Project acronym: ARNOLD 2.0

Project title: Annual Rings to better understand long-term abiotic and biotic drivers of shrub growth at the NOrthernmost Limits of their Distribution.

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Discipline: Earth Sciences & Environment: Global change & Climate observation

Station(s): Abisko Scientific Research Station (Sweden), Kevo Subarctic Research Station (Finland)

Arctic-Alpine shrubs' growth responses to climate change are variable and influenced by different factors. Besides the rising in temperature since the mid-20th century, a shift in snowpack behavior with earlier melting, changes in precipitation regimes and biotic disturbances have also been observed to affect the vegetation productivity in several temperature-limited regions. The yearly resolved analysis of growth at the intra-individual to the community level represents the key to investigate shrub responses to environment and climate. A lack of knowledge still exists on the long-term (decades to centuries) growth variability considered across environmental gradients at individual, species and within species. Focusing on wide distributed taxa (e.g. juniper, willow), ARNOLD projects aim at uncovering the information archived in annual rings and xylem anatomical traits (e.g. lumen size or cell-wall thickness) to gain new fundamental insight on how the plant responses scale from individuals to communities. Specifically, we will provide a retrospective quantification of growth and wood anatomical traits integrating the state-of-the-art quantitative wood anatomical analyses with classical dendrochronology, from Arctic-Alpine shrub species. ARNOLD 2.0 aims to continue expanding our shrub network. In particular, we aim to both expand the network toward a north-east latitudinal gradient in Scandinavia (e.g. Finse, Abisko and Kevo research stations surroundings) and extend it in time beyond the 19th century. ARNOLD 2.0 builds on the success of the 2019 field season of ARNOLD. It will allow to extend in space and time ring width and xylem traits chronologies that could be used as precise climatological proxy in the future.