Sandbar, beach and dune: How do they connect?

Introduction

Seemingly straight coasts, such as the Holland coast, may contain alongshore variations in beach width and dune morphology. The origin of this alongshore rhythmicity stretching across the sandbar-beach-dune system is not reflected in our current understanding of the underlying processes. Existing studies indicate that sandbar patterns may lead to alongshore variations in wave attack during storms (Figure 1a). In addition to this erosive interaction, we hypothesize that sandbar patterns lead to alongshore variations in accretion of the beach-dune system in between storms, providing an alongshore-variable buffer against wave attack during storms (Figure 1b).

We hypothesize that sandbar morphodynamics induces alongshore-variable beach-dune recovery by means of morphological features, called Shoreward Propagating Accretionary Waves.

Mechanism for bar-beach-dune interaction

Shoreward Propagating Accretionary Waves

ARE

Natural nourishments
THAT
Emerge from sandbars
Migrate onshore
Merge with the intertidal beach

CAUSING ALONGSHORE-VARIABLE ...

• beach width
• source of sediment for wind-blown transport
• embryo dune development
• buffer against wave attack

Research approach

3 themes

Subaims

1: SPAW behaviour
   a. Characterize initiation and migration
   b. Elucidate governing processes

2: Beach impact
   a. Reveal SPAW-impact on intertidal beach
   b. Elucidate redistribution processes

3: Dune response
   Quantify alongshore-variability in embryo dune growth and persistence

Methods

Jetki surveys
Quasi-3D model
Argus video
Laser scanner
JarKus elevations

Field sites

Observations worldwide

Application

What can we learn from these natural nourishments to optimise nourishment policy?

Can we stimulate dune dynamics at SPAW-affected beaches?