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Alternative tree-cover states of dryland ecosystems: Inconsistencies between global and continental scales

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Dryland ecosystems are complex systems that can exhibit alternative tree-cover states, making conservation and restoration efforts challenging. However, our understanding of these states is still limited, particularly at the global level. In this study, we utilized remote sensing data to analyze the distribution of tree cover in drylands and assess the impacts of factors such as the aridity index, temperature, fire frequency, and grazing on tree cover at both the global and continental scales. The results showed that dryland ecosystems in Asia, Australia, and South America exhibited alternative tree-cover states, while dryland ecosystems at the global scale and in Africa, Europe, and North America did not. Livestock density and the aridity index appeared to be the primary drivers of these states in the regions where they occurred. This study highlights the importance of considering the variability in dryland vegetation states across different scales and regions, as small-scale processes may not always accurately predict large-scale dynamics. By examining dryland woody vegetation at both global and continental scales, our work contributes to a more comprehensive understanding of the factors that affect the tree-cover states in these ecosystems.