

Carbonaceous Fly ash Particles in the Natural Environment in Sweden

Extended abstract

Concern about pollution and environmental changes caused by man has increased the interest in retrospective studies using lake sediment records. Lake sediments are, literally, extensive environmental archives that contain information about both past and contemporary environmental conditions. Although substantial progress has been made over the last two decades in developing new methods and approaches that permit accurate inferences about environmental changes from the sediment record, we are still at the beginning. It is not the content of these sedimentary archives that limits possible inferences, but the limitations of the analysts and the methodologies used.

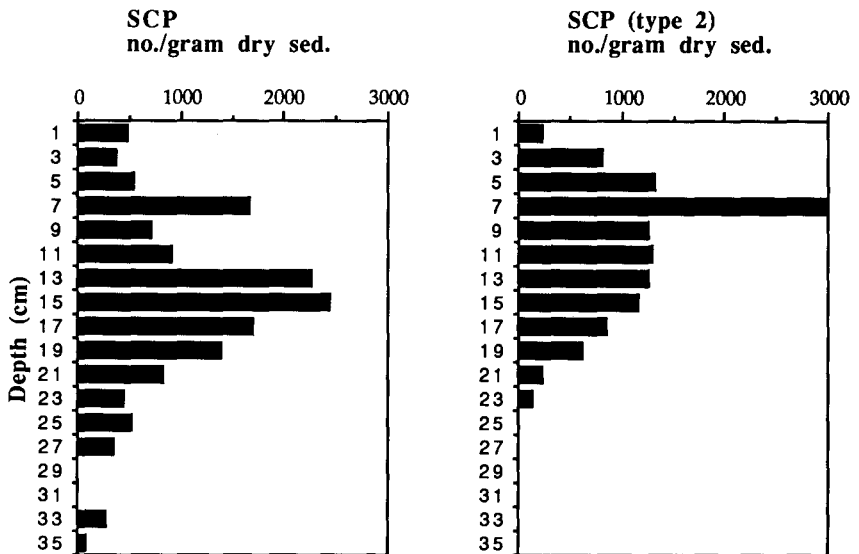


Fig. 1. Spheroidal carbonaceous particles (SCP) in a sediment core from Lake Mina, Minnesota, USA. Type 2 is more «glossy» and usually smaller than the ordinary type.

Palaeolimnological studies of lake acidification within the Lake Gårdsjön Project (Renberg and Wik, 1985a, b), the Palaeolimnology Programme of the Surface Waters Acidification Project (Battarbee *et al.*, 1990) and related projects have revealed the large amount of particulate pollutants derived from fossil fuel combustion that are deposited in recent sediments. These particles are very resistant and do not dissolve or diffuse through the sediments and are, therefore, of potential importance as specific indicators for fall-out of emissions from fossil fuel burning and industrial processes.

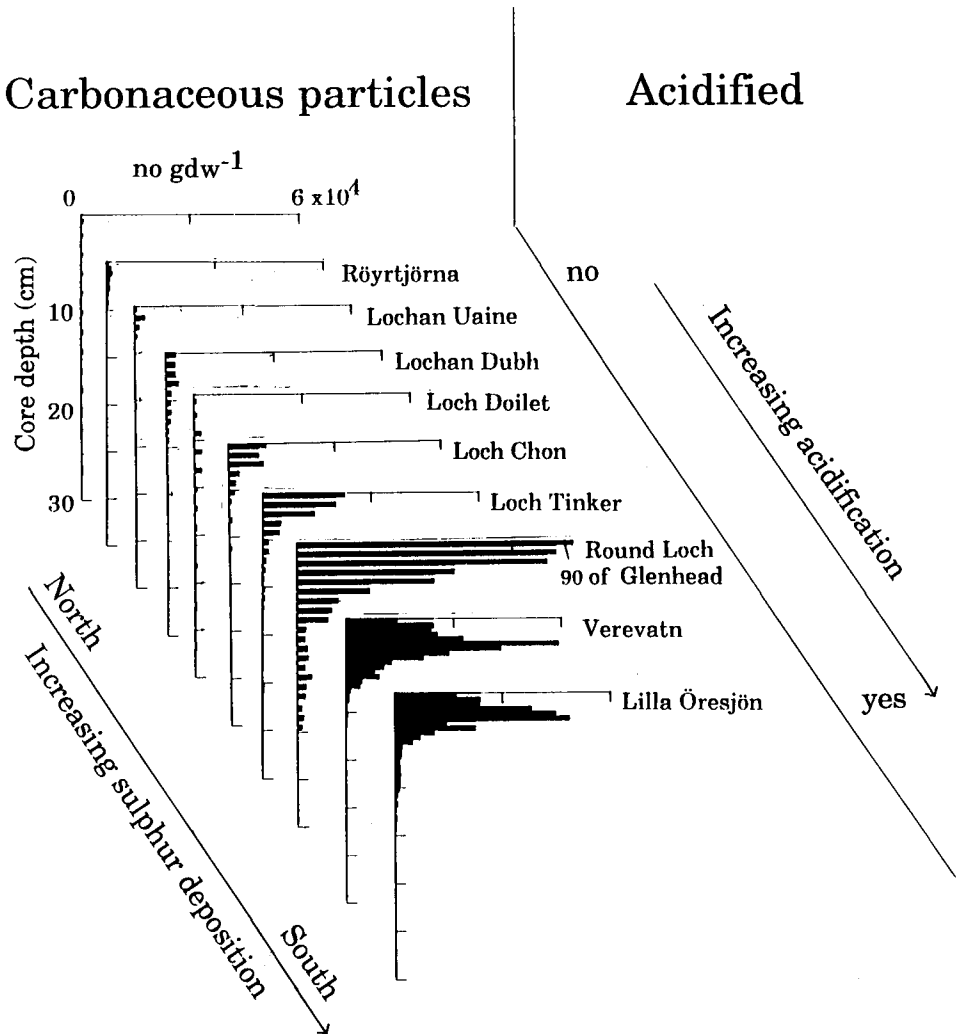


Fig. 2. Spheroidal carbonaceous particles in sediment cores from lakes in Scotland, Norway and Sweden. The lakes are arranged in order of increasing SCP concentration which is also the order of increasing atmospheric sulphur deposition and of the increasing rate of lake acidification (data from Wik & Natkanski (1990) and other papers in Battarbee *et al.* (1990)).

This presentation briefly summarizes the work we have done in our laboratory on spheroidal carbonaceous particles (SCP) derived from oil and coal burning. It comprises :

- a. Development of a method to count SCPs (Renberg and Wik, 1985b). Characterisation and quantification of fly ash is now progressing rapidly (see paper by Rose *et al.* , in this volume). Also, it might be possible to develop further light microscopical methods. Fig. 1 shows results from a North American lake where two different SCPs were distinguished using their light reflection properties as a character.
- b. The use of SCPs as markers in studies of how recent (post- 1950) sediments are distributed in basins of acidified and non-acidified lakes (Wik and Renberg, 1991).
- c. Studies of historical trends in the deposition of SCPs using sediment cores. Fig. 2 shows some characteristic features ; i) the time trend, with slightly increased deposition in the mid-19th century, a marked increase after World War II and decreased fall-out since the 1970's ; ii) the low concentrations of SCPs in clean regions and high concentrations in industrialized, polluted areas, and iii) the correlation between high SCP concentrations in sediments, indicative of high acid deposition, and the rate of acidification of the lakes.
- d. Geographical mapping of recent SCP fall-out from the atmosphere using surface sediment samples from lakes (Wik and Renberg, in press).
- e. Geographical mapping of the total historical SCP loading using soil samples (Wik and Renberg, 1987).

For more details see also Wik *et al.* (1986) and Renberg and Wik (this volume).

Ingemar RENBERG

Department of Ecological Botany
University of Umeå
S-901 87 UMEÅ, Sweden

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