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Tree-rings $\delta^{13}C$ different responses to environmental factors in angiosperms and gymnosperms at global scale

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Tree-rings, was an extraordinary information base of climate. The global climatic change has been modifying ecosystem, it is important to understand mechanism of how plants respond to climate change. The carbon isotope composition of tree-rings corrected to the value before industrial revolution ($\delta^{13}C_{ring}$) can provide climatic information and carbon and water balance relationship of plants. However, it was still a challenge to disentangle the influence of different environmental parameters on $\delta^{13}C_{ring}$ among different tree types. We collected published data of $\delta^{13}C_{ring}$ from published papers and study how angiosperms and gymnosperms responsed to different environmental parameters. The results showed that the $\delta^{13}C_{ring}$ of angiosperms and gymnosperms were significantly different and there was a decrasing trend in $\delta^{13}C_{ring}$ of angiosperms and gymnosperms. In this study, we found that atmospheric concentration (C_a) was not the mainly factor to influence the $\delta^{13}C_{ring}$, and the MAT and PRE were the most important environmental parameters to influence the decreasing trend of $\delta^{13}C_{ring}$ for angiosperms and gymnosperms, respectively. Additionally, the global isoscapes of $\delta^{13}C_{ring}$ were not established, in this study, three machine learning methods to predict the spatial distribution of $\delta^{13}C_{ring}$ were done, the results showed that RF was the best model to established the isoscapes of $\delta^{13}C_{ring}$.