



Mud current ripples in the Toarcian organic-rich succession of the Dutch Central Graben: implications for environmental interpretations of oceanic anoxic events

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A petrographic and geochemical study was carried out using Posidonia Shale Formation (Lower Toarcian) black shale samples from two wells located offshore The Netherlands in the Dutch Central Graben. This formation is a lateral equivalent of Toarcian black shale successions found elsewhere in the world and constitutes the local lithological expression of the Toarcian oceanic anoxic event (T-OAE). The studied black shales exhibit a variety of depositional fabrics, sedimentary structures and textures that indicate dynamical energetic conditions at the time of their deposition and varying benthic oxygenation. The studied black shales have mostly been deposited by bottom currents rather than by settling from suspension. These observations are in contrast with the traditional interpretation of the deposition of Lower Toarcian black shales as having taken place under a stagnant, anoxic water column via suspension settling. The petrographic study of black shales complements geochemical data and sheds new light on the environmental conditions prevailing on the muddy epicontinental shelf of northwest Europe during the Toarcian oceanic anoxic event.