ORAL PRESENTATION: How genetic variability can reduce Fagus sylvatica's vulnerability to climate change.

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Abstract :

General context: Intra-specific diversity plays a key role in species' response to climate change (CC) and their ability to adapt locally through plastic response and/or response to selection. However, the CC velocity is likely to exceed the natural adaptation potential of most species and populations. One solution is to use assisted migration to bring genetic diversity from a region already subject to the expected future climate and therefore able to survive in the new region.

Objective: We investigate how the consideration of existing intra-specific variability (due to local adaptation and to plasticity) affects the past and future prediction of vulnerability in beech.

Methods: We used CASTANEA, a process-based model, able to simulate carbon and water fluxes for different species, to assess the vulnerability of beech stands across Europe. The simulation design include several climatic scenarios of the past and the future under CC, with or without within-stand trait variability, and one with assisted migration (allowing the whole range off variation everywhere). We accounted for the genetic variability in three major adaptive traits: (1) the date of budburst (TBB), related to vulnerability to late frosts, (2) the percentage of loss of conductance (PLC), related to vulnerability to cavitation and (3) water use efficiency (WUE), related to vulnerability to carbon starvation.

Results: We found that the vulnerability of the optimal average tree in a stand with trait variation is lower than that of stands without variation. In addition, with intra-specific variability, the species distribution is larger, especially in the south of Europe. Finally, in the future under CC, migrated trees are able to grow under conditions further north of the area and contribute to reduce the expected vulnerability without assisted migration.

Keywords : Genetic variability, Process-based model, Climate Change, forestry practices, trees vulnerability/risk, assisted migration.
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