Geophysical Research Abstracts
Vol. 19, EGU2017-5504, 2017
EGU General Assembly 2017

New insights into agricultural pesticide pollution through a complete and continuous pesticide screening during one growing season in five small Swiss streams

Simon Mangold (1), Tobias Doppler (2), Simon Spycher (1), Miriam Langer (3), Marion Junghans (3), Manuel Kunz (4), Christian Stamm (1), and Heinz Singer (1)

(1) EAWAG, Environmental Chemistry, Duebendorf, Switzerland (christian.stamm@eawag.ch), (2) VSA Plattform Wasserqualität, Duebendorf, Switzerland , (3) Ecotox Center, Eawag, Duebendorf, Switzerland , (4) Federal Office for the Environment, Bern-Ittingen, Switzerland

Agricultural pesticides are regularly found in many surface waters draining agricultural areas. Due to large fluctuations in concentration over time and the potentially high number of pesticides, it is difficult to obtain a complete overview of the real pollution level. This collaborative project between research, federal and cantonal authorities in Switzerland aimed for a comprehensive assessment of pesticide pollution in five small agricultural streams to tackle this knowledge gap. The five streams are located in catchments (1.5 to 9 km^2) with intensive agriculture covering a wide range of crops including vegetables, vineyards and orchards. Twelve-hour composite samples were collected continuously from March until the end of August 2015 with automatic sampling devices, yielding 360 samples per site. Using precipitation and water level data, we differentiated between discharge events and low-flow periods. Samples from discharge events where measured individually whereas samples taken during dry weather were pooled for the analysis. This procedure resulted in a complete concentration profile over the entire monitoring period covered by 34 - 60 samples per site. The analysis, using liquid chromatography coupled to high resolution mass spectrometry involved a target screening of about 220 pesticides. The measured concentrations were compared to chronic and acute environmental quality standards (EQS values) resulting in risk quotients RQs, which are the ratios between measured concentrations and the respective EQS values.

Despite the small size of the catchments, we observed a large pesticide diversity in all of them with 68 to 103 detected compounds per study area. At all sites, chronic EQS values were exceeded. However, the exposure levels varied substantially among catchments. Maximum chronic RQs per site ranged between 1.1 and 48.8 and the duration of EQS exceedance varied between 2 weeks and 5.5 months. Additionally, the data reveal (very) high concentration peaks reaching up to 40 $\mu g\ L^{-1}$ for single active ingredients. Of 15 compounds measured at high concentrations, several measured concentrations exceeded acute EQS values in three of the five areas for a duration of up to 2.5 months.

Concentration peaks were often linked to discharge events but not exclusively. These findings demonstrate that rain driven processes were important causes of the observed concentration levels but that additional (possibly point) sources need to be considered for a comprehensive understanding of pesticide exposure. Overall, the results from these five catchments provide an unique insight into the diversity of pesticide pollution of small streams across a wide range of natural conditions in Switzerland. The spatial differences indicate that the intensity of pesticide use alone cannot explain the level of exposure but point to the influence of landscape characteristics such as topography, the connectivity of field to the stream network or the number of connected farmyards.