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Tracing 100 years of morphological development of the Sankt Peter-Ording sand, a barrier beach system in the North Frisian Wadden Sea.

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Sankt Peter-Ording is the only mainland beach system of the Wadden Sea between Den Helder in the Netherlands and Blåvandshuk in Denmark. The initiation and morphological evolution of this barrier system was reconstructed based on historical sea charts and literature. It was documented how a narrow Sankt Peter-Ording sand bar first appeared between 1920 and 1925. In the 1960's a second bar attached to the north end and fully merged around 1994. Since its arrival the shoreline has been moving landward, permanent foredunes (today as high as 10m) have formed since the 1970's and a salt marsh has formed behind the barrier. Early mapping campaigns show that the beach has grown over three times in area from approximately 4sq. km in 1943 to 12 sq. km in 2016. The retreat of the central beach is accompanied by accumulation along the Northern and Southern heads of the beach. The landward movement of the central beach is ~7m/a, while the north head has been growing at ~25m/a in the northerly direction. Extensive accumulation was identified in the South head of the beach, which moved ~2km in the SE direction since 1949 and roughly 400m in width. Coast parallel bedforms in the foreshore and at the south head of the beach ranged from 50-300m in length. Analysis of foreshore bathymetry reveals a prevalent SE direction of sediment movement. A foreshore bar system and channel have been moving at an average celerity of ~30m/a in the S-SE direction. Schematic spatial impression on the sediment transport pathways of the system is evaluated from the morphological development.