Geophysical Research Abstracts
Vol. 21, EGU2019-17275, 2019
EGU General Assembly 2019

The influence of weather extremes on nutrient loss to small agricultural rivers

Per-Erik Mellander (1), Gavan McGrath (1), Chris Fennell (1), and Phil Jordan (2)

(1) Department of Environment, Soils and Landuse, Teagasc, Johnstown Castle Environmental Research Centre, Wexford, Ireland (per-erik.mellander@teagac.ie), (2) School of Geography and Environmental Sciences, Ulster University, Coleraine, BT52 1SA, UK

Assessments of current weather extremes are useful to better understand potential future challenges to water management. Within the Irish Agricultural Catchments Programme N and P concentrations and river discharge are monitored sub-hourly in the river outlets of six catchments with intensively farmed land. Nine-years of monitoring have concurred with oceanic-scale weather changes and have captured a number of weather extremes. Particularly during the last hydrological year (Oct 2017 – Sep 2018) when Ireland experienced a series of events: i) "Hurricane Ophelia", ii) the wettest winter in 300 years, iii) atypically cold weather with snow in March ("Beast from the East" concurrent with "Tropical storm Emma") and iv) a summer drought. The influence of large-scale weather shift and short events on N and P loss to rivers was assessed, allowing for interpretation of the role of weather conditions expected in the near future.

Catchments of different typologies responded differently to the large-scale weather shift and to short-term weather extremes. Large-scale weather shifts could override the effects of local management, but a drought emphasised local activities during low flows. For example, in one catchment with mostly grassland, the incidental P loss caused by discrete dairy farmyard management was identified and quantified during the drought period. Furthermore, large flow events, caused by tropical storms, could offset the baseline conditions for both N and P flux and the effect was influenced by management, hydro-chemical controls and antecedent conditions. One catchment with mostly arable land on well drained soils, which is normally "N loss risky", lost 67% of its annual average total P loss during one large autumn rain event when soils were already saturated. Another catchment with mostly grassland on poorly drained soils, which is normally "P loss risky", reached its highest NO_3-N concentrations (13.6 mg/l) during one large flow event after a summer drought (annual average 2.6 mg/l).

A clearer understanding of how large-scale weather shifts and short-term weather extremes influence N and P loss differently in different catchment typologies is needed to reshape the thinking on future nutrient management. Such information is needed to facilitate targeted and effective mitigation measures.