

## **Spatio-Temporal Variability and Trends in Frost-Free Season Parameters in Finland: Influence of Climate Teleconnections**

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**Abstract :** Variability and changes in thermal conditions play a crucial role in functioning of human society, particularly over cold climate regions like Finland. Accordingly, the frost-free season (FFS) parameters in terms of start (FFSS), end (FFSE) and length (FFSL) have substantial effects not only on natural environment (e.g. flora and fauna), but also on human requirements (e.g. agriculture, forestry and energy generation). Applying the 0°C threshold of minimum temperature (Tmin), the FFS was defined as the period between the last spring frost as FFSS and the first fall frost as FFSE. For this study, gridded (10 x 10 km<sup>2</sup>) daily minimum temperature datasets throughout Finland during 1961-2011 was used to investigate recent spatio-temporal variations and trends in frost-free season (FFS) parameters and their relationships with the well-known large-scale climate teleconnections (CTs). The FFS in Finland naturally increases from north (~60 days) to south (~190 days), in association with earlier FFSS (~24 April) and later FFSE (~30 October). Statistically significant (p<0.05) trends in FFSL were all positive (increasing) ranged between 0 and 13.5 (days/decade) and mainly observed in the east, upper west, centre and upper north of Finland. Such lengthening trends in FFS were attributable to both earlier FFSS and later FFSE mostly over central and upper northern Finland, while only to later FFSE in eastern and upper western parts. Variations in both FFSL and FFSS were significantly associated with the Polar (POL) pattern over northern Finland, while with the East Atlantic (EA) pattern over eastern and upper western areas. However, the POL and Scandinavia (SCA) patterns were most influential CTs for FFSE variability over northern Finland.

**Keywords :** climate teleconnections, Finland, frost-free season, trend analysis

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