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Microclimatic effects on spring budburst and autumn leaf coloration of four temperate tree species

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Recent study highlighted large microclimatic variation occurring within forests, especially concerning light and temperature. In this study we aimed to quantify to what extent variation in light, soil humidity, nutrient availability and bud temperature alter the phenology of four tree species (*Fagus sylvatica*, *Quercus robur*, *Prunus avium* and *Fraxinus excelsior*). Various treatments were applied to seedlings grown in large wooden boxes in situ conditions near Zurich. The different treatments included shade (~60% of light transmission), reduced precipitation using rain shelters, fertilizer, additional watering during summer, as well as painting buds in black or white to alter bud temperature via albedo change. Budburst timing and leaf coloration were observed twice a week during the spring and autumn 2019.

Preliminary results show that the time of budburst was delayed when seedlings were grown under shade conditions (from +3 to +11 days for *Quercus* and *Fagus* respectively) or when buds are painted in white compared to black (from +4 to +11 days from *Quercus* and *Prunus* respectively), whereas no significant effect was found under reduced precipitation for any species. For the timing of leaf coloring, a very significant effect of light was found with a delay of +22, +39 and +42 days observed under shade conditions for *Fraxinus*, *Prunus* and *Fagus*. Preliminary results based on the temperature recorded within the buds or close to the plants suggest that bud temperature explain the differences observed in the time of bud burst among the different treatments, though light intensity may have also directly influenced bud development of *Fagus* in spring. Regarding leaf coloration, our results suggest that light intensity has a strong influence on most of temperate trees whereas soil water and nutrient content has only a minor species-specific effect. Overall, our results underline the importance of microclimatic variation to explain phenological variation among trees within or among nearby sites, especially in topographically complex regions as in mountains or in forests with varying vertical structure.