Geophysical Research Abstracts
Vol. 20, EGU2018-12313, 2018
EGU General Assembly 2018

Leaf trait diversity is superior to species richness in predicting tree-layer carbon storage in the mature temperate forests of Changbai Mountain, NE China

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Lin The nature and strength of links between plant diversity and a forest's ecosystem carbon storage at large spatial scales represent a key emerging field in studies of biodiversity and ecosystem functioning (BEF) with strong relevance for climate change. Here, we investigated the species composition and plant functional traits in the main tree layer of mature temperate forest ecosystems on the north slope of Changbai Mountain, NE China, to explore the relationships between species diversity, functional diversity and carbon storage, testing the hypothesis that functional diversity in leaves is superior to plant species richness in predicting ecosystem carbon storage. In total, 37 tree species were recorded on 115 plot measuring 20m $\times$ 20m and situated in mature forest at eight distinct altitudinal levels. Both tree carbon storage and all diversity indices significantly decreased with increasing altitude, resulting in species and functional trait diversity indices being significant predictors of the tree layer carbon storage. Nonetheless, multiple linear regression revealed that functional diversity indices are superior in predicting carbon storage, especially in relation to functional evenness (FE_{ve}). Traits including leaf size and quality that correspond with the leave's photosynthetic activity were most significantly correlated with carbon storage in the tree layer. Leave petiole shape and ingredient variables represent secondary factors determining lant pattern, such as leaf carbon content and thickness, interpreted with carbon stock and carbon instantly storage. In temperate montane forest landscapes, the composition and balance between broad-leaved trees and conifers represents a crucial factor determining both trait diversity and forest carbon sinks.