**Title:** (Understanding the decoupling of CO2 uptake and woody production)

**Authors:**

Kristina J. Anderson-Teixeira1,2\* ( Orcid ID : 0000-0001-8461-9713)

**Author Affiliations:**

1. Conservation Ecology Center; Smithsonian National Zoo & Conservation Biology Institute; Front Royal, Virginia 22630, USA
2. Forest Global Earth Observatory; Smithsonian Tropical Research Institute; Panama, Republic of Panama

\*corresponding author: [teixeirak@si.edu](mailto:teixeirak@si.edu); +1 540 635 6546

**keywords:**

|  |  |
| --- | --- |
|  | count |
| words |  |
| figures |  |
| tables | 0 |
| references |  |

In this issue of New Phytologist, Martínez-Sancho *et al.* (2022) (pp. 000-000) use an innovative approach to describe the seasonal course of carbon sequestration in tree stem growth and how this is affected by drought.

There is growing evidence that CO2 uptake and woody production are decoupled. …(Jiang *et al.*, 2020) …(Dow *et al.*, in press) …(Cabon *et al.*, 2022) …. (Kannenberg *et al.*, 2022) Of course, these observations of decoupling do not imply that *ANPPwoody* is completely decoupled from *GPP*; rather, the two show some level of correlation both in relation to interannual climatic variation at a single site (Cabon *et al.*, 2022) and across broad climatic gradients (Banbury Morgan *et al.*, 2021). However, we now have clear evidence that we cannot expect that a constant allocation of photosynthate will be coupled to woody growth, on either intraanuual or interannual time scales.

C allocation to woody growth is an important parameter in models, yet models get it wrong. Therefore, this is an important uncertainty.  
To get models right, we need to understand seasonal patterns of C allocation to woody growth and how they are influenced by climate variation (and change)

(describe typical seasonal patterns, including what was known and what Martinez-Sancho contributed.)

(talk about drought impacts)

We need more studies like Martínez-Sancho *et al.* (2022) – bonus if they also get GPP – to broaden our understanding of how *ANPPwoody* is jointly shaped by climate– both directly and indirectly (through GPP).

# References

**Banbury Morgan R, Herrmann V, Kunert N, Bond-Lamberty B, Muller-Landau HC, Anderson-Teixeira KJ**. **2021**. Global patterns of forest autotrophic carbon fluxes. *Global Change Biology* **27**: 2840–2855.

**Cabon A, Kannenberg SA, Arain A, Babst F, Baldocchi D, Belmecheri S, Delpierre N, Guerrieri R, Maxwell JT, McKenzie S, *et al.*** **2022**. Cross-biome synthesis of source versus sink limits to tree growth. *Science* **376**: 758–761.

**Dow C, Kim A, Loïc D’Orangeville, Gonzalez-Akre E, Helcoski R, Herrmann V, Harley G, Maxwell J, McGregor I, McShea W, *et al.*** **in press**. Warm springs alter timing but not total growth of temperate deciduous trees. *Nature*.

**Jiang M, Medlyn BE, Drake JE, Duursma RA, Anderson IC, Barton CVM, Boer MM, Carrillo Y, Castañeda-Gómez L, Collins L, *et al.*** **2020**. The fate of carbon in a mature forest under carbon dioxide enrichment. *Nature* **580**: 227–231.

**Kannenberg SA, Cabon A, Babst F, Belmecheri S, Delpierre N, Guerrieri R, Maxwell JT, Meinzer FC, Moore DJP, Pappas C, *et al.*** **2022**. Drought-induced decoupling between carbon uptake and tree growth impacts forest carbon turnover time. *Agricultural and Forest Meteorology* **322**: 108996.

**Martínez-Sancho E, Treydte K, Lehmann MM, Rigling A, Fonti P**. **2022**. Drought impacts on tree carbon sequestration and water use evidence from intra-annual tree-ring characteristics. *New Phytologist* **n/a**.