**Intrinsic water-use efficiency in conifer species in a global change scenario. Can the increasing atmospheric CO2 prevent drought-induced trees’ growth decline?**

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The projected rise of temperature and atmospheric CO\textsubscript{2} concentration at a global scale with a simultaneous rainfall decrease and rainfall concentration in extreme events can dramatically affect survival of tree populations, especially those located at the limits of their geographical and altitudinal distribution. Drought-induced mortality has been noted in forests subjected to severe water deficit, as most of those located in the Mediterranean Basin. Moreover, there is a lack of knowledge about vulnerability of Mediterranean forests to global change and the future of community species composition in these forest ecosystems, where water availability is the major limiting factor for tree growth and survival.

It has been proposed that global atmospheric CO\textsubscript{2} rise could compensate for stomatal closure driven by drought events, in water-limited forest ecosystems, giving no noticeable changes in tree primary production and growth. However, several authors have also shown the lack of correlation between assimilation and growth rates indicating that the increasing CO\textsubscript{2} availability is not necessarily stimulating growth mainly due to both, alternative pathways for C such as increasing respiration rates, and the modulating effect of local climate conditions, stand structure, tree age or intra-specific competition for limiting resources, particularly water and light.

In this work we show different trends of intrinsic water use efficiency (iWUE), estimated from $\delta^{13}$C in tree rings, and basal area increment (BAI) as an estimator of stand growth, measured in several conifer species from different geographical locations and structural characteristics. Responses to increasing atmospheric CO\textsubscript{2} concentration were modeled under different physiological theoretical scenarios. We have compared stands in the following locations: i, healthy vs decline Abies alba stands in the Pyrenees. ii, healthy Abies pinsapo stand from the upper altitudinal distribution range (1700 m a.s.l.); declining A. pinsapo stand from the lower altitudinal distribution range (1200 m a.s.l.); Pinus halepensis stands from the same lower elevation site; all of them are located in Sierra de las Nieves Natural Park (Southern Spain). iii, healthy A. pinsapo stands in Grazalema Natural Park (Southern Spain). iv, healthy A. pinsapo subsp. maroccana in Talassemtanne Natural Park (Northern Morocco). v, Pinus ponderosa stands along a strong precipitation gradient in the Chilean Patagonia. We obtained a general 20\textsuperscript{th} century iWUE increase, but lower increasing rate was yielded in water-limited stands from the mid 1980s. Declining A. alba and A. pinsapo stands, showed higher mean iWUE but lower rate of increase after recurrent drought events. Healthy stands of both species showed a stronger response to atmospheric CO\textsubscript{2}. A simultaneous decrease in tree BAI was also found in declining stands. These results suggest that the CO\textsubscript{2} increase cannot compensate for the stomata closure under drought conditions. On the other hand, P. halepensis, although in the same locality as declining A. pinsapo stands, under the same climatic conditions (1200 m a.s.l.) did not show a BAI decrease and yielded higher rate of iWUE increase, suggesting higher ability to cope with low water availability by means of increasing C assimilation under increased CO\textsubscript{2} availability. Finally, no differences were found in BAI measured in P. ponderosa stands along the geographical and precipitation gradient while first results of iWUE estimated from $^{13}$C discrimination suggest different acclimation mechanisms related to C sink along this gradient.