The distribution of tritium in the Dnieper River

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With 1 figure in the text

Abstract

One of the main radioactive components of liquid outlets from nuclear power plants, tritium, is not contained in water-treatment systems and thus enters the environment. Tritium was determined in water from various locations in the Dnieper River cascade of six reservoirs, and in the river upstream and downstream, during 1992–1993. Major sources of tritium inputs were identified. The levels of tritium found in the Dnieper system are substantially lower than concentrations permitted by international drinking water regulations.

Introduction

Among the wide range of nuclear power development problems, the radioecological assessment of the impact of Nuclear Power Plants (NPPs) seems to be among the major ones.

The Dnieper is the third major river in Europe (after the Volga and the Danube). Its overall length nears 2200 km and the catchment area is 504,000 km². A substantial part of the river is located in the Ukraine, so the Dnieper is the principal waterway of the country. The river is of significant economic value and forms the Dnieper cascade of water reservoirs with six hydroelectric power stations. Besides that, four of the five Ukrainian NPPs are located within the Dnieper catchment area.

Tritium is the major radioactive component of emissions and discharges from NPPs, equipped with reactors that use either boiling water or pressurized water as a coolant and moderator for fast neutrons. The first type includes BWR reactors; the second type are PWR reactors and their VVER-1000 and VVER-440 analogues (the latter forms 80% of the Ukrainian overall reactor capacity).

The main concern of this study was to investigate tritium distribution and to locate major sources of tritium supply into the Dnieper and its system of water reservoirs.

Materials and methods

Tritium contents were determined in the Dnieper River upstream, in six reservoirs at Kiev, Kaney, Kremenchug, Dneprodzerzinsk, Zaporozhye and Kakhovka, and in the river downstream near Novaya Kakhovka and Kherson. Samples were taken from the scientific ship during the expedition.