Ammonium Dynamics In Tidal Salt Marshes

-An experimental study of ammonium adsorption, tidal flushing and ammonia volatilization

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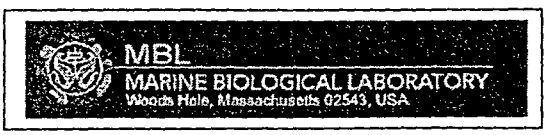

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Abstract (English)

In this study ammonium dynamics in tidal salt marshes was studied focusing on processes, such as ammonium adsorption, tidal flushing of ammonium and ammonia volatilization, which can affect the exchange of ammonium between the salt marsh, the adjacent water masses and the atmosphere.

The study showed that inundation of salt marshes at high tide could have significant effect removing ammonium from the sediment, but that removal of ammonium did not always occur. In the situations where ammonium was removed, the ammonium lost from the sediment could not be found in the inundating water and was potentially taken up by salt marsh primary producers. Hence ammonium was primarily cycled internally in the sediment and exchange of ammonium between the salt marsh and estuary did not seem to play an important role for the ammonium dynamics in the sediment.
Due to low pH and low pore water concentrations of ammonium caused by a high ammonium adsorption affinity in the top sediment, ammonia volatilization was not an important factor exporting ammonium from the salt marsh sediment.
The ammonium adsorption affinity of the sediment did not prevent ammonium from being removed during tidal inundations. When removal of ammonium was measured in the field, 80% of the removed ammonium originated from the pool of adsorbed ammonium.

The ammonium adsorption equilibrium in the sediment was studied in laboratory experiments, where the sediment surface was air-exposed for 24 hours at 10°C and 25°C, respectively.
No significant effect of air-exposure could be shown, however, in the deeper sediment layers (>6cm) a temperature effect was shown. The ammonium partitioning coefficient (K_d) expressing the ratio between adsorbed and dissolved ammonium was 3 times higher at 10°C than K_d at 25°C.

It was generally concluded that tidal inundations can result in an internal cycling of ammonium in the salt marsh and that loss of ammonium from the salt marsh sediment in that case is minimal.

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