Effects of mitigation measures on nutrient loads in agricultural catchments in Norway

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We will present the analyses of long-term time series (9-16 years) of suspended particulate matter (SPM), nitrogen (N) and phosphorus (P) concentrations and loads from eight small (85 to 2830 ha) agricultural catchments in Norway. These analyses will be related to changes in agricultural management practices in Norway, such as reduced autumn-ploughing, catch-crops, constructed wetlands and nutrient application rates.

The studied catchments are part of the National Agricultural Environmental Monitoring Programme (JOVA) and represent the main agricultural production systems, and typical differences in soils, topography and climate in Norway. In-stream water quality data is monitored as volume proportional composite samples in combination with continuous water discharge data. In addition, detailed information on farming practices at field level (e.g., type of crops, fertilizer use, soil tillage) is given by farmers on an annual basis. For the two larger catchments information on farming practices is obtained from Statistics Norway (SSB). The trend analyses were performed using the non-parametric Partial Mann-Kendall test (PMK).

Implementation of mitigation methods were registered in some of the catchments. Results show a decrease in autumn ploughing in two of the catchments with high erosion risk and a decrease in nutrient application rate in catchments with the most extensive agricultural production. However, in two catchments with intensive agricultural production, nutrient application rates have increased during the monitoring period. Results from trend analyses of the in-stream monitoring data show (i) large differences in levels of losses between the catchments (ii) large interannual variability and (iii) few time-trends in losses. Few statistically significant upward and/or downward trends were detected which may be explained by the fact that the most effective mitigation measures were implemented before the monitoring periods, but can also be explained by changes in climatic conditions, such as changes in temperature and changes in precipitation and runoff patterns (e.g., frequency, intensity). In addition, the data demonstrate changes in farmer behaviour driven by economic incentives in combination with active extension services stimulating environmental friendly management practices. Besides this, we discuss the difficulty to relate a trend to a specific mitigation measure implemented in the catchment as well as the importance of trend analyses that take account for variations in discharge.