On The Ecological Effects of Arctic Airborne Contaminants

Hotel Saga • Reykjavik, Iceland
October 4-8, 1993

ABSTRACTS

S.J. Christie and J. Martin, Editors
J.E. Mello, Administrative Associate

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THE ASSESSMENT OF LIGHT FOREST DEGRADATION BY TREE-RING ANALYSIS IN THE NORILSK INDUSTRIAL AREA

Stepan G. Shiyatov and A.P. Ivshin, Institute of Plant and Animal Ecology, Russian Academy of Sciences, 8 Marta Street 202, Ekaterinburg, Russia

A partial or total dying off of spruce-larch forests has been observed in the area of 0.55 million ha (data for 1988) in the zone around the Norilsk mining and metallurgical group of enterprises with sulfur dioxide emissions of more than 2 million tons per year. For the spatial-temporal evaluation of forest degradation, a death time of trees was estimated and an analysis of radial tree growth under the influence of natural and technogenic factors was made. It is shown that before the beginning of contamination, the variability of tree-width indices was determined mainly by the thermal conditions in June and July of the current year; in cool years and periods, the influence of July temperatures increases as compared with temperatures in June. The reduction in tree growth due to air pollution began in the mid-1960s, that is, nearly 15 years before the mass dying off of trees. At present, the difference between the actual and expected ring-width indices reaches 60–100%. The influence of pollutants on tree growth reduction has been observed at a distance of 170 km from the source of emission. As they grow, larch trees are more sensitive to pollution than spruce. To reduce the effect of pollution on forests, it is necessary first to diminish the emissions into the atmosphere that occur in July.

HEAVY METALS IN THE SOILS OF SØRKAPP LAND, SOUTHWEST SPITSBERGEN, AND SVALBARD

Stefan Skiba, Geographical Institute of Jagiellonian University, ul. Grodzka 64, 31-044 Krakow, Poland

Research on the occurrence of heavy metals (Pb, Zn, Cd) in the southern part of Spitsbergen is presented. This region is situated in the northwestern part of Sørkapp Land, which is a part of the Norwegian National Park on West Spitsbergen (Svalbard Archipelago). The soil cover of this region was formed on contemporarily nonglacialized seaside plains (Kulmstranda, Hornsundneset, Breinesflya, Tørrflya) and mountain slopes (Hohenlohefjellet, Iddfjellet, Wiederfjellet). Soils formed there are the arctic tundra variations of the cryogenic soils (Pergelic: Cryorthents, Cryaquepts, Cryochrepts, Cryofibrists). The quantity of the indicated heavy metals is as follows: Pb, ~4.30–39.83 ppm; Zn, 2.9–98.66 ppm; Cd, 0.14–0.66 ppm. The increased concentrations of those metals, especially zinc, is a concern in the soils of the Breinesflya seaside plains and the slopes of Wiederfjellet. Most likely, this results from the occurrence of those elements in bedrock (parent material) of these soils (fyllite of Heclas Hoeck formation, triassic dolomite). The concentration of heavy metals in other parts of the described region can be described as not being affected by the emission of industrial dust from air pollution.