

Reaction of wood radius of multiple tree species to changing environmental conditions

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Dendrometers are frequently used to study the radial dynamics of forest trees. Since the fluctuations of tree stem radius are caused by multiple factors including changes in tree water status and the actual tree growth, the methods used to derive the radial growth from dendrometer data provide us with the estimates of diurnal radial increments rather than their precise values. In addition, dendrometers react to environmental conditions themselves, which can in some cases cause misinterpretation of measured values. In the presented study we aimed at analysing the reaction of band dendrometers and wood radius of 7 different tree species on changing environmental conditions. The data come from a controlled experiment performed in the climate chambers, in which we placed 5 stand-alone dendrometers and 30 wooden pieces representing 7 different tree species equipped with band dendrometers. Air temperature and air humidity were controlled inside the chambers and their impact on wood radius and dendrometers was analysed. The results showed that both wooden pieces and dendrometers reacted to changes in air temperature and air humidity, while the reaction was species specific and dependent on the actual water status of wooden pieces. The overall trend of measured radial changes of wooden pieces followed the changes in temperature, i.e. the increase in temperature caused the increase in the measured radii. The change in air humidity explained less than 50% of the variation in radial measurements. The obtained results indicate that although the band dendrometers applied in the study were able to measure values with the precision of one micrometre, the differences between the measurements of up to ten micrometres need not represent the actual changes in stem radius, but may only reflect the reactions of the instrument to surrounding conditions. Hence, the measurements by dendrometers must always be examined thoroughly with regard to all the multiple effects before any conclusions based on them are stated.