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The imprint of disturbance on the global wood density distribution

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Wood density is an important functional trait, linked to tree growth and carbon storage in forests. Studying biogeographic variation in this trait along with the environmental and anthropogenic drivers of this variation is therefore critical to improve present and future carbon storage estimates of global forests. We combined a global database of ~1.1 million forest inventory plots with wood density records from 10,703 tree species to quantify the global wood density distribution and its drivers. In a first step, we tested the phylogenetic imprint on wood density variation among species and communities. Using information on environmental and anthropogenic covariates, we then created a global map of wood density at ~1km resolution. By integrating this wood density map with an existing map of growing stock volume and biome-level biomass expansion factors, we estimate that 403 Gt C are presently stored in the world's forests, which largely agrees with previous estimates. Our analysis also allowed us to explore wood density variation along human disturbance and fire frequency gradients at different spatial scales to show that disturbance effects on wood density vary between forest types, biomes and environmental conditions. This study contributes to a better understanding of terrestrial biomass distribution patterns and the effects of human and ecological disturbances on forest structure.