

Assessment of a Re-processed GPR Data in the Distal Part of Trandum Delta in Southern Norway

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Abstract

The study focused on the geometry and the depositional history of the Trandum delta, 40 km north of Oslo, the largest unconfined Quaternary aquifer in Norway and a part of the Gardermoen ice contact delta. The depositional mechanisms that built up the ice-contact Gardermoen delta earlier referred to the Hauerseier delta that are quite diverse and make the delta system complex. The characterization of the distal part of the Trandum delta was based on the interpretation of the ground penetrating radar (GPR) data. A grid of 69 GPR profiles was collected using a 50 MHz antenna. 17 profiles were re-collected using a 25 MHz antenna in order to try reaching bedrock. The GPR data were recorded as a single-fold, fixed-offset reflection profiles, except for three common depth point (CDP) gathers recorded for velocity analysis. Both the 50 and 25 MHz data have been processed mainly for attenuation removal, filtering, gain enhancement and velocity analysis in Reflexw. Furthermore, migration and fk-filtering have been tested in some profiles. The processed 50 MHz records provided a maximum depth of 26 m. The 25 MHz data did not image the bedrock and the maximum penetration depth was less than 40 m. This result is ascribed to the existence of clay rich sediments at depth and to a low S/N ratio. The GPR interpretation was tied to the sedimentary log of well G21 located 120 m east of the study area. Three main reflectors were identified and interpreted as the soil surface, groundwater table, and the base of a prominent foreset unit. Several time-structure maps were created of the unsaturated and the saturated zones revealing an anticlinal structure that was interpreted as a mouth bar structure. Other imaged sedimentary structures were observed as buried channels, onlap sequences and fault evidences. The mouth bar structures indicate rapid changes in feeder directions. The rapid outbuilding of the huge Trandum delta during 70 years suggests an extreme supply of sediments. The vertical thickness of the unsaturated zone increased westwards.