
Investigating the link between phenology and growth in a temperate deciduous forest

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Résumé

Woody biomass is, with soil organic carbon, the main perennial carbon sink in a temperate forest.

Although the analysis of carbon flux data has increased our understanding of the temporal variability of carbon inputs into forest ecosystems, we still know little about the determinants of aboveground wood growth (AWG). Here, we aimed to identify which drivers control the temporal variability of wood growth in a mesic temperate deciduous forest (FR-Fon, Fontainebleau-Barbeau Oak forest).

At the stand scale, we show that carbon inputs and AWG anomalies have been uncorrelated from the seasonal to interannual scales over the past 10 years. More than 90% of the interannual variability of AWG is explained by a combination of the growth intensity during a first "critical period" of the wood growing season and the timing of the first summer growth halt. Both atmospheric and soil water stress exert a strong control on the interannual variability of AWG at the study site, despite its mesic conditions, whilst not affecting carbon inputs.

The critical role of the timing of growth cessation is further observed at the individual scale. Indeed among dominant trees, the individuals that grow more also experience a longer wood growing season. Interestingly, those trees also display a later budburst and shorter leafy season than their conspecifics, suggesting that the acquisition of C resources may neither be a crucial driver in determining wood growth at the individual scale.

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