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Introductory Talk

Is Recent Climate Change the Primary Driver Behind Contemporary Biotic Responses of Trees and Understory Vegetation?

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Quantifying the relative importance and interactions of recent (i.e., from 1070s onwards) climate change with other global-change drivers (e.g., land-use changes, nitrogen depositions, biological invasions) on contemporary biotic responses is a challenging and timely issue. By focusing on trees and understory vegetation, I will first provide an overview of the most likely drivers that have recently been blamed in the literature for contemporary demographic responses (e.g., forest dieback and defoliation), species distribution shifts (e.g., range contraction) or community-composition changes (e.g., floristic homogenization). These drivers are: (i) climate warming; (ii) precipitation changes; (iii) increased frequency and severity of drought events; (iv) soils acidification and eutrophication; (v) forest-canopy closure (a global proxy for human-induced and natural disturbances); (vi) and non-native species invasions. Then, I will present recent results from Bertrand (2012) who assessed the respective effects of several of the above-listed drivers to explain community-composition changes in the French forests between 1965–1986 and 1987–2008. Accounting for plant plasticity as well as forest fragmentation, he specifically tested for the effects of (i), (ii), (iv), and (v) on the observed community-composition changes in highland and lowland forests, separately. Bertrand (2012) found that climate warming is the primary driver explaining 53.4% and 32.9% of the observed community-composition changes in highland and lowland forests, respectively. In lowland forests, the observed community-composition changes were mitigated by forest-canopy closure (2.5%) but amplified by soils eutrophication (1%). Interestingly, the thermal plasticity of plant communities increased in lowland forests between 1965–1986 and 1987–2008 and had a mitigating effect on the observed community-composition changes in lowland forests. These results support the general idea that recent climate warming is the primary driver behind contemporary biotic responses of understory vegetation albeit other global-change drivers such as forest-canopy closure and soils eutrophication may act as secondary drivers mitigating or amplifying climate-warming impacts on understory vegetation. It is noteworthy that community-composition changes in lowland forests seem to be offset by an increase in plant plasticity, suggesting a tradeoff between these two biotic responses to climate warming.

References

Bertrand, R. (2012). Spatio-temporal response of the forest vegetation to climate warming: assessment of the vegetation reshuffling and characterisation of the effect of ecological and geographical factors modulating this process at the species and community scales. PhD thesis, AgroParisTech, Nancy, France, 305 p.