

Drivers of plant diversity, community composition, functional traits and soil processes along an alpine gradient in the central Chilean Andes

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Abstract

Aim High alpine regions are threatened but understudied ecosystems that harbor diverse endemic species, making them an important biome for testing the role of environmental factors in driving functional trait-mediated community assembly processes. **We tested the hypothesis** that plant-soil feedbacks along a climatic and elevation gradient influence plant community assembly through shifts in habitat suitability, which drive plant functional, phylogenetic, and spectral diversity. **Location** In a high mountain system (2400-3500 m) of Región Metropolitana in the Chilean Andes (33°S, 70°W). **Methods** We surveyed vegetation and spectroscopic reflectance (400-2400 nm) to quantify taxonomic, phylogenetic, functional, and spectral diversity at five sites from 2400 m to 3500 m elevation. We characterized soil attributes and processes by measuring water content, carbon and nitrogen, and net nitrogen mineralization rates. **Results** At high elevation, colder temperatures reduced available soil nitrogen, while at warmer, lower elevations, soil moisture was lower. Metrics of taxonomic, functional, and spectral alpha diversity peaked at mid-elevations, while phylogenetic species richness was highest at low elevation. Leaf nitrogen increased with elevation at the community level and within individual species, consistent with global patterns of increasing leaf nitrogen with colder temperatures. **Main conclusions** The increase in leaf nitrogen, coupled with shifts in taxonomic and functional diversity associated with turnover in lineages, indicate that the ability to acquire and retain nitrogen in colder temperatures may be important in plant community assembly in this range. Such environmental filters have important implications for forecasting shifts in alpine plant communities under a warming climate.

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