Geophysical Research Abstracts,
Vol. 11, EGU2009-4751, 2009
EGU General Assembly 2009

Pesticides in the Lake Kinneret basin: a combined approach towards mircopollutant management

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Lake Kinneret is the only large surface waterbody in Israel, supplying about 27% of the country's freshwater. Water quality in Lake Kinneret is of major concern and improving the ecological status of this large water body is now a national priority. While many studies in the past focused on nutrients inflows and phytoplankton dynamics, less research has been done on assessing the fate and pathways of micropollutants at semi-arid environments in common and Lake Kinneret in particular.

Since the watershed area of Lake Kinneret is used primarily for agriculture, it is important to evaluate the fate and dynamic transfer of organic micropollutants such as pesticides and herbicides in the watershed streams and in the lake itself.

This study introduces a combined concept of extensive measurements and modelling tools to observe and simulate the pesticide release chain (i) application – (ii) diffuse release to rivers – (iii) transport in the river – (iv) accumulation in the lake.

The available information regarding identification of application zones (i) and the amounts of used pesticides is based on stakeholders interviews, a survey of the different crop types and orchards and a comparison to sold amounts of the target pesticides (Melman and Bar-Ilan 2008). In the current research, a single field mass balance of pesticides is carried out to determine the field release to rivers (ii) by an extensive measurement campaign on the different compartments (soil, vegetation, atmosphere) and phases (water, air, solids) of a single field. The mass balance results in a release pattern of pesticide, which will be overtaken into the modelling approach. Transport of pesticides in rivers (iii) is modelled on the base of a recently developed stream network model for ephemeral streams (MOHID River), introducing important instream fate processes of pesticides and supported by six instream measurement stations of hydrological as well as pesticide data in the basin. To determine the final concentration of the pesticides in Lake Kinneret (iv) and therefore the drinking water reservoir, a lake model is fed by the stream network model outputs.

However, the most difficult part of the current risk management approach of water resources in the upper Jordan River basin is to produce reliable field data on the environmental fate of pesticides and to evaluate their impact on the local water supply.

The introduced combined approach aims at providing useful information and arguments for the decision making process and supporting water managers in revision of management strategies and planning of new infrastructure projects.