Fire activity in Scandinavia during 1500-1900

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Objectives and Rationale

Separating the natural, climate-related signals from the human-related signals in fire chronologies presents one of the major problems in the interpretation of forest disturbance histories.

In the boreal zone, fire was common both as the main factor driving forest dynamics and as an agricultural tool used to clear the land and grow food for people and their domesticated animals. As a result, fire chronologies contain a mix of signals that reflects both climate variation and differing land-use regimes, complicating their interpretation.

In this study we use a network of sites with spatial reconstruction of past fire histories to separate climatically controlled (temporally synchronous within a study area) fires vs. non-climatic (non-synchronous and typically small) fires. By using this simple conceptual model, we will analyse long-term trends and within-regional variation in historical fire activity over Scandinavia.

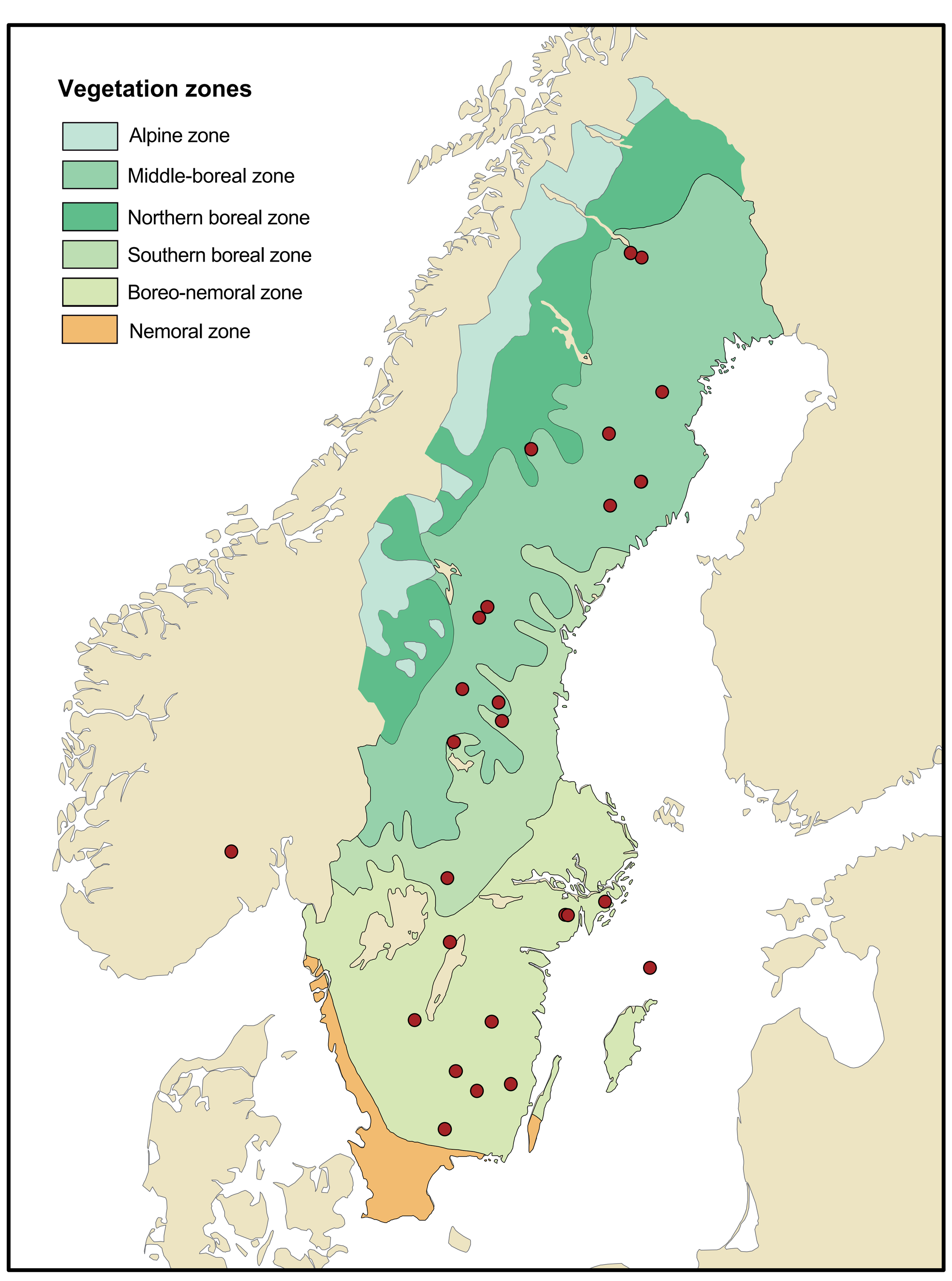
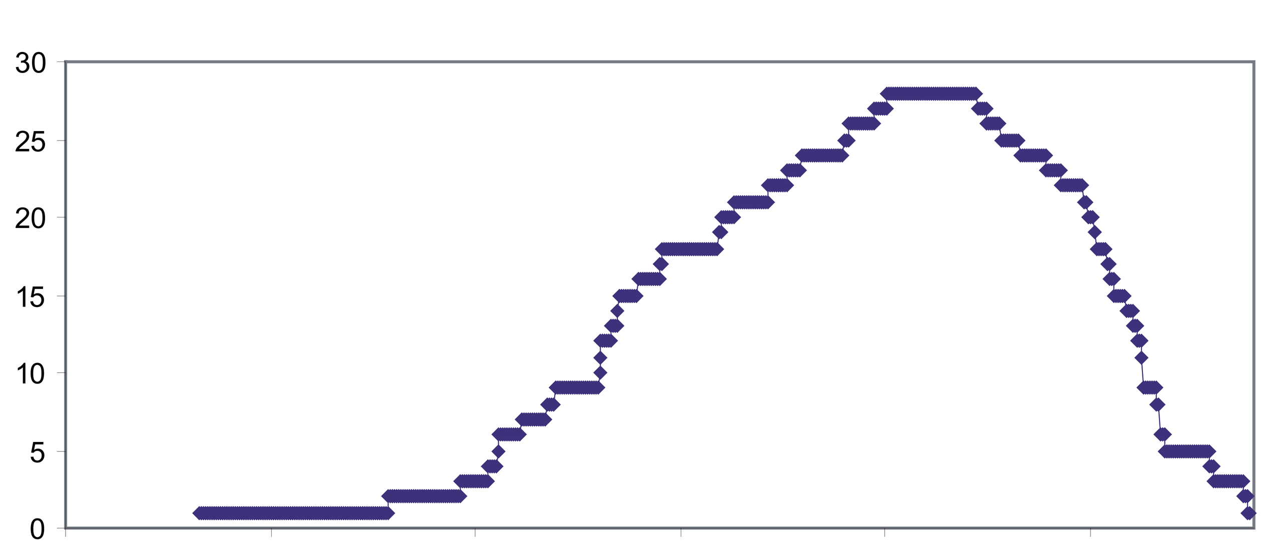


Fig. 0. Location of sites with reconstructed fire histories. Earch red point represent a single site (< 5 ha) or a network of sites (n = 5- 30, area 100 - 10 000 ha) with independent reconstructions. Boundaries of vegetation zones are according to the Swedish National Atlas (SNA, 2001).

Fig. A. Absolute number of sites (OY axis) with fire chronology covering a particular year (OX) axis. While the increase in the number of sites over 1200-1600 is an effect of time on preservation of fire-scarred deadwood/trees, the decrease in the number of sites since early 1800 is an effect of fire suppression.



Some Preliminary Results

(1) large fire years
(based on fire history reconstructions):

Mean interval - 20 years (over 1523 – 1847)
Min interval - 1 year
Max interval - 66 years
Major historic fire years in southern Scandinavia:
1652 / 1568 / 1575 / 1624 / 1636 / 1775

Recent fire suppresion is the main century-scale pattern in the fire histories (**Fig. A**).

Synchronicity in fire occurence is mostly observed in the southern Scandinavia.

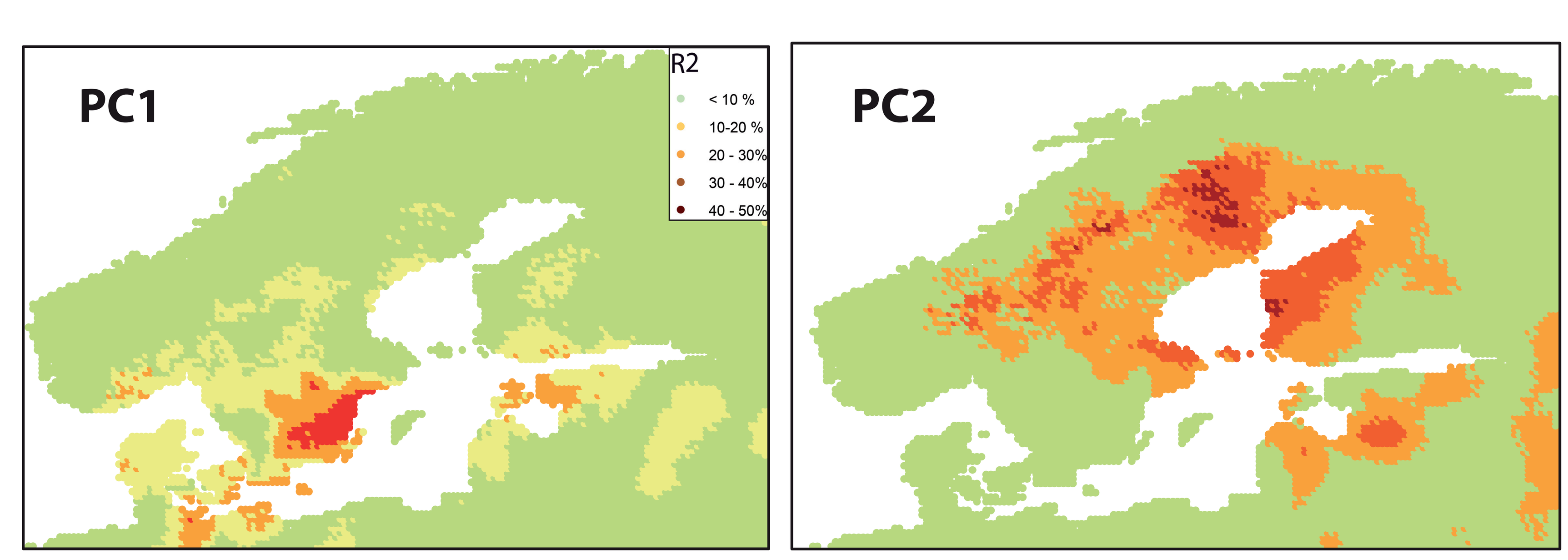
(2) potential for tree-ring-based reconstruction of regional fire activity:

DI (Drought Index, Prentice 1993) is superior over MDC (Girardin and Wotton 2009) and SPI (McKee 1993) as a regional fire proxy.

DI accounts for up to 72% of variation in provintial fire history record.

In Scandinavia, sub-regional variation in fire activity is large. Recent fire statistics suggests that south-eastern and central-northern parts of Sweden may require at least two sub-regional sets of proxies for reconstructions of historical fire activity (**Fig. B**).

Fig. B. Correcation between PC axes and Drought Index (DI, a bioclimatically modelled index reflecting a ratio between effective and potential evapotranspiration). PC axes were obtained on provincial (län) forest fire statistics over 1942-1975.



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