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Late Pleistocene and Holocene climatic variability in the Carpathian-Balkan region. Abstracts volume



**Late Pleistocene and Holocene Climatic Variability  
in the Carpathian-Balkan Region**

**ABSTRACTS VOLUME**



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## Snow avalanche history in Parâng Mountains (Southern Carpathians) revealed by dendrogeomorphic analyses

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Parâng Mountains belong to Southern Carpathians, having the maximum altitude in Parângul Mare Peak (2519 m a.s.l.). The geology is dominated by crystalline schists, due to whom the relief is characterized by steep slopes. Between 1400 – 1700 m the average annual temperature is around 2-3°C and the total precipitation about 1000-1200 mm/year. Coniferous belt extends roughly at the mentioned altitudes, being dominated by Norway spruce (*Picea abies*) forests. Above 1800 m the average annual temperature drops below 2°C and the average rainfalls reach 1200 mm/year, allowing the development of alpine shrubs and alpine grassland (Oancea *et al.*, 1987). Crests and steep slopes in these subalpine areas are prone to snow accumulation and avalanche release. Despite the favorable conditions for avalanche trigger in this area, only one avalanche event is historically recorded, with severe impact on forest areas, but no destructive impact on infrastructure or fatalities.

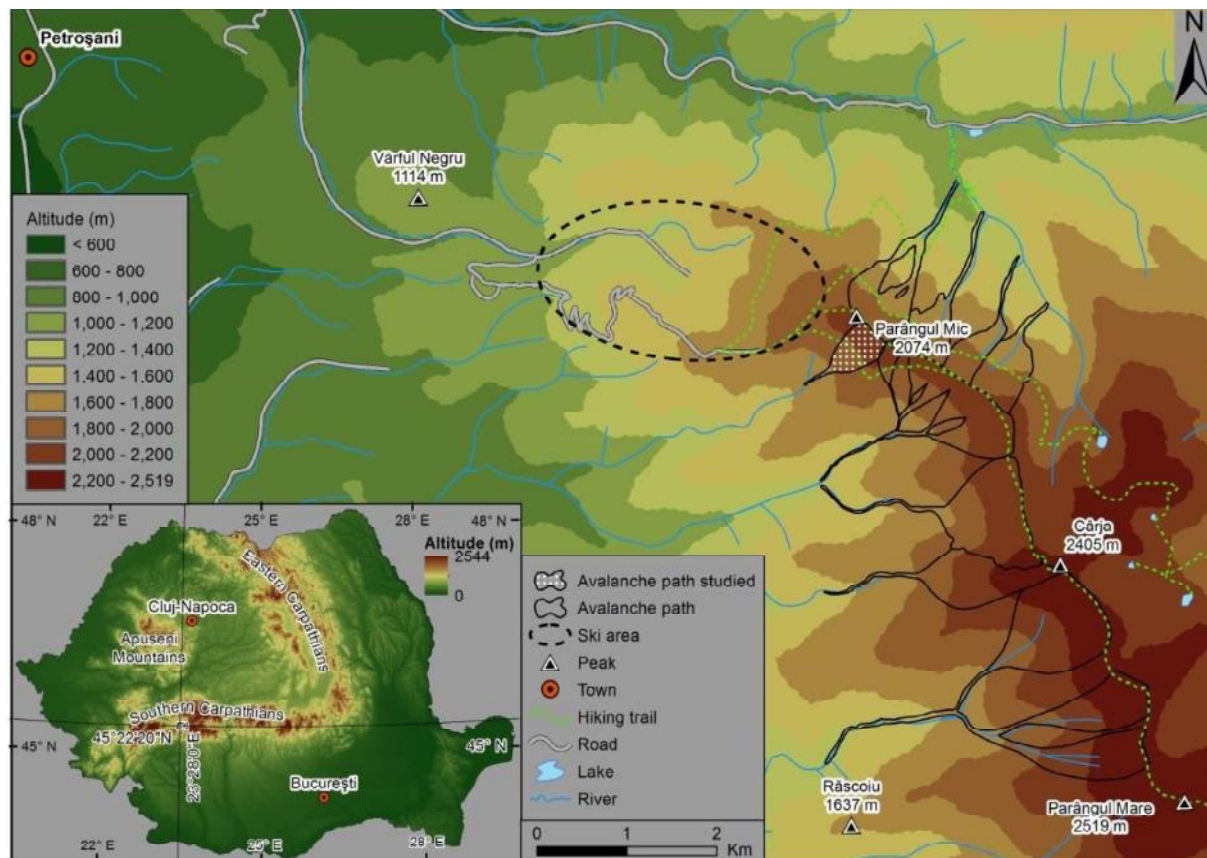
The occurrence of geomorphic processes, including snow avalanches, may disturb the trees located in the area affected. The most important disturbances left by snow avalanches in trees are stem tilting, scars, tree decapitation, broken branches (Butler and Sawyer, 2008; Stoffel and Bollschweiler, 2009; Luckman, 2010). Correlated with those disturbances, the trees record in their internal structure the effects of the mechanical impact by developing growth anomalies, such as tangential rows of traumatic resin ducts, compression wood, growth suppression (Wilford, 2005; Stoffel and Bollschweiler, 2009). They are stored in the annual rings formed after the impact and represent a reliable natural archive suitable for reconstructing past avalanche activity with annual resolution (Stoffel *et al.*, 2010).

The current study was performed in the western part of Parâng Mountains, south of Parângul Mic Peak (2074 m a.s.l.), close to the Parâng Ski Resort, on Scăriţa Valley avalanche path (Fig. 1). In this area an ambitious development project for ski area extension is currently under implementation by Petroşani local council (Agentia pentru Protectia Mediului Hunedoara, 2011). The project aims, among other things, to prolong the existing ski pistes with twelve new ski pistes (12.66 km length) that will reach Parângul Mic Peak (2074 m) and to build three ski lifts above tree line. Three ski pistes and one ski lift are planned to be built in the starting zone of the Scăriţa avalanche path.

This study aims to reconstruct the past snow avalanche activity, in order to provide more information about avalanche activity in this area.

In the field, 116 Norway spruces (*Picea abies* (L.) Karst) showing severe external disturbances as a consequence of past avalanche impact were sampled (219 increment cores, 14 stem discs and one wedge). Other 26 undisturbed spruces (52 increment cores) were sampled in order to build a local reference chronology.





**Fig. 1** Study area location.

The samples were mounted in wood supports, air dried and sanded with increasing grits (80, 120, 240, 400, 600) in order to enhance the anatomical details. Tree-rings were then counted. Then, the growth anomalies were identified and centralized allowing us to identify a minimum of 13 avalanche events that occurred along the avalanche path since the beginning of the 20th century until present. For every avalanche year, the tree index was calculated according to Shroder (1978). Further, the spatial extent of avalanches was mapped for each event year. The return period and annual probability of avalanche occurrence were also calculated and mapped.

The results of this study proves that the future extension of the tourist area in the upper part of the Scărița valley may be affected by the avalanche activity, as it was in the past, so it must be seriously taken into consideration by winter tourism activities.

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