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Impact of sediment resuspension in coastal and shelf seas on macronutrient exchange across the sediment-water interface

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Benthic-pelagic exchange processes are recognised as important nutrient sources in coastal and shelf sea areas, particularly so in estuarine environments; however, the relative impact of sediment resuspension is still poorly understood. Elevated concentrations of suspended sediments resulting from natural (waves, storm events) and anthropogenic (trawling) events have the potential to be a key factor in regulating the amount of primary production in coastal and shelf seas. A number of research projects funded by NERC have started to evaluate the effect of sediment resuspension on nutrient fluxes at a number of UK locations including estuarine, coastal and shelf seas.

Physical and chemical data were measured during resuspension experiments on a range of sediment types in the Southern North Sea, Celtic Sea and Christchurch Harbour. In-situ (Voyager II benthic annular flume) on deck (core Mini-flume) and laboratory (mini-flume) experimental approaches were employed to elucidate the extent of dissolved macronutrient release from a number of sediment types ranging from cohesive mud to permeable sands. The resuspension of benthic fluff in coastal seas led to significant releases of phosphate and nitrate to the water column whilst resuspension of the sediment bed increased water column concentrations of dissolved silicon by as much as 125% and phosphate and nitrate concentrations by up to 66% and 67% respectively. However, initial results in the Celtic Sea have shown quite varied results with no significant inorganic nutrient releases from the cohesive sediment sites.

These initial findings indicate location, season and sediment type influences the extent of nutrient and particulate organic carbon release into the overlying water column, dependent on the depth of erosion. These studies suggest that sediment resuspension effects should therefore be considered in ecosystem models of benthic nutrient supply as it may be a major pathway in resupplying the water column with nutrients.