

Contribution ID: 323

Type: **Oral Presentation**

Reproducing reproduction: understanding and modelling masting in European tree species

Thursday, 12 July 2018 15:30 (30 minutes)

Masting is the highly variable and synchronous production of seeds by plants. Masting can have cascading effects on plant population dynamics and forest properties such as tree growth, carbon stocks, regeneration, nutrient cycling, or future species composition. However, the spatio-temporal patterns and drivers of masting at the continental scale remain unknown. As a consequence, masting has often been missing from forest simulation models.

Here we detail the ongoing efforts to build a comprehensive dataset of seed production for the main European tree species. This dataset has been used, for example, to demonstrate that climate-masting relationships across the entire geographical range of European beech are (a) temporally and spatially consistent in the last century at the continental scale, and (b) are driven by low frequency modes of climate teleconnections (the Northern Atlantic Oscillation).

Our large research collaboration has also reviewed more than 200 published papers on mechanistic formulations of masting, to summarize how the main processes involved in masting and their related patterns (variability, synchrony, and frequency) can be incorporated into forest models with different degrees of complexity.

Future work will involve building empirical and mechanistic models to explore the tradeoffs between climate, resources, masting, and resource allocation, and using long-term, large-scale masting data to explore the effects of climate change on masting frequency, variability and synchrony at the population and continental scale.

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Session Classification: Unravelling mechanisms underlying reproductive synchrony: from gene to ecosystems

Track Classification: Minisymposium: Unravelling mechanisms underlying reproductive synchrony: from gene to ecosystems