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Vertical structural complexity of plant communities represents the combined effects of resource acquisition and environmental stress on the Tibetan Plateau

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Abstract

Knowledge of vertical structural complexity (VSC) is important, because the resulting spatial partitioning is closely linked to resource utilization and environmental adaptation. How VSC responds to environmental changes on large scales and its mechanisms are poorly understood. We investigated 2,013 plant communities on the Tibetan Plateau (TP). VSC was quantified as the maximum height (Height-max), height variation (Height-var), and height evenness (Height-even). Precipitation dominated the VSC variation in forests and shrublands, supporting the classic physiological tolerance and hydraulic limitation hypotheses. In contrast, for alpine grasslands in extreme environments, non-resource limiting factors dominate VSC variation. Generally, with the shifting of climate from optimal to extreme, the effect of resource availability gradually decreases, but the effect of non-resource limiting factors increases. Using machine learning models, maps of VSC at 1-km resolution were firstly produced for the TP. These findings provide new insights into macroecological studies, especially for adaptation mechanisms and model optimization.

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Running title: Height complexity of plant communities

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N.H. planned and designed the research; C.C., M.L., C.L. and L.X. conducted fieldwork and collected data; C.C. analyzed data and wrote the manuscript; and all authors contributed substantially to revisions.

Data accessibility

Should the manuscript be accepted, the data supporting the results will be archived in an appropriate public repository such as Dryad or Figshare and the data DOI will be included at the end of the article.

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`Main files.docx` available at https://authorea.com/users/505388/articles/584456-vertical-structural-complexity-of-plant-communities-represents-the-combined-effects-of-resource-acquisition-and-environmental-stress-on-the-tibetan-plateau

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