EGU22-9450
https://doi.org/10.5194/egusphere-egu22-9450
EGU General Assembly 2022


# The biogeographic distribution of forest functional types based on ground-sourced inventory data

**Haozhi Ma**, Constantin M. Zohner, Lidong Mo, Daniel S. Maynard, Johan van den Hoogen, and Thomas W. Crowther
Institute of Integrative Biology, ETH Zurich, Zurich, Switzerland (haozhi.ma@usys.ethz.ch)

Forest leaf habit and leaf type largely affect the structure and functioning of ecosystems, driving spatial variation in carbon, water, and nutrient cycles. To address spatial variation of leaf habit and leaf type across global forests, we combined a global scale forest inventory dataset with leaf habit and leaf type information from the TRY database, allowing us to generate a spatial understanding of the environmental controls of the global forest functional type distribution. Our analyses reveal large gradients of broadleaved evergreen, broadleaved deciduous and needle-leaved forest across the globe, which can be attributed to climatic, soil and anthropogenic features. In agreement with local experimental studies, hot and humid climates with acidic soil favor broadleaved evergreen species, whereas broadleaved deciduous species dominate in regions with intermediate rainfall, and needle-leaved trees dominate in nutrient-poor sites with cold or dry climate. By integrating our forest functional type maps with a recent global assessment of tree density, we estimate that 29.6%, 28.9% and 41.5% of the ~3 trillion global trees presently existing are broadleaved evergreen, broadleaved deciduous and needle-leaved. Based on the analysis of forest-type climate envelopes, we predict that 22–37% of the forest area is likely to experience a future change in climate envelope, with the evergreen forest climate envelope declining and the deciduous forest climate envelope increasing in area worldwide. By quantifying the present distribution of trees with different leaf habit and leaf type and highlighting regions where climate change will increase the climatic stress experienced by the present forest, our results are valuable to improve predictions of global terrestrial carbon cycling now, and in the future.