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Responses of cambial growth and wood properties to winds

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The mechanical environment is a significant factor that controls tree growth. Growth response to mechanical stress inhibits primary growth, stimulates radial growth and produces acclimated wood. That results in trees designed at their proper limit of mechanical stability with a low margin. Several regionalized models under IPCC scenarios predict that winter storm frequency in Europe may increase, while chronic winds speed, that is responsible of growth acclimation, may decrease. As this biomechanical response is scarcely invoked when discussing forest vulnerability and acclimation to global change, assuming implicitly that other environmental effects are more significant, we will discuss its ecological relevancy, from observations of forest tree growth in natural both dried and windy conditions (*Pinus halepensis* in Spain) and models of tree mechanical stability related to tree size and allometry of growth.

Then, wood responses to mechanical constraints include reaction and flexure woods, that differ from normal wood by their cellular and cell wall structure, with great consequences on wood properties. Wood acclimation to mechanical constraints should have feedback effects on carbon and water balance at the organ or whole tree level: for instance, reaction wood anatomy could induce a lower hydraulic conductivity that could result in lower stomatal conductance.

We present some results from greenhouse experiments about how controlled mechanical stimuli modify local secondary growth rate and wood mechanical and hydraulical properties. We discuss how this acclimation of wood properties could change the margin of mechanical safety of trees, stating the whole complexity of the problem involving many feedback loops.