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Disturbance and climate signal in Norway spruce and European larch dendrochronological series

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Norway spruce and European larch, dominant natural tree species in the Tatra Mountains (Slovakia), might be seriously threatened by projected climate change and intensified disturbance regime. Regional climate change scenarios project +2 °C increases in the 2050-2070 period and relatively stable precipitation regime when compared to long term normal. Such a climate change might shift both species on the edge of their bioclimatological conditions. Tree ring width is a good indicator of climate and disturbance impact on tree growth.
The aim of our study was to identify abrupt growth changes indicating climatological stress on spruce and larch. We analysed local historical meteorological data (1890-2016) to reveal occurrence of such events in past. We hypothesize that number of stress days is increasing as a consequence of changing climate.
Using band dendrometers we identified growth changes on five mature spruce and five larch trees during the 2008-2016 period. Each specific growth period was characterized by set of climatological parameters and indexes. Standardized precipitation index (SPI) and rate of photosynthesis (GPP) coincided well with abrupt growth decline, indicating physiological stress. These stress stimulating conditions were identified in past along historical climate records and verified on two-hundred tree cross sections. We applied combined step and trend intervention detection (CSTID) method for minimizing the effects of disturbance in tree ring width chronologies and enhance the climate signals.