

Phenological changes of woody plants in the southern and northern regions of Nanling mountains and their relationship with climatic factors: A study based on long-term observations

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Abstract

In response to the implications of climate change, comprehending the phenological variations of woody plants has emerged as a crucial area of research. This study focuses on the phenological changes of woody plants and their associations with climatic factors in the southern and northern regions of Nanling Mountains, which serve as the boundary between the North Subtropical Climate Zone and the South Subtropical Climate Zone in South China. The data in question was accumulated through long-term manual observations in four plant phenology observations (Ganxian, Foshan, Guilin, and Changsha), spanning from 1963 to 2008. The study examined four widely distributed woody plant species in the research area, namely *Castanea mollissima* Bl., *Paulownia fortunei*(seem.) Hemsl., *Melia azedarace* L., and *Magnolia grandiflora* Linn.. The analytical methods employed encompass linear trend estimation and Pearson correlation coefficient analyses. The key findings are: 1, during the past 46 years, the phenological stages of woody plants on the southern region consistently preceded those on the northern region; 2, an advancing trend was observed in the phenological stages of all woody plants on the southern region; 3, in the same geographic region, varied species showed varying sensitivities to climatic factors, with *Melia azedarace* L. demonstrating a particularly high sensitivity to climate variations in relation to phenological stages; 4, different climatic factors had diverse effects on individual plant species. Notably, temperature emerged as the primary driver of phenological changes, supported by a significant negative correlation between the phenological stages of the studied plants and spring temperature. This study augments our comprehension of the ramifications of climate change on plant phenology and affords valuable insights that can inform ecological conservation and management strategies within the region.

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