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Growth climate relations of different conifer species along elevation transects in an inner-alpine dry valley

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Climate change is altering growth conditions in mountain forests. While increasing temperatures may have positive growth effects at high elevations, higher atmospheric water demand and limited water availability at lower elevations may restrict growth. To analyze the reaction of different trees species on changing climate at different elevations, we analyzed tree ring width series from 5 conifer species (native Picea abies (PCAB), Larix decidua (LADE), Pinus sylvestris (PISY), and Pinus cembra (PICE) as well as introduced Pinus nigra (PINI) which has a Mediterranean origin) at a total of 11 sites at elevations from 1000 to 2300 m a.s.l. in the upper Vinschgau/Val Venosta region in South Tyrol/Italy. Each species was measured at a minimum of 3 sites at different elevations: while LADE, PCAB, and PISY occurred at the most of the elevation range, PICE was only found above 2000 m a.s.l and PINI was restricted to lower elevations below 1500 m a.s.l. Generally, PCAB is considered the most sensitive of the five species to drought and temperature increase which should lead to a negative growth response on temperature/positive response on precipitation at all but the highest elevations. In contrary LADE, PISY and especially PINI are regarded as rather drought resistant and should cope better with dry conditions at low elevations. At the high elevation distribution range of PICE, growth should benefit from increasing temperatures. Our results will show the influence of changing climatic conditions on five abundant conifer species in one of the driest regions in the Alps which should provide insights on future growth characteristics and limitations and might have implications for forest management.