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# Transport processes in intertidal sand flats

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Methane rich sulfate depleted seeps are observed along the low water line of the intertidal sand flat Janssand in the Wadden Sea. It is unclear where in the flat the methane is formed, and how it is transported to the edge of the sand flat where the sulfidic water seeps out. Methane and sulfate distributions in pore water were determined along transects from low water line toward the central area of the sand flat. The resulting profiles showed a zone of methane-rich and sulfate-depleted pore water below 2 m sediment depth. Methane production and sulfate reduction are monitored over time for surface sediments collected from the upper flat and seeping area. Both activities were at 22 C twice as high as at 15 C. The rates in sediments from the central area were higher than in sediments from the methane seeps. Methanogenesis occurred in the presence of sulfate, and was not significantly accelerated when sulfate was depleted. The observations show a rapid anaerobic degradation of organic matter in the Janssand. The methane rich pore water is obviously transported with a unidirectional flow from the central area of the intertidal sand flat toward the low water line. This pore water flow is driven by the pressure head caused by elevation of the pore water relative to the sea surface at low tide (Billerbeck et al. 2006a). The high methane concentration at the low water line accumulates due to a continuous outflow of pore water at the seepage site that prevents penetration of electron acceptors such as oxygen and sulfate to reoxidize the reduced products of anaerobic degradation (de Beer et al. 2006). It is, however, not clear why no methane accumulates or sulfate is depleted in the upper 2 m of the flats.