

ABSTRACTS

POTENTIAL NITRIFICATION AND DENITRIFICATION OF AUTOMORPHIC AND HALF-HYDROMORPHIC SPODOSOLS

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The soils formed at different parts of meso-relief of a single agricultural field were studied for potential nitrification and denitrification. Quantitative contributions of each of the processes to the N₂O emission from the soils were studied in a laboratory experiment with disturbed soil samples.

It was found that nitrification was responsible for 3–15%, while denitrification resulted in 85–97% of the total N₂O emission from the studied soils.

Key words: nitrous oxide, nitrification, denitrification, meso-relief, automorphic and half-hydromorphic soils.

BIOLOGICAL PROPERTIES, TOTAL AND LABILE ORGANIC MATTER OF LOAMY-SAND SPODOSOL WITH MINERAL FERTILISER APPLICATION

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Biological properties as well as contents of total organic carbon and of the light fraction of soil organic matter were measured in a loamy- sandy Spodosol with mineral fertilizer application. The field experiment was conducted in 2007-2009 and contained plots with three treatments: control (no fertilizer), conventional system of fertilizer application and precision system of fertilizer application.

It was found that precision system of fertilizer application resulted in accumulation of light fraction of soil organic matter in the studied soil but had no significant effect on the total soil organic carbon content or the soil biological activity.

Key words: emission of carbon dioxide, denitrification, light fraction of soil organic matter, soil organic matter, loamy-sand Spodosol.

ESTIMATES OF CONSEALED RADIATION FROSTS FORMATION AND PROBABILITY

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The analysis of factors responsible for the process of consealed radiation frosts formation is given. The data used for the analysis were collected from the official Rosgidromet data for 1977-2010 for three meteorological stations in Leningrad region: Belogorka, Viborg and Tikhvin. A procedure for prediction of consealed frosts on the soil surface of agricultural fields was developed.

Key words: frost, consealed frost, radiation cooling, temperature of soil surface.

SHORT-TERM PREDICTION OF CONSEALED FROSTS

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The technique, related software and hardware are presented for consealed frosts forecasting on farmland. All kinds of possible frosts are considered. In the developed method they are presented

as images or classes to be recognized according to the forecast information of meteorological factors.

Key words: consealed frosts, computer program, forecast.

INCLUSION OF THE TIME, UNCERTAINTY AND RISK FACTORS INTO CALCULATIONS OF INVESTMENT EFFECTIVENESS IN SOIL MELIORATION

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The paper discusses different ways of time factor inclusion into the investment projects on soil melioration on arable lands including lands with precision agriculture.

The time factor inclusion into investment projects in the situation when the information about the land parameters is not full and requires also the inclusion of uncertainty and risk factors is also being discussed.

Key words: time factor, investments, uncertainty, risks, soil amelioration.

MODELING OF HYDROPHYSICAL PROPERTIES OF SOIL AS A CAPILLARY-POROUS MEDIUM AND MODIFICATION OF THE MUALEM-VAN GENUCHTEN APPROACH: THEORY

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Based on the concepts of capillarity and the long-normal distribution of soil pores' effective radii a theoretical substantiation for the function of soil differential moisture capacity (a relationship between reduced volumetric soil moisture content and capillary water potential) and its primitive function as a characteristic of soil water retention capacity is presented. Relative hydraulic conductivity of soil is calculated with usage of these functions and Mualem's approach. Hydro-physical parameters are interpreted and evaluated from some physical and statistical soil characteristics. The physically-based approximations for water-retention capacity and relative hydraulic conductivity is also proposed.

Key words: differential soil water capacity, soil water retention curve, hydraulic conductivity of soil, capillarity, lognormal distribution of effective pore radii.

HISTORY OF SOIL LIMING

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The paper presents a short review on the problem of soil liming in some countries. The main steps in soil liming history of England, Germany and Western Europe are given. Data on soil liming in Russia from 1917 until present time are provided. The need of agriculture in soil liming is highlighted.