

Exploring the long-term vegetation and fire-disturbance history of the Biogradska Gora old-growth forest (Montenegro)

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Introduction

As disturbances are predicted to increase due to global changes, it is important to improve our knowledge on their natural regimes in order to adopt an appropriate management to enhance the resilience of forest stands.

The assessment of disturbance regimes in old-growth forests is important because these ecosystems are considered as reference systems that developed without significant human impact for long periods of time.

Here we focus on one of the best preserved old-growth forests in the Balkans (fig 1). The vegetation in the core area (6000 ha) is dominated by conifer trees (silver fir and Norway spruce). On the border of the core area there are mainly mixed beech and conifer stands and pure beech stands.

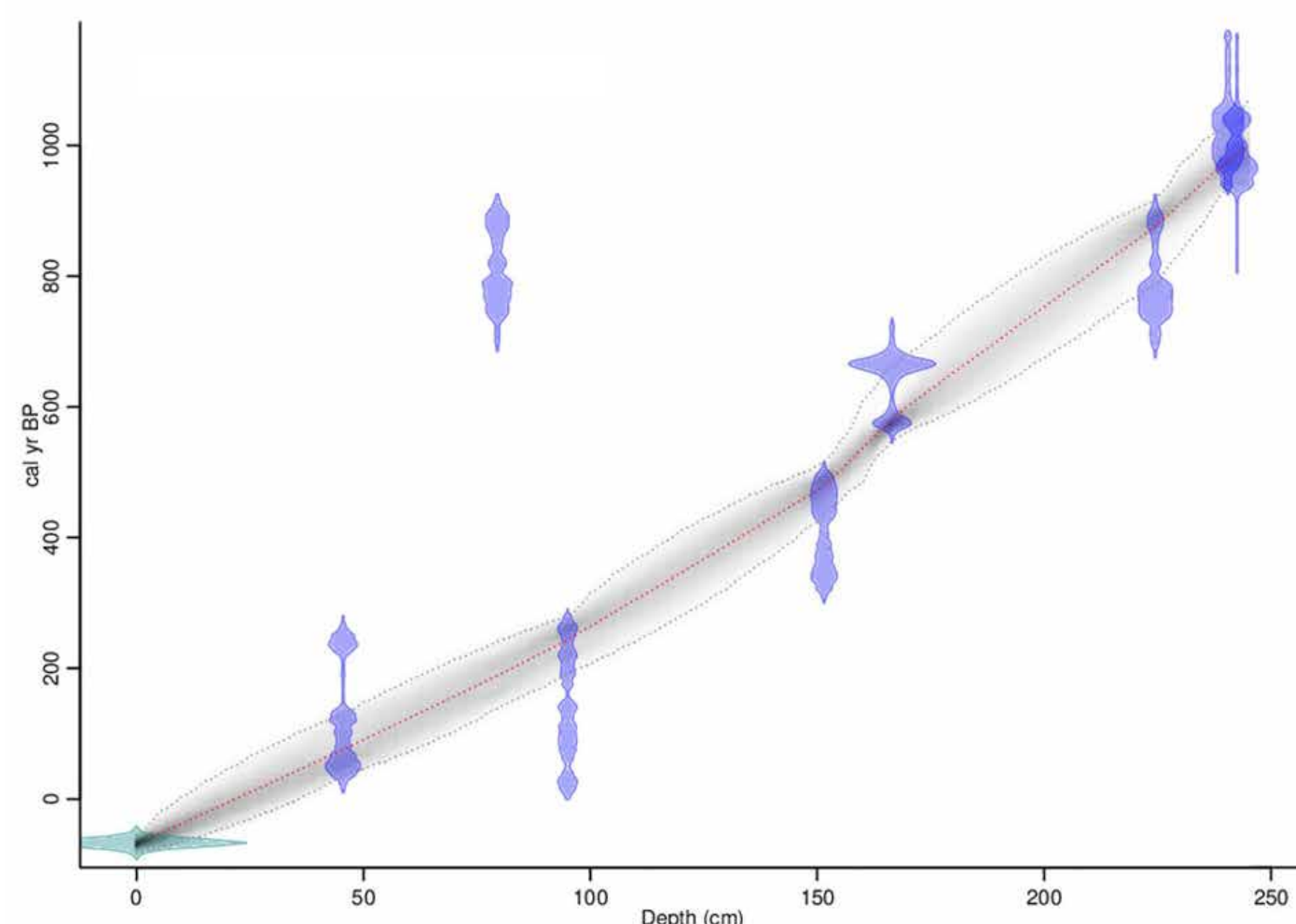


Fig. 2 - Depth-age model based on eight ¹⁴C dates from terrestrial plant macrofossils. We considered one of the ¹⁴C dates as re-worked material and therefore excluded from the model

Hypothesis

Surface extent regression

The old-growth forest covered a wider surface of the area shrunk over time as consequence of natural disturbances and land-uses (grazing activities, fires, forest exploitation) that promoted the spread of beech.

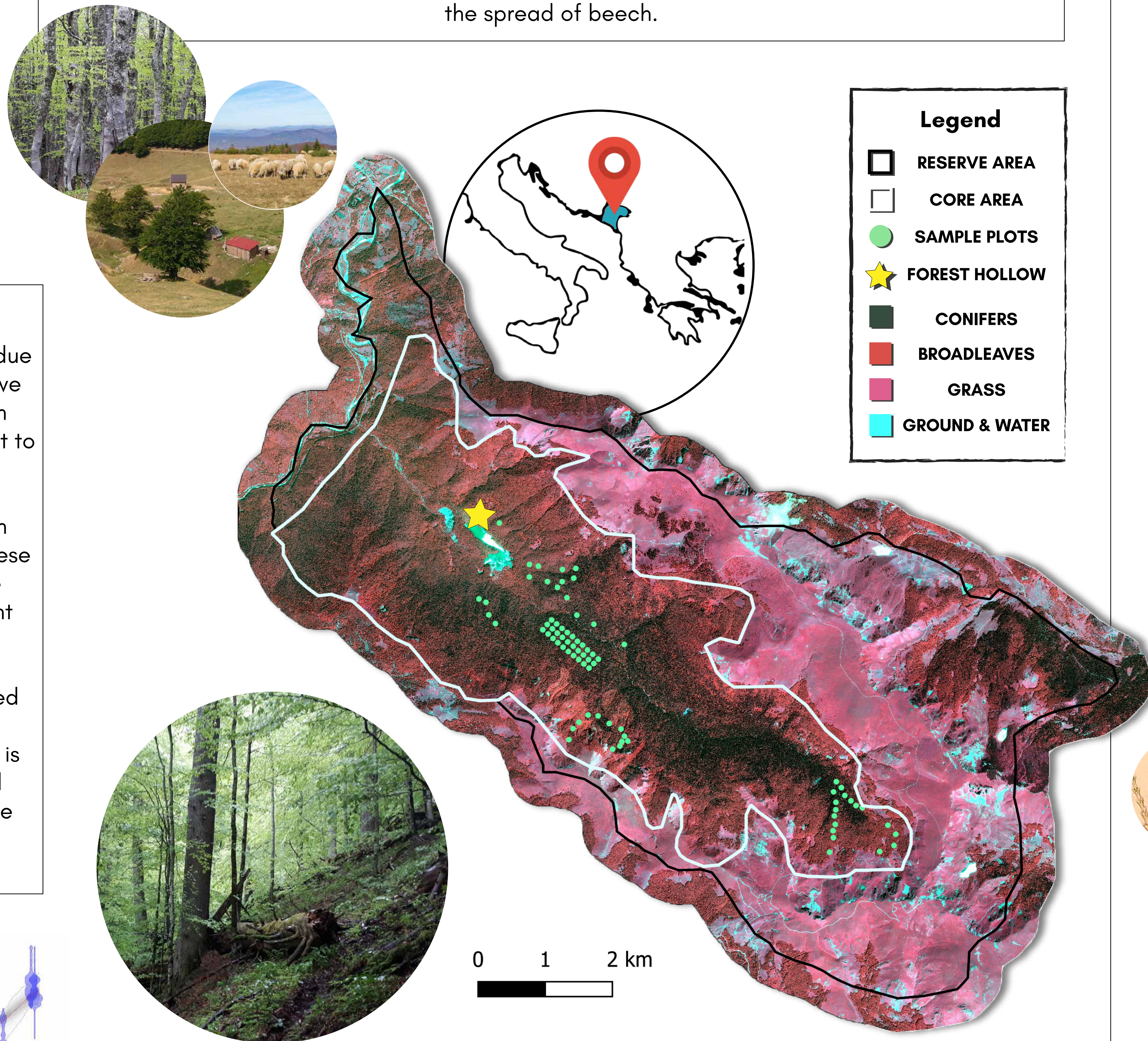


Fig. 1 - Location and false color image of the study area

Results

The expansion of beech, which is dominant around the forest hollow today, occurred very recently. Tree cover and composition changed substantially over time on the edge of the old-growth forest reserve. This suggests that the edges of the reserve were disturbed and consequently not characterized by long-term stability and continuity of forest cover.

Materials & Methods

How ?

Using a multidisciplinary method

PALEOECOLOGY

Temporal analysis

By studying the long-term vegetation dynamics of the forest

To reconstruct local vegetation

To obtain material for AMS radiocarbon dating

PLANT MACROFOSSILS

245 cm long sediment sequence from a small forest hollow - 1000 cal yr BP (fig. 2)

High resolution record of c. 4-8 cm/yr

POLLEN and SPORES

Reconstruction of past vegetation history and land-use changes

MACROSCOPIC CHARCOAL

Reconstruction of long-term fire activity

Interaction

Anthropogenic disturbances

Natural disturbances

REMOTE SENSING

Spatial analysis

By assessing the spatial patterns of successional stages of forest development

High-resolution Pléiades satellite images (0.5-2 m)

Object-based segmentation

Training of the model

Classification

Results

Mosaic of patches linked to different stages of development of the stands used to infer the time from the last disturbance

*Motta et al., 2015. Structure, spatio-temporal dynamics and disturbance regime of the mixed beech-silver fir-Norway spruce old-growth forest of Biogradska Gora (Montenegro). Plant Biosystems 149, 966-975