Variability of phosphorus load from agricultural land in Czech Republic Part I: baseflow condition

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Should we reduce primarily point or non-point sources of phosphorus pollution? Crucial question of many managers is always answered in context of existing data and their interpretation. As well in Czech Republic in 2010´, where apparent decrease of TP concentration during last 20 years is recorded in rivers. In spite of improvement, many water bodies stay in risk not to meet good ecological status in 2015 (WFD) because of eutrophication. Gathering knowledge of amounts, impacts and desirable threshold of P load from point and non-point sources revealed agricultural land as a most uncertain P source. Moreover its relative amount is suspected to prevail in future.

Aim of the project is to describe unbiased P load from Czech agricultural land and evaluate its share on present stage of eutrophication. Load is described in terms of P quantity and bioavailability along with its flow, temporal, and spatial variability.

Firstly, flow conditions divide the task into two disparate *modi operandi*. Through incompatible impact, we value them separately (neither potential nor realized uptake is proportional to P emitted during erosion events, thus we exclude stormflow from this part).

Secondly, spatial variability in P load during baseflow conditions is characterized according to 11 dominant soil groups in macro-scale (158 one-shot summer samples over whole country in 2006). TP and SRP concentration in major soil groups (Cambisols, Chernozems, dystric Planosols and orthic Luvisols) were lower then mean of 0.069 and 0.038 $mg.l^{-1}$, respectively. Eutric Fluvisols, albic and albo-gleick Luvisols frequently far exceeded global median of SRP concentrations of 0.024 $mg.l^{-1}$. Although they cover < 10 % of Czech arable land they could be important source of bioavailable P. In addition, micro-scale variability is described by one example of eutric Cambisols, most extent soil group in Czech Republic. In ten profiles within one watershed, which diverge only in land-parcels structure and of course in crop, summer concentration of TP and SRP were 0.038 ± 0.012 and 0.021 ± 0.010 $mg.l^{-1}$, respectively.

Thirdly, temporal variability in P load during baseflow conditions is characterized by seasonality of instantaneous load (monthly sampling of cca 30 profiles) and interannual variability of specific yield (15 headwaters during 2007-2009). Annual specific yields of TP are estimated at range at 1-20 $kg.km^{-2}$ of agricultural land. While highest P loads (0.2 $mg.s^{-1}$) are regularly realized after snowmelt or within long lasting rain periods, highest concentrations are reached during summer months, conversely. But only summer maxima at about ⅓ of profiles exceeded 0.035 $mg.l^{-1}$ SRP.

We conclude, with respect to threshold for eutrophic water, 0.035 $mg.l^{-1}$ BAP, that summer load from agricultural land during baseflow (it unable continuous algal succession) do not afford large capacity for downstream wastewater dilution, but alone cannot hold up persistent blooms. Now first statewide monitoring of exclusively agricultural headwaters is done in Czech Republic. P load during baseflow conditions is comprehensively summarized. Finally, it will help to find appropriate measures in water bodies across the country. Assessment of P from erosion will follow with emphasis on conditions surrounding soil particles during in-stream transport (*i.e.* different delivery of size fractions and their saturation/equilibrium concentration with regard to surrounding water incl. discharged wastewaters) and conditionally delayed P release from riverine or lake sediment.