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Forest age stands affect soil respiration and litterfall in a Black pine forest managed by a shelterwood system in the Central Spain?

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This study aims to investigate the effects that stand age and forest structure generates on soil respiration and litterfall quantity. The effect of stand age on these variables was studied in a shelterwood system Spanish Black pine chronosequence in central Iberian Peninsula composed of 0-20, 20-40, 40-60, 60-80, 80-100-year-old. For each stand age, six forest stands with similar characteristics of soil type and site preparation were used. Also, a forest area ranging 80-120 years old and without forest intervention was selected and used as control. We also measured organic matter, C:N ratio, soil moisture and pH in the top 10 mineral soil at each compartment. Soil respiration measurements were carried out in three time points (3, 8 and 12 days). Results showed a clear trend in soil respiration, comparing all the experimental areas. Soil respiration showed the same trend in all stands. It initially showed higher rates, reaching stability in the middle of the measurement process and finally lightly increasing the respiration rate. The older stands had significantly higher soil respiration than the younger stands. Soil organic matter values were also higher in the more mature stands. C:N ratio showed the opposite trend, showing lower values in the less mature stands. More mature stands clearly showed more quantity of litterfall than the younger ones and there was a positive correlation between soil respiration and litterfall. Finally, the multivariate PCA analysis clearly clustered three differenced groups: Control plot; from 100 to 40 years old and from 39 to 1 years old, taking into account both soil respiration and litterfall quantity, also separately. Our results suggest that the control plot has a better soil quality and that extreme forest stand ages (100-80 and 19-1 years old) and the associated forest structure generates differences in soil respiration.