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Clade-Specific Biogeographic History and Climatic Niche Shifts of the Southern Andean-Southern Brazilian Disjunction in Plants

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Abstract

Several plant clades show a characteristic disjunction between the southern Andes (SA) and southern Brazil (SB). This disjunction has been explained by Neogene geologic and climatic changes, especially due to the Andean uplift, the Mid-Miocene marine transgressions, and the development of Patagonian aridity. We compared phylogeny-derived divergence times and realized climatic niches for ten clades disjunct between the SA and the SB, and compared them with the timing proposed for the above-mentioned geologic and climatic events. Divergence times obtained for the node corresponding to the SA-SB split ranged from 27 to 1 Ma. Climatic niche overlap between SA and SB is generally low and niche equivalency (but not similarity) between SA and SB is significantly lower than expected by chance. Precipitation tends to be higher in SA and SB than in the intervening areas, where no species of the disjunct clades occur, but this trend does not apply to all clades. Clades ages correlate to differences in minimum temperature of coldest month and mean temperature of coldest quarter. Our results indicate that while different Neogene climatic and geological events can explain the disjunction of most clades, there is no single explanation for all of them: SA-SB disjunctions go back to different clade histories. Climatic niche shifts could explain the generally low climatic overlap and lack of niche equivalency between SA and SB, and might have played a central role in the biogeographic history of the SA-SB disjunction. A proper test of this hypothesis will require measuring differences in the fundamental niches of the species—which is beyond the scope of this study.

Keywords

Andes

Arid diagonal

Marine transgressions

Paranean Sea

Patagonia

South America

Cite this chapter

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