

Tritium in the radioecological safety problem of Baltic Sea basin (Russia)

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Tritium is a radioactive form of hydrogen, used in research, fusion reactors and neutron generators. Tritium is present in water (liquid and vapor) as a result of natural processes in the atmosphere, as well as from fallout from past atmospheric nuclear weapons tests and the operation of nuclear reactors and fuel reprocessing plants. The form of most concern, tritium oxide (HTO), is generally indistinguishable from normal water and can move rapidly through the environment in the same manner as water. Tritium is naturally present in surface waters at about 10 to 30 picocuries per liter (pCi/L).

The expanding construction of nuclear industrial plants and nuclear power stations on the shores of the Baltic Sea is creating a real possibility for the introduction of radioactive wastes into the sea water and the waters of Baltic Sea basin (Ladoga Lake, St.Petersburg rivers). The problem is even more pressing because the Baltic Sea has limited water exchange with the ocean and is comparatively shallow. Tritium concentrations were measured for Baltic Sea waters and snow cover near shores of Russia, for Ladoga Lake water and for river waters of St.Petersburg city. This makes it possible to evaluate the background "global" level of tritium. A low-level liquid scintillation system Quantulus 1220 (Wallac, Turku, Finland) was used for measurements. The detector background is reduced by means of a passive shield (made of lead, cadmium and copper) and an active shield (based on a mineral oil scintillator) around the vial chamber. Low activity materials were used in its construction. Significant difference was observed on the distribution of tritium concentrations in different types of water and snow, the Baltic Sea water samples had higher concentrations and the average was about twice compared to that from the Ladoga Lake.

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The role of organic vapours in atmospheric aerosol formation and growth

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The formation of new atmospheric aerosol particles has been observed all around the world. The recent results show that organic vapours will participate effectively in initial steps of the growth and probably also in atmospheric nucleation process. The new results show that the atmospheric nucleation do occur at sizes around 1.5 nm as mobility diameter. Also recently developed instruments enables us to detect neutral clusters (sub 3nm or even sub 2 nm). A pool of clusters seems to exist all the time, and it seems to be connected with the emissions, concentration and chemical reactions of organic precursors. When investigating the growth of fresh aerosol particles, we can conclude that organic material is able to predict even over 95% of it.