SubForDyn

Reconstructing, Understanding and Modelling Subalpine Forest Dynamics to Support Carbon Sequestration, Biodiversity Conservation, and Infrastructure Protection

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Context — The tree line is a major characteristic of alpine landscapes, resulting from the interaction of many factors. Despite a complex determinism, the recent expansion of alpine forest limits is largely attributed to land use changes and global warming. Recent publications suggest that climate change and resulting forest expansion have already had a negative impact on alpine biodiversity, significantly modifying functions such as carbon sequestration and nutrient cycling.

Objectives — In this PhD project, we plan to quantify, understand, and model the evolution of the French subalpine forests, from the forest minimum of 1850 to their current maximal expansion. Besides, we also want to quantify the ecological impacts of this evolution to propose actions capable of mitigating the negative consequences of these changes (*e.g.* loss of biodiversity), but also to seize the opportunities they represent (*e.g.* carbon sequestration).

Approaches — Our knowledge of the distribution of the French forests is mainly based on three distinct sources (the 'Etat Major' map; the BD forêt ® versions 1 and 2, and one aerial photographic layer) that we will compare for the mountain regions (Alps, Pyrenees, Corsica). From these digital documents and a digital terrain model, we will assess the dynamics (expansion and densification) of the subalpine forests. The dynamics will then be analysed using economic, social, historical and environmental data.

Expected results and impacts — This project will provide pivotal results on the dynamics of the upper forest limit, which is considered a key element of the Alpine landscape and a crucial marker of environmental change, yet still resists our understanding. These results will be used to understand the influence of human and environmental factors on these dynamics, and then to predict the position of sensitive areas where specific actions could be considered, whether for biodiversity conservation, carbon sequestration, or maintenance of ecosystem services.