How similar islands and continents are ? A phylogenetic approach in plant communities

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Abstract

Although most of insular lineages have a continental origin, communities in islands and in continents may highly differ. Compared to the mainland, islands harbor high rates of endemism and are also noted by disharmonies in their community composition. Speciation and extinction rates, geological history, in addition to dispersal events blur the frontier between insular and continental communities. However, how similar islands and continents are is still unclear. Here, we used for the first time a phylogenetic approach to estimate divergence between plant communities in islands and in continents. We focused on monocotyledons in 4,600 islands and 610 continental areas, and used two well-known measures of phylogenetic beta diversity : beta Mean Pairwise Distance (MPDβ) and beta Mean Nearest Taxon Distance (MNTDβ). We first explored the role of spatial and environmental distance on the phylogenetic divergence between each island and the surrounding continental areas. Then we determined spatial patterns of continental-island divergence across world islands. We looked for geographic, climatic, historic factors, as well as community structure factors, that may explain why some islands are more divergent than others. All analyses were performed thanks to Boosted regression trees and Generalized Linear Models. We showed that spatial distance and difference in solar radiation may be the main factors of phylogenetic divergence between a given island and the surrounding continental areas. Abiotic and community structure features of highly divergent islands varied with the measure of beta phylogenetic diversiy used. MPDβ and MNTDβ were thus complementary to shed light on geographic, historic and climatic processes at the origin of divergence between continents and islands.Here we showed how rarely employed phylogenetic approaches may give new insights in the continental origin of plant diversity in islands and may explain how divergence, or similarity may have arisen.

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