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## Vegetation and climate: Exploring feedbacks across scales

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Vegetation plays a fundamental role in shaping Earth's climate by controlling the energy, water, and carbon cycles across terrestrial landscapes. It exerts influence by altering surface roughness, consuming significant water resources through transpiration and interception, regulating atmospheric CO<sub>2</sub> concentration, and controlling net radiation and its partitioning. This influence propagates through the atmosphere, from microclimate scales to the atmospheric boundary layer, subsequently impacting large-scale circulation and the global transport of heat and moisture. Understanding the feedbacks between vegetation and atmosphere across multiple scales is crucial for predicting the influence of land use and cover changes and for accurately representing these processes in climate models.

This presentation aims to review the mechanisms through which vegetation modulates climate across scales. Particularly, I will evaluate the vegetation impact on circulation patterns, precipitation and temperature during extreme events, such as droughts and heatwaves. Key questions regarding the influence of vegetation feedbacks during these events will be explored: What is the impact of extreme meteorological conditions on ecosystem transpiration? How does vegetation regulate the atmospheric boundary layer and affect the potential intensification and propagation of droughts and heatwaves? Furthermore, I will review the climatic consequences of land use/cover changes, with specific emphasis on extreme events. The goal of this presentation is not to provide a convincing answer to these questions, but rather to highlight the state of science and review recent studies that may help advance our collective understanding of vegetation feedbacks and the role they play in climate.