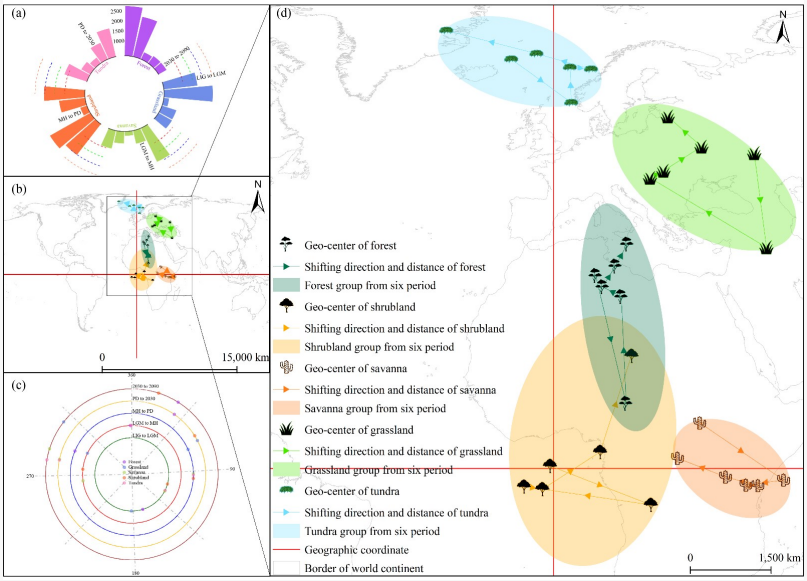
Quantifying Climate Change Effects on Global Natural Vegetation Dynamics

USA, April 11, 2024 /EINPresswire.com/ -- In the context of global warming, natural vegetations have been altered worldwide in spite of they are far away in the niches. Warming plus precipitation increase can extend the distributions of forest, grassland and savanna northwards while cooling plus drought may drive the tundra towards the equator. Modelling analysis shows that temperature and precipitation are two most important drivers regulating the patterns of natural vegetations although it may be a general knowledge for us.



Graphic abstract.

Recent studies have shown that rising atmospheric CO2 concentrations and consequential warming may compromise the community structure and functioning of the cold tundra ecosystems. However, in addition to uptake carbon, natural vegetation, particularly forests, can physically cool neighboring areas by releasing certain cooling molecules. These molecules can humidify the air and causally form clouds, which, in some cases, attenuates climate warming. Therefore, studying the quantitative correlations between warming and vegetation shifting would be beneficial to our understanding on the underlying mechanism of natural vegetation adapting to a warmer Earth in the future.

In a recent study (doi:10.1016/j.fecs.2024.100180) published in the KeAi journal Forest Ecosystems, a team of researchers in China applied an ensemble of long-time series encompassing paleoclimatic, historical and future meteorological data and a sophisticated theoretical model (CSCS) to portray the past, current and future potential patterns of global natural vegetation in the context of climate change.

“Our results suggest that global natural vegetations commonly match with their ecotopes, which serve as habitats for specific species and are primary influenced by varying climate,” shares Zhengchao Ren, the first author of this study. “Meanwhile, drastic fluctuations of temperature

and precipitation may result in remarkable conversions among natural vegetations, especially in northern latitudes and high elevations. The appreciable effects of climate change impacting on vegetation dynamics are also embodied on the distances and directions shifting of natural vegetations."

Significant warming plus precipitation increase is expected to lead to the forest, grassland and savanna spreading northwards and to the high altitudes, while pronounced cooling coupled with precipitation decrease induces tundra expanding extensively southwards and to the low elevations.

"The quantitative correlations between shifting distances and directions of global natural vegetations and climate drivers more confirm that temperature and precipitation are two most critical controlling factors deciding the patterns of natural vegetation on the Earth," adds Ren.

Warming is widely recorded in most of the world, particularly, in the high latitudes and altitudes such as the Arctic and Qinghai-Tibet Plateau, where the warming has a possibility of magnifying the effect of climate as well as anthropogenic activities on the vegetation dynamics. Moreover, warming-induced vegetation variation, to some extent, would impede our humanity fundamental survival via food, water and atmosphere supplies gained from the nature.

The outputs of this study can be taken as a reference for community construction and species selection, particularly in the ambitious ecological restoration projects practice worldwide for global degraded ecosystems.

DOI
10.1016/j.fecs.2024.100180

Original Source URL
https://doi.org/10.1016/j.fecs.2024.100180

Funding information
This research was funded by the National Natural Science Foundation of China (grants no. 30960264, 31160475 and 42071258), Open Research Fund of TPESER (grant no. TPESER202208), Special Fund for Basic Scientific Research of Central Colleges, Chang'an University, China (grant no. 300102353501), Natural Science Foundation of Gansu Province, China (grant no. 22JR5RA857) and Higher Education Novel Foundation of Gansu Province, China (grant no. 2021B-130).

Lucy Wang
BioDesign Research
email us here

try to be careful about weeding out false and misleading content. As a user, if you see something we have missed, please do bring it to our attention. Your help is welcome. EIN Presswire, Everyone's Internet News Presswire™, tries to define some of the boundaries that are reasonable in today's world. Please see our Editorial Guidelines for more information.