

## Submitted Abstract

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<b>Title</b>	Spatio-Temporal Dynamics Of Apennines Treeline Ecotones Under Global Change.
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## Abstract

Human activities and natural processes over millennia have shaped the forest landscapes of European mountain ranges. In the Apennines, the second largest range in Italy, the post-World War II abandonment of traditional activities has led to a widespread forest expansion with a different declination from valley bottoms to upper treelines ecotones. Firstly, we examined the available literature about the land-use/cover change in the Apennines (57 case studies), that revealed a clear trend of forest expansion (+78%) and the reduction of croplands (-49%) and grasslands (-19%). Secondly, we investigated the landscape configurational shifts comparing different slope exposures and altitudinal zones. We selected two paired study landscapes (North-East vs South-West slopes) for each of 10 selected sites. Computing the reforestation dynamics with historical (1954) and recent aerial images (2012), we found that landscape mosaics generally experienced a structural simplification and specifically a diffuse fragmentation of grasslands at higher elevations. Most treeline ecotones in the Apennines are human-shaped. Here we assessed the major drivers of the highest treeline location and their species composition. Human impact, geomorphology, and environmental conditions acted in synergy to determine tree species distribution. The mean treeline altitude is 1755 m a.s.l. and *Fagus sylvatica* is the dominant species (94%), forming the typical abrupt transition from forest to grassland. We also found several *Pinus nigra* plantations and very limited *Pinus mugo* shrublands and *Pinus heldreichii* stands in the central and south Apennines, respectively. Treelines at lower elevations were associated to human presence and sunny exposures. The depressed and monospecific features of Apennines treelines suggested a widespread severe human pressure. Examining the species-specific ecotones with remote sensing data, we reported that beech treelines slowly shifted upslope in the last 60 years. The common spatio-temporal dynamics of beech is characterized by infilling processes, canopy enlargement of preexisting trees and microtopography-dependent upward shift of new stems. The presence of shrub species acted as facilitation driver for the establishment of new forest patches. Oppositely, the faster successional processes of *Pinus nigra* were reported as rapid upward shift controlled by microsite topography and guaranteed by the proximity to seed source plantations. The presence of reproductive pines above the treeline, could indicate an increasing tree recruitment in the future. The role played by climate on growth and recruitment processes seems to be overrun by anthropogenic-processes. These secondary successions could induce a significant long-term decline in plant diversity in species-rich grasslands and the loss of cultural landscapes.