БЪЛГАРСКА АКАДЕМИЯ НА НАУКИТЕ
НАЦИОНАЛЕН ИНСТИТУТ ПО МЕТЕОРОЛОГИЯ И ХИДРОЛОГИЯ

Application of the WAVE model to predict groundwater nitrate contamination

ПРИЛОЖЕНИЕ НА МОДЕЛА WAVE ЗА ПРОГНОЗИРАНЕ НА НИТРАТНОТО ЗАМЪРСЯВАНЕ НА ПОДПОЧВЕНИТЕ ВОДИ

Prof. Dr. Eng. Z. Diankov, Dr. Eng. O. Nicheva, Eng. S. Stefanova

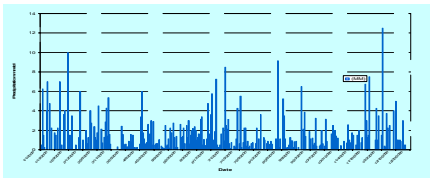
The theme is developed in the Institute of Water Problems (2008 –2010) in connection with Directive 98/83 of the European Union to work out standards in Bulgaria for preventing nitrate contamination of groundwater. How do crops partake in the rural areas balance?

- The WAVE (**W**ater and **A**grochemicals in soil, crop, and **V**adose **E**nvironment) model is one-dimensional mathematical model. It describes the vertical movement of water and nitrate substances in the unsaturated and saturated soil zones.
- The initial studies on the nitrate modeling process are directed to certain specific soil and climatic conditions in North Bulgaria.
- Variant results from simulations with numerical values of certain factors indicate the significance of these factors for the development of contamination processes.

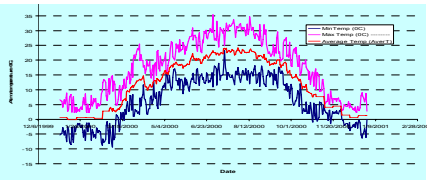
Information on the modeling of the soil profile

Soil type	Depth of the profile	Groundwater level	Porosity	Hydraulic conductivity	Dispersiviti	Culture	Planting Harvest
Chernozem	**4,00** m	Constant **1,25** m	**0,47**	**0,22** m/day	**0,08** m	Maize	15 May 30 October

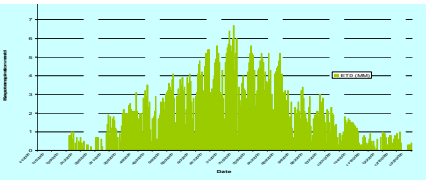
Average daily precipitation values



Change of temperature values

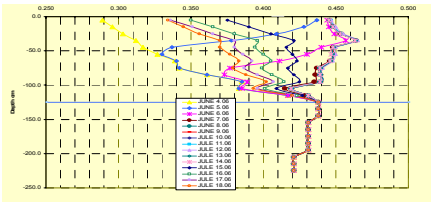


Daily potentional evapotranspiration

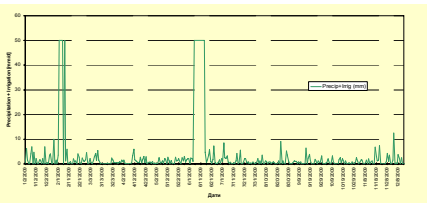


Movement of water in the soil profile

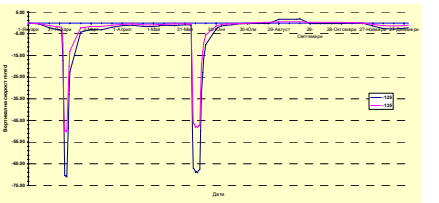
Change of volumetric soil moisture during the year



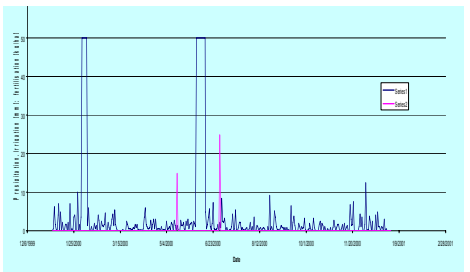
Atmospheric precipitation and irrigation



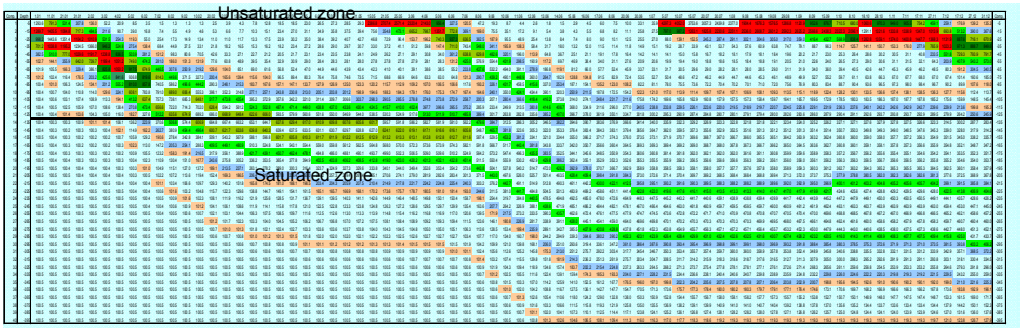
Vertical movement of water in the soil profile obtained during periods of saturation of the vadose environment



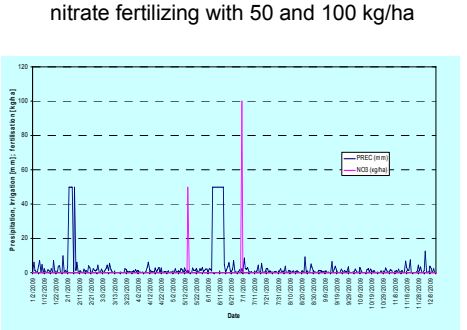
Simulation of precipitation, irrigation and nitrate fertilizing with 25 and 50 kg/ha



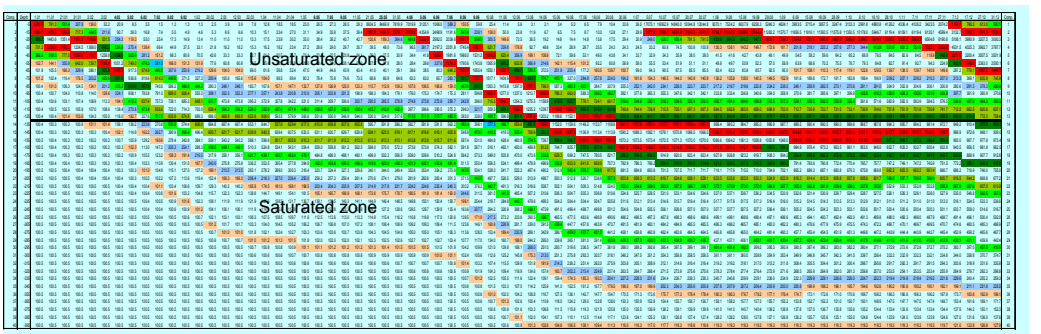
Change of the NO_3 concentration [mg/m^2/10cm] during a year. Doses of fertilizers 25 kg / ha and 50 kg / ha



Simulation of precipitation, irrigation and nitrate fertilizing with 50 and 100 kg/ha



Change of the NO_3 concentration [mg/m^2/10cm] during a year. Doses of fertilizers 50 kg / ha and 100 kg / ha



Results of the WAVE model application:

- **The propagation of nitrate concentrations in the saturated zone (groundwater) is modeled for both high and low fertilizer doses**
- **The distribution of the unused part of the nitrates in the saturated zone is delayed with time. This requires modeling for longer periods**