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Interrill erosion of carbon and phosphorus from conventionally and organically farmed Devon silt soils

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Conventionally, most erosion models assume similar soil and sediment Carbon content. This may be the case for erosion (not deposition) by rill processes, but does not apply to interrill erosion. Globally, between 0.57 and 1.33 Pg of soil organic carbon (SOC) may be affected by interrill processes. Also, a significant amount of phosphorus (P) is contained in the surface soil layer transformed by raindrop impact, runoff and crust formation. In the EU, the P content of a crusted (2 mm) surface layer corresponds to 4 to 40 kg ha-1 of P on arable land (1.094 mil km2). Therefore, the role of interrill processes for nutrient cycling and the global carbon cycle require close attention, especially to assess the potential of soil management as a tool for reducing nutrient and C losses. In this study, the P and organic C content of sediment generated from two Devon silts under conventional (CS) and organic (OS) soil management were examined. Artificial rainfall was applied to the soils using a high and a low rainfall intensity to determine the effects of rainfall kinetic energy on the P and C enrichment in interrill sediment. Erodibility of the OS was lower than on the CS and sediment from both soils showed a significant enrichment in P and C compared to the eroding soils. Surprisingly, sediment from the OS displayed a much greater degree of P and C enrichment than CS sediment. This shows that the net P and C export from organically farmed soils is not reduced by a similar degree than soil erosion compared to conventional soil management. Consequently, the nutrient and C status of sediments cannot be predicted based on P content, SOC or interrill erodibility alone. Clearly, further experimental research on crust formation and the composition of fragments generated by aggregate breakdown and their transport in raindrop impacted flow under different rainfall conditions is required. Attaining this critical missing knowledge would enable the development of a comprehensive model for assessing the benefits of organic farming on nutrient budgets, off-site effects of interrill erosion and its role in the global C cycle. A challenge to be dealt with is the proper trade-off between basic research experiments on erosion, transport and deposition of sediment