

# Nonlinear response of community stability to ambient climate determines response direction of community stability to warming and grazing

Peipei Liu<sup>1</sup>, Wangwang Lv<sup>2</sup>, Jianping Sun<sup>2</sup>, Caiyun Luo<sup>3</sup>, Zhenhua Zhang<sup>4</sup>, Xiaoxue Zhu<sup>4</sup>, Xinwu Lin<sup>5</sup>, Jichuang Duan<sup>2</sup>, Guangping Xu<sup>2</sup>, Xiao-Feng Chang<sup>6</sup>, Yigang Hu<sup>2</sup>, Qiaoyan Lin<sup>2</sup>, Burenbayin Xu<sup>2</sup>, Xiaowei Guo<sup>2</sup>, Lili Jiang<sup>2</sup>, Tsechoe Dorji<sup>7</sup>, Yanfen Wang<sup>8</sup>, Shilong Piao<sup>9</sup>, Jinzhi Wang<sup>2</sup>, Haishan Niu<sup>2</sup>, Liyong Shen<sup>2</sup>, Yang Zhou<sup>2</sup>, Bowen Li<sup>7</sup>, Qi Wang<sup>7</sup>, Suren Zhang<sup>2</sup>, Lu Xia<sup>2</sup>, Yingnian Li<sup>2</sup>, Guangmin Cao<sup>10</sup>, Josep Penuelas<sup>11</sup>, Xinquan Zhao<sup>2</sup>, and Shiping Wang<sup>12</sup>

<sup>1</sup>Chinese Academy of Sciences

<sup>2</sup>Affiliation not available

<sup>3</sup>Northwest Institute of Plateau Biology Chinese Academy of Sciences

<sup>4</sup>Chinese Academy of Sciences, Northwest Institute of Plateau Biology

<sup>5</sup>Institute of Soil Science, Chinese Academy of Sciences

<sup>6</sup>Institute of Water and Soil Conservation of Chinese Academy of Sciences and Ministry of Water Resource

<sup>7</sup>Institute of Tibetan Plateau Research Chinese Academy of Sciences

<sup>8</sup>University of the Chinese Academy of Sciences

<sup>9</sup>Peking university

<sup>10</sup>Key Laboratory of Adaptation and Evolution of Plateau Biota, Northwest Institute of Plateau Biology, Chinese Academy of Sciences

<sup>11</sup>CSIC-CREAF

<sup>12</sup>Institute of Tibetan Plateau Research, Chinese Academy of Sciences

March 30, 2022

## Abstract

The impacts of human-driven environmental changes on the stability of natural grasslands have been assessed by comparing differences between manipulative warming and grazing plots and reference plots. However, little is known about whether or how ambient climate regulates the effects of manipulative treatments. A 36-year observational dataset shows that there is a nonlinear response of community stability to ambient climate. Manipulative warming and grazing decrease community stability with experiment duration through an increase in legume coverage and/or decrease in species asynchrony, due to exceeding the threshold of background annual mean air temperature with decreasing background annual mean air temperature through time during the 10-year experiment period. Moreover, the temperature sensitivity of community stability is more sensitive under the ambient treatment than under the manipulative treatments. Therefore, our study emphasizes the importance of the context dependency of the response of community stability to human-driven environmental changes.

## Hosted file

20210130-manuscript.docx available at <https://authorea.com/users/470996/articles/562763-nonlinear-response-of-community-stability-to-ambient-climate-determines-response-direction-of-community-stability-to-warming-and-grazing>