being revealed by 3D-imaging tools such as X-ray computed tomography, magnetic resonance imaging and neutron tomography.

Combining these insights (see, for example, T. Roose *et al. Plant Soil* **407,** 9–38; 2016) with gene-expression studies, spatially resolved data on chemical and physical parameters, and the composition of the soil microbiome around roots should help to explain how system properties emerge as these components interact. Such properties are relevant to the acquisition of water and nutrients, as well as to plant health, carbon storage in soil and soil structure.

Priorities are to develop joint sampling protocols and a common language across physics, soil science and biology, along with skills in image analysis, spatial statistics and modelling at scales from root hairs to whole-root systems.

Germany's main research funder (the DFG) has just launched a programme to study the spatio-temporal organization and function of the soil zone altered by the plant root, also called the rhizosphere (see www.ufz.de/spp-rhizosphere).

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Temperature debt of solar geoengineering

Solar geoengineering is a proposed method of climate engineering that aims to reduce global warming using an artificial 'sunscreen' of aerosols in Earth's high atmosphere. As planning of the first field experiments gets under way, any potential risks associated with the technology must be transparently assessed and not downplayed or dismissed. One such risk of solar geoengineering is its 'temperature debt' — the planetary heating that would arise if maintenance of the artificial sunscreen was discontinued.

Modelling suggests that most of the world's population could benefit from this temporary sunscreen, compared with the adverse effects of unabated climate change (a questionable reference state, in my view). However, models also reveal the alarming rise in temperatures that could occur if the screen of short-lived aerosols should suddenly cease to function for any reason in the presence of high concentrations of long-lived greenhouse gases (see H. D. Matthews and K. Caldeira *Proc. Natl Acad. Sci. USA* **104,** 9949–9954; 2007). This rapid warming would pose a severe risk to ecosystems and society.

Even with the best planning to ensure steady operation of the technology, its continuous safe functioning and maintenance cannot be guaranteed. Yet it could take hundreds of years to safely phase out solar geoengineering and achieve the same degree of cooling by reducing greenhouse-gas concentrations. It is therefore imperative that, in the absence of a fail-safe mode for solar geoengineering, the temperature debt is fully accounted for in any assessments of this technology.

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Drop author position as a proxy metric

Marcus Munafò and George Davey Smith suggest that using different lines of evidence (triangulation) to verify results will change how credit is assigned to authors of research papers (*Nature* **553,** 399–401; 2018). In my view, it would help if we were to abolish the convention of using an author's position in the list as a proxy weighting of contribution. Such a move would shift the assessor's curiosity to the 'author contributions' section, and render evaluation more meaningful and transparent.

Currently, author sequence still claims more attention than short descriptions of author contributions in those journals that include them (D. van Dijk *et al. Curr. Biol.* **24,** R516–R517; 2014). If individual careers in many fields continue to depend on first and last authorship positions, scientific progress and even quality could become a lesser concern. And simple quantitative metrics, such as linear ranking of authors according to contribution, are open to abuse (P. E. Smaldino and R. McElreath *R. Soc. Open Sci.* **3,** 160384; 2016).

If it is only the specified contribution that counts, there will be a strong incentive for researchers to contribute effectively and in innovative ways. It would encourage collaboration and discourage honorary and 'guest' authorship. Indeterminate contributions would become more apparent.

As for the roll-call of authors, let's explore such alternative formats as alphabetical listing, which is often used in mathematics, economics and high-energy physics.

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CORRECTION

The Nature Index article 'Industry links boost research output' (*Nature* **552,** S11–S13; 2017) erroneously located Keyvan Vakili at the University of Southern California. He is actually at the London Business School.