Geophysical Research Abstracts
Vol. 16, EGU2014-8812, 2014
EGU General Assembly 2014

Climate change impacts on risks of groundwater pollution by herbicides: a regional scale assessment

Karin Steffens (1), Julien Moeys (1), Bodil Lindström (2), Jenny Kreuger (2), Elisabet Lewan (1), and Nick Jarvis (1)

(1) Swedish University of Agricultural Sciences, Soil and Environment, Uppsala, Sweden (karin.steffens@slu.se), (2) Swedish University of Agricultural Sciences, Aquatic Sciences and Assessment, Uppsala, Sweden

Groundwater contributes nearly half of the Swedish drinking water supply, which therefore needs to be protected both under present and future climate conditions. Pesticides are sometimes found in Swedish groundwater in concentrations exceeding the EU-drinking water limit and thus constitute a threat. The aim of this study was to assess the present and future risks of groundwater pollution at the regional scale by currently approved herbicides. We identified representative combinations of major crop types and their specific herbicide usage (product, dose and application timing) based on long-term monitoring data from two agricultural catchments in the South-West of Sweden. All these combinations were simulated with the regional version of the pesticide fate model MACRO (called MACRO-SE) for the periods 1970-1999 and 2070-2099 for a major crop production region in South West Sweden. To represent the uncertainty in future climate data, we applied a five-member ensemble based on different climate model projections downscaled with the RCA3-model (Swedish Meteorological and Hydrological Institute). In addition to the direct impacts of changes in the climate, the risks of herbicide leaching in the future will also be affected by likely changes in weed pressure and land use and management practices (e.g. changes in crop rotations and application timings). To assess the relative importance of such factors we performed a preliminary sensitivity analysis which provided us with a hierarchical structure for constructing future herbicide use scenarios for the regional scale model runs. The regional scale analysis gave average concentrations of herbicides leaching to groundwater for a large number of combinations of soils, crops and compounds. The results showed that future scenarios for herbicide use (more autumn-sown crops, more frequent multiple applications on one crop, and a shift from grassland to arable crops such as maize) imply significantly greater risks of herbicide leaching to groundwater in a changing climate, and that these indirect effects outweigh the direct effects of changes in climate driving variables. Due to the large uncertainties in climate change impact assessments, drawing firm conclusions is not possible, but this type of analysis provides indications of likely future concerns and can be used as an early-warning tool to inform the general public, responsible public authorities and decision makers.