The EuroDendro project - Snow-avalanche frequency and magnitude in European Middle Mountain unravelled by dendrogeomorphological analyses

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The EuroDendro project - Snow-avalanche frequency & magnitude in European Middle Mountain unravelled by dendrogeomorphological analyses

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Objectives

The EuroDendro project aims to detect the signal of recent snow-avalanche activity within the analyses of tree rings.

In mountain areas, even middle mountains, snow-avalanches are a common process & pose serious hazards & risks in recently occupied sectors, either for residence or recreation purposes.

Where (i) geomorphological evidence of snow-avalanche occurrence are scarce, (ii) historical records are poor & (iii) trees are colonizing part of the slopes, tree-ring analyses appear as a good alternative to reveal the recent snow-avalanche history.

Investigated areas

The EuroDendro project investigates four main areas, some of them in connection with other scientific frameworks.

The investigated areas are located in:

(A) Northern Iceland, in the Dalsmynni valley, the Ljosavatnkarð pass & the southern Frjòskadafjall valley,
(B) Western Norway, at the bottom of Nordfjord, in Erdalen & Bedalen,
(C) Central Romania, in the Southern Carpathians, in the Bâlea valley, Făgărăș massif,
(D) Central France, in the Northeastern valleys of the Cantal massif.

All these areas are characterised by steep slopes, harsh wintry conditions, known frequent snow-avalanche activity, a relative remoteness & a tree-cover on talus & cones.

The dendrogeomorphological approach

The dendrogeomorphological approach consists in a survey of the investigated areas to inventory damages that affect the morphology of the tree:

- tilting of the trunk,
- presence of scars on the trunk,
- topped trees.

Such a survey enables mapping the most frequent snow-avalanche paths, helping to:

- locate the maximum potential damages
- estimate the runout distances
- appreciate the lateral dispersion of the events
- map the tree morphology reflecting damages due to snow avalanche activity in the damaged area.

The core extractions in c & d directions, i.e. parallel to the main flux lines, on both the uphill & the downhill sides of the tree.

Core analyses on a Lintab measurement table, enabling tree-rings counting, location & dating of growth disturbances (narrow & large rings) & reaction wood formation.

Tree species

The EuroDendro project is very interested in:

(i) broad-leaved trees, which attracted seldom attention in dendrogeomorphology related to snow-avalanche activity:
- birch (Betula pubescens) in N Iceland
- birch (Betula pubescens) & alder (Alnus) in W Norway
- beech (Fagus sylvatica) in NE Cantal - France

(ii) coniferous trees in little explored areas where broad-leaved trees are unavailable:
- spruce (Picea abies) in Central Romania

Reference curve built from straight spruces sampled below the参考 curve

Measurements of tree-ring width (mm)

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Dendrochronology approach

Steem growth
- samples from the lower trunk & upper rannusk zone

Reactive growth reaction wood formation
- location of the reaction wood date recurrent events over the last 40 years, with a different distribution

Skoggrækt

Ljósavatn karð-west, Iceland - tree #9

Dalsmynni, Iceland - tree #16

Bedalen, Norway - tree #44

Erdalen, Norway - tree #7

Figusti, Romania - tree #94

Ljósavatn karð-west, Iceland - tree #9

Bedalen, Norway - tree #44

Erdalen, Norway - tree #7

Figusti, Romania - tree #94

Scars on the trunk & main branches in the snow-avalanche path.

Location of the reaction wood date recurrent events over the last 40 years, with a different distribution.

Reference curve built from straight spruces sampled below the reference curve

Locate the maximum potential damages
- estimate the runout distances
- appreciate the lateral dispersion of the events
- map the tree morphology reflecting damages due to snow avalanche activity in the damaged area.

Reaction wood formation on the downhill side of the trunk.

Narrow path with poor tree cover, even in the distal rannusk zone.

Most of the trees are very young (c. 14 years)

Young trees could indicate:
- snow-avalanche activity deep at valley level
- well defined areas of felled trees = recent major snow-avalanches

Reference growth = average of all cores extracted in c & d direction

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