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**How the climate limits the wood density of angiosperms** JIN WOO CHOI, HO-YOUNG KIM, Seoul National University — Flowering trees have various types of wood structure to perform multiple functions under their environmental conditions. In addition to transporting water from the roots to the canopy and providing mechanical support, the structure should provide resistance to embolism to maintain soil—plant—atmosphere continuum. By investigating existing data of the resistivity to embolism and wood density of 165 angiosperm species, here we show that the climate can limit the intrinsic properties of trees. Trees living in the dry environments require a high wood density to slow down the pressure decrease as it loses water relatively fast by evaporation. However, building too much tissues will result in the decrease of hydraulic conductivity and moisture concentration around mesophyll cells. To rationalize the biologically observed lower bound of the wood density, we construct a mechanical model to predict the wood density as a function of the vulnerability to embolism and the time for the recovery. Also, we build an artificial system using hydrogel microchannels that can test the probability of embolism as a function of conduit distributions. Our theoretical prediction is shown to be consistent with the results obtained from the artificial system and the biological data.

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