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Facies associations in the interaction zone of coastal and fluvial sedimentation - Holocene Rhine-Meuse Delta (The Netherlands)

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The Holocene Rhine-Meuse delta in the Netherlands covers 5700 km^2 and is the densest investigated delta in the world. At Utrecht University a dataset containing approximately 220000 lithological borehole descriptions and 1800 radiocarbon dates is available, as well as laser altimetry-based high-resolution digital elevation models and delta-wide palaeogeographical reconstructions. This allows to study the Holocene delta evolution in great detail, to pin-point the many interacting processes that influenced it, and to quantify at which rate and for how long these processes were operating.

Where earlier sedimentary studies focused on dynamics of fluvial or the coastal depositional systems seperarely (avulsing river channels, prograding and retrograding beach barriers), this study targets river channels in direct vicinity of the North Sea, in particular a major Holocene Rhine branch that traversed tidal lagoon and coastal barrier. During the Holocene the Rhine discharged through several branches into the North Sea. We focus on one of these branches (‘Oude Rijn’, Utrecht-Alphen-Leiden-Katwijk-North Sea, $\sim$40 km). This channel carried the main drainage of the river from $\sim$6000 years ago (5595 ^{14}C BP) until roman times (2000 years ago). It has naturally silted up until humans dammed the residual channel in the 11^{th} century AD. In the up-

stream part of the Rhine-Meuse delta avulsions are the key mechanism explaining the distribution of facies, but in our downstream area essentially no avulsions occurred in the last 6000 years. In fact, the studied channel belt functioned for over 4500 years – in the Rhine-Meuse delta this is exceptionally long – despite many upstream avulsions which caused channels to branch off time after time. Presumably the stability is due to interaction of fluvial and coastal sedimentary processes: we aim to reveal in what way.

Detailed lithologic cross-sections reveal the spatial distribution of different depositional environments. The sandy Pleistocene subsurface gently slopes towards the west, to depths of 13-15m below present sea level at the coast. The base of the Rhine channel (fine to medium sand) cuts into these deposits. Overbank deposition occurred in a relative narrow zone along the river (clayey levees), whereas peat dominate the adjacent floodbasins. The upstream part of the reach through the lagoon (Utrecht-Alphen), has a larger clayey levee than the downstream part (Alphen-Leiden). In the latter reach, the surrounding lagoonal facies is comparable to the present Wadden Sea. Numerous tidal creeks and crevasses divert from the main channel into this area. Currently we are dating the various river and tidal deposits to enhance the palaeogeographic reconstruction, aiming to reveal whether the ‘wadden lagoon’ and the ‘tidal crevasses’ are simultaneous or subsequent features.