

B41D-1986: Flocculation of organic carbon from headwaters to estuary – the impact of soil erosion, water quality and land use on carbon transformation processes in eight streams draining Exmoor, UK

Thursday, 14 December 2017

08:00 - 12:20

📍 *New Orleans Ernest N. Morial Convention Center - Poster Hall D-F*

Flocculation of dissolved organic carbon (DOC) in streams and rivers is a process that contributes to the pool of particulate organic carbon (POC) in the aquatic system. In low-energy waters the increased sedimentation rates of this higher-density fraction of organic carbon (OC) makes POC important in allocating organic carbon into limnic storage, which subsequently influences emissions of greenhouse gases from the continental environment to the atmosphere.

Allochthonous OC, derived from the terrestrial environment by soil erosion and litterfall, import both mineral aggregate-bound and free OC into freshwaters, which comprise carbon species of different quality and recalcitrance than autochthonous in-stream produced OC, such as from biofilms, aquatic plants and algae. Increased soil erosion due to land use change (e.g. agriculture, deforestation etc.) influences the input of allochthonous OC, which can lead to increased POC formation and sedimentation of terrestrial OC at flocculation boundaries in the landscape, i.e. where coagulation and flocculation processes are prone to occur in the water column.

This study investigates the seasonal variation in POC content and flocculation capacity with respect to water quality (elemental composition) in eight river systems (four agricultural and four wooded streams) with headwaters in Exmoor, UK, that drain managed and non-managed land into Bristol Channel. Through flocculation experiments the samples were allowed to flocculate by treatments with added clay and salt standards that simulate the flocculation processes by 1) increased input of sediment into streams, and 2) saline mixing at the estuarine boundary, in order to quantify floc production and investigate POC quality by each process respectively.

The results show how floc production, carbon quality and incorporation (e.g. complexation) of metals and rare earth elements (REE) in produced POC and remaining DOC in solution vary in water samples over the season and how these are related to different flocculation processes and affected by land use. This study improves our understanding on OC flocculation dynamics on a local catchment scale and how POC fate is affected by changed water quality in streams perturbed by land use change.

Plain Language Summary

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