Evergreen broadleaf greenness and its relationship with leaf flushing, aging, and water fluxes

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Abstract

Remote sensing capabilities to monitor evergreen broadleaved vegetation are limited by the low temporal variability in the greenness signal. With canopy greenness computed from digital repeat photography (PhenoCam), we investigated how canopy greenness related to seasonal changes in leaf age and traits as well as variation of trees' water fluxes (characterized by sap flow and canopy conductance). The results showed sprouting leaves, with significantly different leaf traits compared to mature and old leaves, are mainly responsible for the rapid increase in canopy green chromatic coordinate (GCC) in spring. Thus, the temporal dynamics of canopy GCC can be explained by leaf spectral properties and leaf age. Air temperature and vapor pressure deficit (VPD) explained most of sap flow and canopy conductance variance, respectively. Besides, GCC is an important explanatory variable for variation of canopy conductance may because GCC can represent the leaf ontogeny information. We conclude that PhenoCam GCC can be used to identify the new leaf flushing for evergreen broadleaved trees, which carries important information about leaf ontogeny and traits thus can better estimate of water fluxes such as canopy conductance.

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