Submitted Abstract

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Abstract

In mountain habitats, where life is limited by cold temperatures, it seems obvious that climate warming has a strong impact on the composition of ecosystems. Long-term monitoring studies like the GLORIA project are crucial to understand diversity changes and species range shifts on mountain summits, elucidate the processes leading to these changes, and understand the time scales over which they are acting. Up to date a worldwide vascular plant species increase on mountain summits has been observed and attributed to warming temperatures. But the species increase might only be temporal phenomenon and cryophile species are expected to be threatened by competitive displacement and physiological constraints in the near future. Until now, time series that monitor vegetation change are often too short to detect and generalize patterns of winner or loser species within alpine communities.

Therefore, we complemented a 14-year time series of summit vegetation change with a space-for-time approach along gradients below these summits in two GLORIA regions in the Central and Southern European Alps. To combine patterns of change and patterns of elevational distribution, we recorded vascular plant species composition every 50 vertical meters from the summits down to the treeline. By using indicator values and plant strategy types, we analysed changes in community weighted means and differences of the species composition along the time and elevation gradient. Through an analysis of distribution patterns and functional traits of the recorded species, we expected to identify potential migrators likely to approach the summits in the near future. Further, we tested the hypothesis whether successfully migrating species from lower elevation might originate from nutrient-richer sites and are more widespread and competitive compared to the alpine resident species.

Results from the transects and summit monitoring showed clear thermophilization trends. Competitive species played a minor role in the communities of the summits. Especially at the lower summits the proportion of thermophilic species increased significantly over time. Here, thermophilic species limit cryophilic species in near future. This process will be intensified due to increasing abundance of dwarf shrubs and trees.

The knowledge about the species and their traits will be highly valuable for interpreting future monitoring results. Especially for conservation issues, such detailed local studies are crucial as they can detect species at risk. Moreover, the functional approach gives an idea which consequences the changes will have for the whole ecosystem and its services.