

HAFL Master's Thesis Abstract

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English Title: **Variations in leaf morphological traits of European beech and Norway spruce over two decades in Switzerland**

English Summary:

Leaf morphological traits (LMT) of forest trees have been observed to vary across space and species. Long-term records of LMT are however mostly missing due to the lack of measurements or systematic leaf archives. We thus lack an understanding on the temporal dynamics and drivers of LMT variations, which may help us understand the different acclimation strategies of forest trees. In our study, we made use of long-term LMT measurements from foliar material collections of European beech (*Fagus sylvatica*) and Norway spruce (*Picea abies*), performed every second year on the same trees within the Swiss Long-term Forest Ecosystem Research Program LWF 1995–2019. The study plots (6 beech, 4 spruce and 1 mixed stand) are distributed along gradients of elevation (485 – 1650 m a.s.l.), mean annual precipitation (935 – 2142 mm), and mean annual temperature (3.2 – 9.8 °C). The investigated LMT were i) leaf or needle mass, ii) leaf area or needle length, and iii) the ratios leaf mass per area or needle mass per length. In a holistic approach, we combined this unique data set with site variables and long-term data from potential temporal drivers of LMT variations. We made use of univariate linear regressions and linear mixed models to examine and identify the main drivers. Our results showed high year to year LMT variations in response to site characteristics, climatic variations, intermittent and recurring events along complex and less studied dynamics such as legacy effects, mast years, low and high vapor pressure deficit and many more. This study highlights the importance of additional studies combining spatial and long-term LMT measurements, to improve our understanding of the acclimation potential and strategies of forest trees in a rapidly changing environment with increasing frequency of extreme events.

Keywords: leaf morphological traits, long-term monitoring, European beech, Norway spruce, climate change

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