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Differential age and species growth responses to climate warming detected in old-growth Mediterranean mountain forests

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Mediterranean mountainous forest ecosystems are key hotspots to study the impact of climate change, thus understanding the species-specific growth response is of great relevance. In this study, we take advantage of the few remnant patches of old-growth forests located in the Pollino Massif (southern Italy), to evaluate how the growth of conspecific young and old trees responded to climate. Indeed, thanks to their remote critical topographic conditions in which these patches are located, they have remained nearly untouched from human pressure over the last centuries. We compared two conifer species (*Abies alba*, *Pinus heldreichii* var. *leucodermis*) vs. two hardwood species (*Fagus sylvatica*, *Quercus cerris*) in four stands situated along an altitudinal gradient. Younger trees grew faster than their conspecific oldest trees during their juvenile stage, regardless of the environmental conditions and species studied, highlighting more favorable recent climatic and environmental conditions for growth compared to the past. Rising temperature had a positive effect on growth rate in high-elevation young and old *P. leucodermis* individuals. However, *F. sylvatica*, inhabiting mesic sites at lower elevation, had slow growth with the least difference in growth rates between young and old trees. Similarly, the growth rates of old tree species found at lower elevation (*Q. cerris* and *A. alba*, respectively) tended to be relatively stable since 1950, except for *A. alba*, increased over the last two decades. Climate sensitivity in recent decades differed between young and old trees in some of the species, with younger trees tending to be more sensitive in *Pinus* and *Abies*, and older trees being more sensitive in *Fagus*. Such disparity in climate sensitivity and long-term growth reactions to climate should be recognized and considered when forecasting the future dynamics of old-growth forests.