Elevation gradients in inner-alpine dry valleys as a proxy for climate change effects on mountain forests

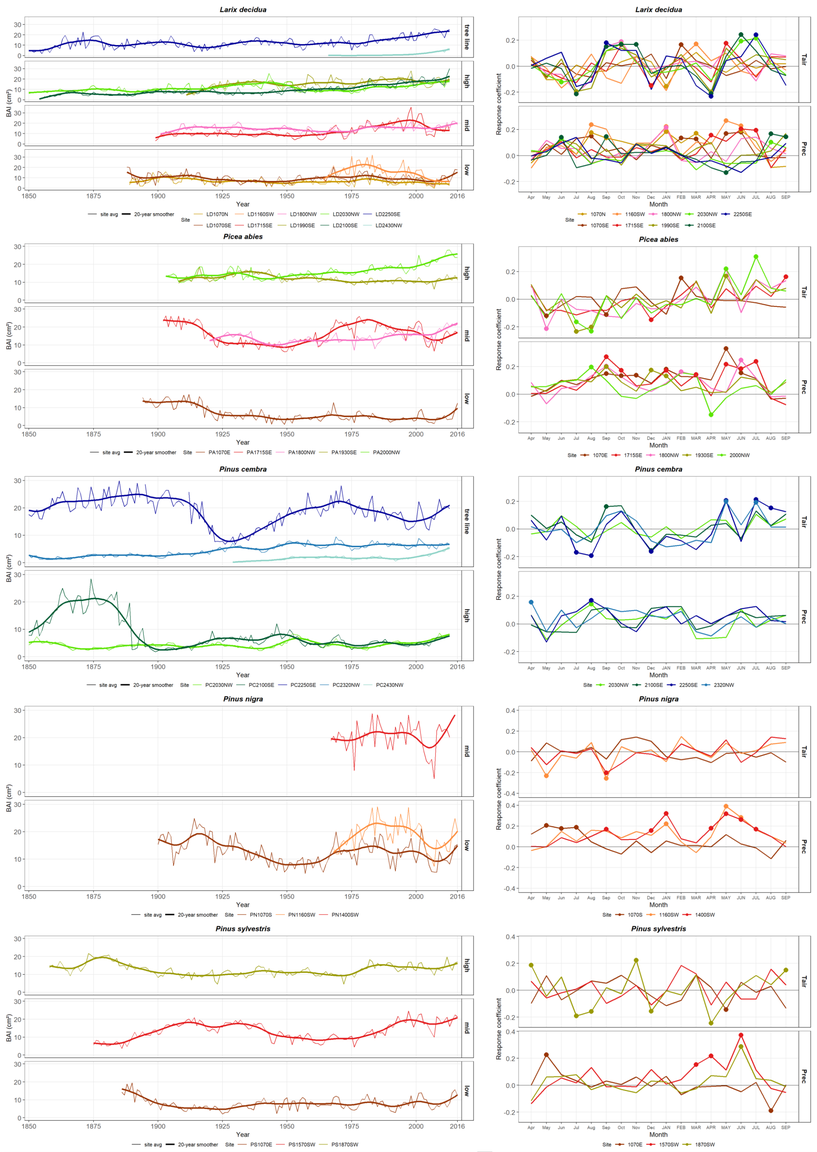
Obojes N[1*], Tasser E[1], Oberhuber W[2], Mayr S[2], Tappeiner U[3]

[1] Eurac Research, Institute for Alpine Environment, Bolzano, Italy, [2] Department of Botany, University of Innsbruck, Austria , [3] Department of Ecology, University of Innsbruck, Austria

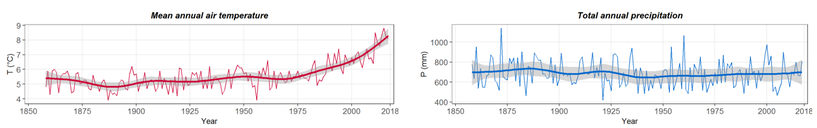
* nikolaus.obojes@eurac.edu

Long-term tree ring data

Basal area increment - Temperature/Precipitation response

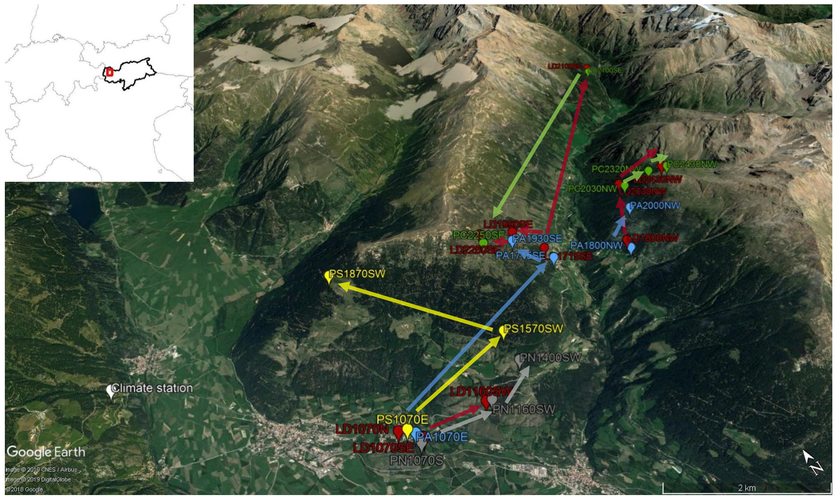


Long-term Climate data



Background/Research area/Experimental design

- Research area: LTSER platform Matsch | Mazia in Vinschgau/Val Venosta, Province of Bozen/Bolzano, Northern Italy; one of the driest regions in the Alps (P 528 mm/year, T 6.6 °C at 1570 m a.sl.)
- Forests from 1000 to 2400 m a.s.l., mainly 5 conifer species: Larix decidua (LD), Picea abies (PA), Pinus cembra (PC), Pinus nigra (PN), Pinus sylvestris (PS)
- Climate data since 1858 (nearby climate station Marienberg/Monte Maria): strong increase of T since 1970s, no precipitation trend.
- Hypothesis: species-specific water limitation at low-, temperature limitation at high elevation.

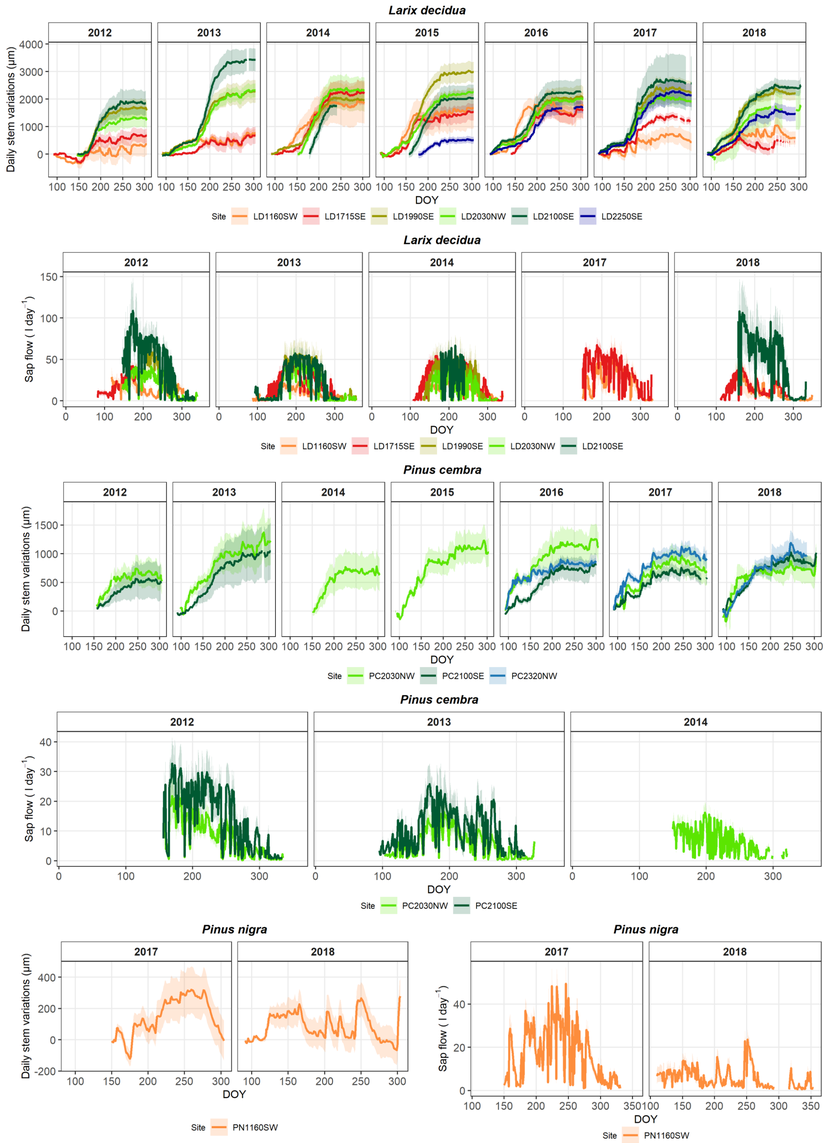
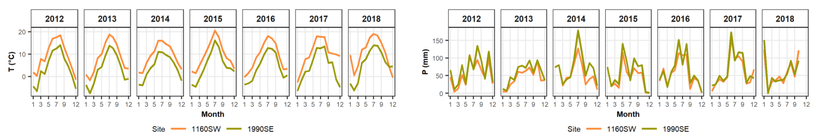


Results/Conclusions

- Hypothesis supported, with precipitation dependence up to quite high elevation (approx. 1700 m for L. decidua and P. abies).
- Stronger climate response of larch and spruce, pine species more complacent. Positive precipitation response in spring/previous autumn at low/mid elevation, positive temperature response in spring at high elevation.
- Dry periods lead to periodic reduction of stem radius and sap flow at low and mid elevation, resulting in less overall growth in dry years.

International Mountain Conference 2019 Innsbruck

High resolution dendrometer/sap-flow data



Monthly temperature/precipitation 2012-2018