



**Faculty of Geosciences** Physical Geography

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# 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).

## **Erosive interaction**



### **Accretive interaction**



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

Figure 1 Alongshore variability coupled to alongshore variations in (a) wave attack (Le Truc Vert, FR) and (b) beach-dune accretion (The Gold Coast, AUS).

# **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



Figure 2 Planview (left) and oblique time-exposure video image (Argus) from Egmond aan Zee (NL)

# **Research approach**

## 3 themes







**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



Argus video



# Application



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



Can we stimulate dune dynamics at SPAW-affected beaches?

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