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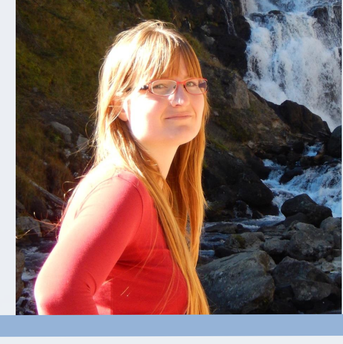

Determining characteristics of sand strips on a narrow beach by using video monitoring

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Introduction

Wind can transport sand from the beach towards the dunes. The transported sand can form zebra-like stripes, which are known as sand strips. They are common bedforms in wet aeolian systems, but their characteristics and dynamics are not well understood. They might provide insight about which wind conditions and beach characteristics result in high aeolian transport rates. This is important for narrow beaches, where many potential transport events do not result in actual events.

Goals

- Characterise sand strips from video imagery, focussing on their wavelength and migration velocity.
- Study the dependence of these characteristics on wind velocity and direction.

Used data

- Argus images from the Coast3D tower at Egmond aan Zee (2005-2010).
- KNMI weather data from de Kooy.

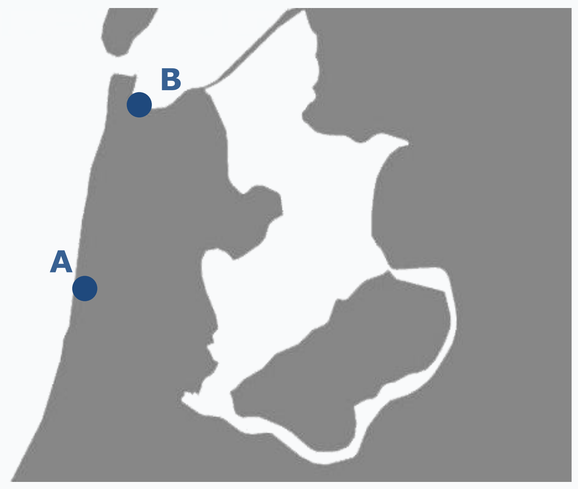

Figure 1: Location of the Argus tower at Egmond aan Zee (A) and the weather station in de Kooy (B).

Methodology

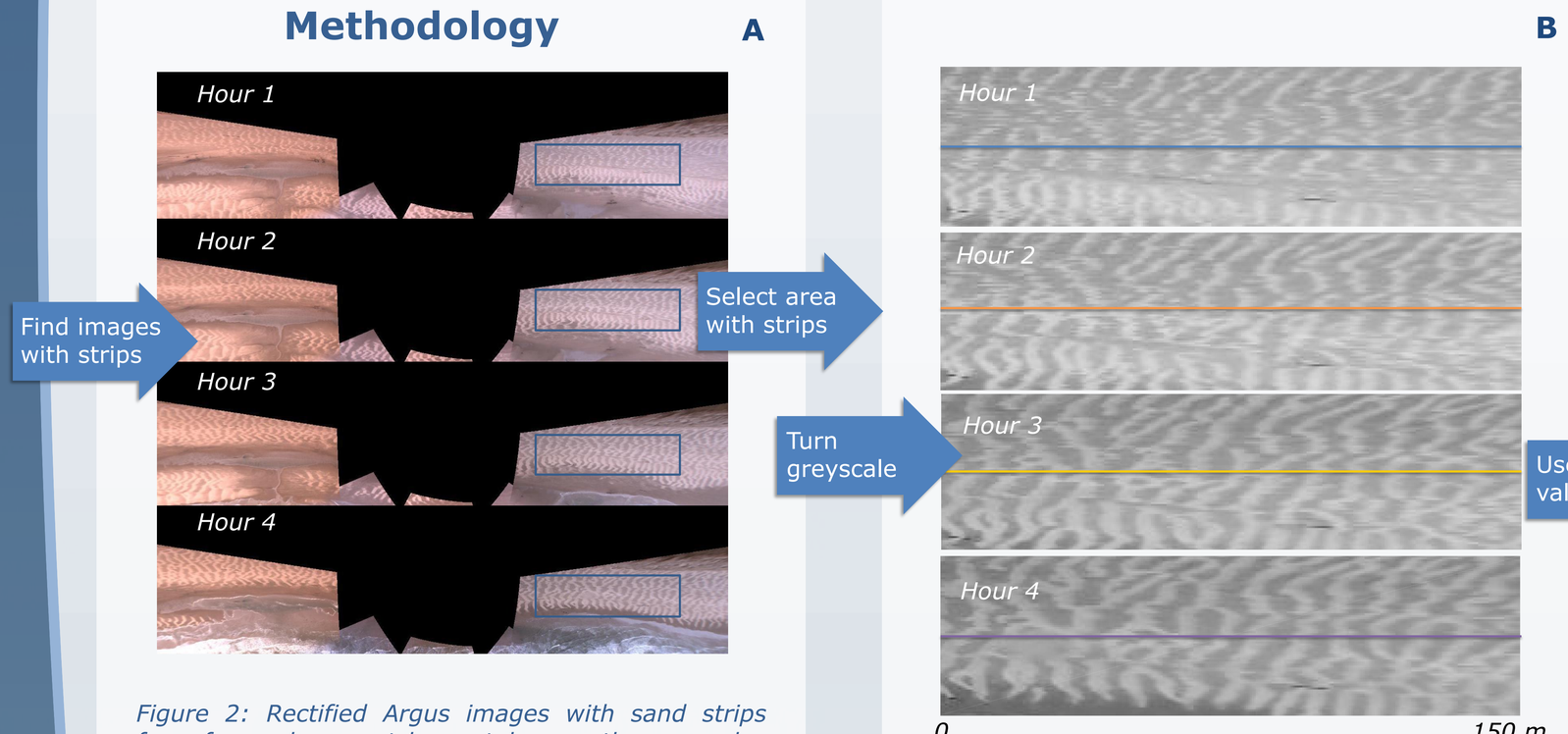

Figure 2: Rectified Argus images with sand strips from four subsequent hours taken on the same day (01-04-2008). Dataset consists of multiple days showing aeolian transport.

Greyscale cutouts of the images in figure 2A (area in blue rectangles).

The sand strips create a sinusoid pattern in the pixel values (lines in figure 2B, zoomed in), where high values correspond to light colours. Cross-correlation was used to determine the wavelength of the pattern and how much the signal had shifted through time. This was done for all pixel rows in all images.

Results

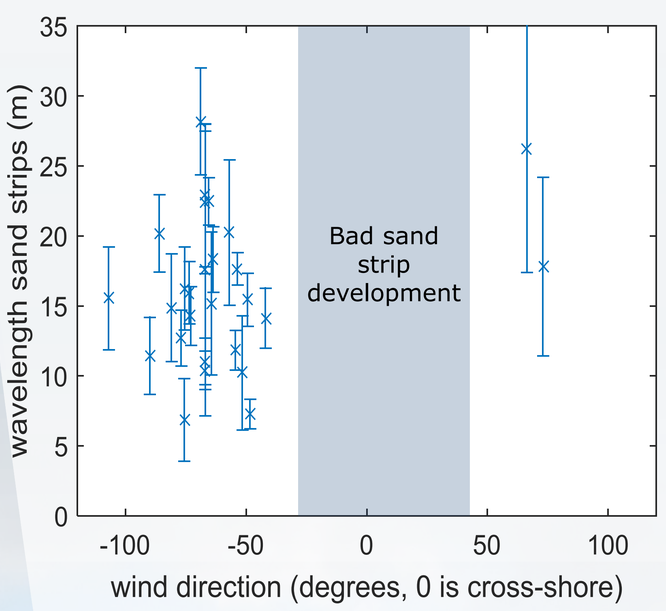

Figure 3: Wavelength (A) and migration velocity (B) of sand strips against wind direction with error bars. Each datapoint represents one day with sand transport.

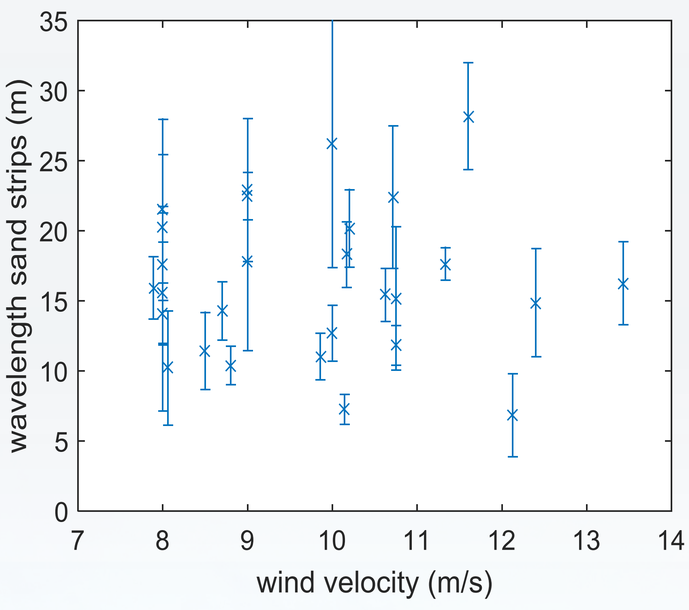

Figure 4: Wavelength (A) and migration velocity (B) of sand strips against wind velocity with error bars. Each datapoint represents one day with sand transport.

Conclusion and discussion

Goal 1: Characteristics sand strips

- Formation starts at wind velocities ≥ 8 m/s.
- They appear first most often in front of the dunefoot.
- Sand strips develop well when the wind is alongshore.
- They form only on relatively broad beaches (low tide).
- Mean migration velocity = 7.6 m/h.
- Mean wavelength = 16.4 m.

Goal 2: Dependence on wind velocity and direction

No clear relationship was found between wind direction or wind strength and characteristics strips.

Some outliers are visible in figure 4A, which do not show realistic values for the migration velocity. A weak relationship exists if these outliers are ignored.

Future research:

Study the cross-shore width of the area sand strips cover and how beach width affects the characteristics of sand strips

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