SOIL ACIDIFICATION BY ATMOSPHERIC POLLUTION AND FOREST GROWTH

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Abstract. In recent years concern has been expressed about the danger of harmful pollution deposits which affect areas at great distances from the emission sources.

The investigation was so designed that a possible reaction in growth resulting from a supposed acidification could be observed as far as possible. A poorer growth development was observed in regions, which are suspected of being more susceptible to acidification than those regions which are presumed to be less susceptible in this respect. We have found no good reason for attributing the reduction in growth to any cause other than acidification.

1. General

It has long been known that smoke fumes from industries may damage surrounding vegetation. Forests around such local pollution sources often have reduced growth, and may in extreme cases be completely destroyed.

In recent years concern has been expressed about the danger of harmful pollution deposits which affect areas at great distances from the emission sources. In this respect the S compounds have attracted most attention. It appears to be quite clear from observations during the past few decades that a general acidification is taking place in our environment. The S emitted into the atmosphere is brought down to the surface of the Earth by rainfall, in the form of H₂SO₄, and causes acidification, which amongst other things, is clearly expressed in the increased acidification of lakes and rivers. Soils are also exposed to H₂SO₄, and it may be suspected that as a result, a longterm impoverishment of the soil will ensue. On soils which are more susceptible to acidification, this results in an accelerated impoverishment which in its turn may result in a lower growth rate as compared with less susceptible regions. This hypothetical difference in growth between regions of different susceptibility to acidification is the object of study in this investigation.

2. Material

The investigation is limited to Sweden south of 61°N (essentially Svealand and Götaland), i.e. to about 40% of the country's productive forest land by area, or about 50% of the production.

In this part of the country, two types of region have been selected, primarily on the basis of soil and water chemical conditions (see Section 3), viz. those regions, which are suspected of being more susceptible to acidification, as a result of S deposition, than other regions; and those regions which are presumed to be less susceptible in this respect. It is possible that these latter regions have remained substantially unaffected by the deposited S.

For the sake of simplicity the more susceptible regions are designated as A regions.
Fig. 1a–b. Averages of logarithmized double annual ring widths (in mm) for the more susceptible (full line) and less susceptible (dashed line) regions, respectively, and difference series of these average series. The average level during the period 1911–1950 is shown for each series. Two linear trends of the difference series are also drawn. The trend of the acidification component is represented under the two assumptions of individual (full fine) and common (dotted line) rate of ageing, respectively, discussed in the text. The figures before 'sample trees' represent the number of sample trees; the first one from the more susceptible regions and the second from the less susceptible regions.