

Methane and nitrous oxide in tidal estuaries

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Estuaries contribute significantly (5-10 %) to the marine emission budget of methane and nitrous oxide. During the BIOGEST project we have measured the distribution of these two gases in the water column of nine tidal estuaries.

In well-mixed estuaries, methane concentrations were high in the river end-member and initially decreased with increasing salinity, then increased at intermediate or high salinities before decreasing again going offshore. Tidal flats and creeks were identified as a methane sources to estuarine waters. Methane concentrations in river-dominated stratified estuaries were rather erratic.

Nitrous oxide concentrations were always above atmospheric saturation levels and showed consistent and systematic relationships with distribution patterns of oxygen, ammonium, nitrite and nitrification activities. Nitrous oxide concentrations were very high in ammonium-rich and oxygen-depleted systems such as the Scheldt and Thames estuaries. Nitrous oxide concentrations were also high in the suboxic zone of fluidised mud systems of the Gironde estuary. If time permits, we will show laboratory results for nitrous oxide production in Scheldt water and we will speculate on the role of sediment versus water-column processes.