

Abstract

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Recycling and removal of nitrogen has been studied in sediments of one deep-sea and four contrasting continental margin environments. Particulate organic nitrogen deposited on the sea-floor undergoes degradation forming dissolved organic nitrogen (DON). The DON can be further mineralized to a range of different inorganic forms of nitrogen. Measurements of benthic fluxes of ammonium, nitrate, nitrite and nitrogen gas has been performed in situ using benthic landers. These investigations have been done at the Porcupine Abyssal Plain (NE Atlantic), in the Skagerrak, in the Gulf of Finland and in the Aegean Sea. In the White Sea benthic solute fluxes were measured by sediment-water incubations in the laboratory. Benthic fluxes have also been calculated from pore water concentration gradients.

When working at great water depths it is important to do measurements in situ. If sediment samples are brought to the surface the pore water concentration in the uppermost sediment will be enriched with e.g. dissolved organic carbon and nitrogen, ammonium and carbohydrates. This is due to cell lysis, occurring when cells are exposed to drastic changes in temperature and pressure, causing the cell content to leak out in the pore water. To overcome the problem with bursting cells pore water can be sampled in situ with e.g. gel probes. This method for pore water sampling has been compared to the conventional technique for pore water sampling in which a sediment core is sliced and the sediment centrifuged to obtain the pore water. The two methods, which were applied on a coastal sediment, measure on different spatial scales with the gel probe having a higher resolution.

The different seas investigated are variable with respect to e.g. temperature and oxygen concentration in the bottom water. They are also subject to different loads of organic matter to the sea floor. The relative importance of processes recycling fixed N (hydrolysis, ammonification, nitrification, dissimilatory nitrate reduction to ammonium (DNRA)) versus processes removing fixed N (anammox, denitrification, burial) has been evaluated. The fate of the deposited material is dependent on whether its origin is marine or terrestrial and also on the sediment accumulation rate and the oxygen exposure time.

Keywords: benthic fluxes, nutrients, DON, nitrogen, sediment, recycling, removal, burial, autonomous landers, sampling artifacts, deep sea, continental margin, Porcupine Abyssal Plain, Skagerrak, Gulf of Finland, White Sea, Aegean Sea

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