Ludwig-Franzius-Institute
for Hydraulic, Estuarine and
Coastal Engineering

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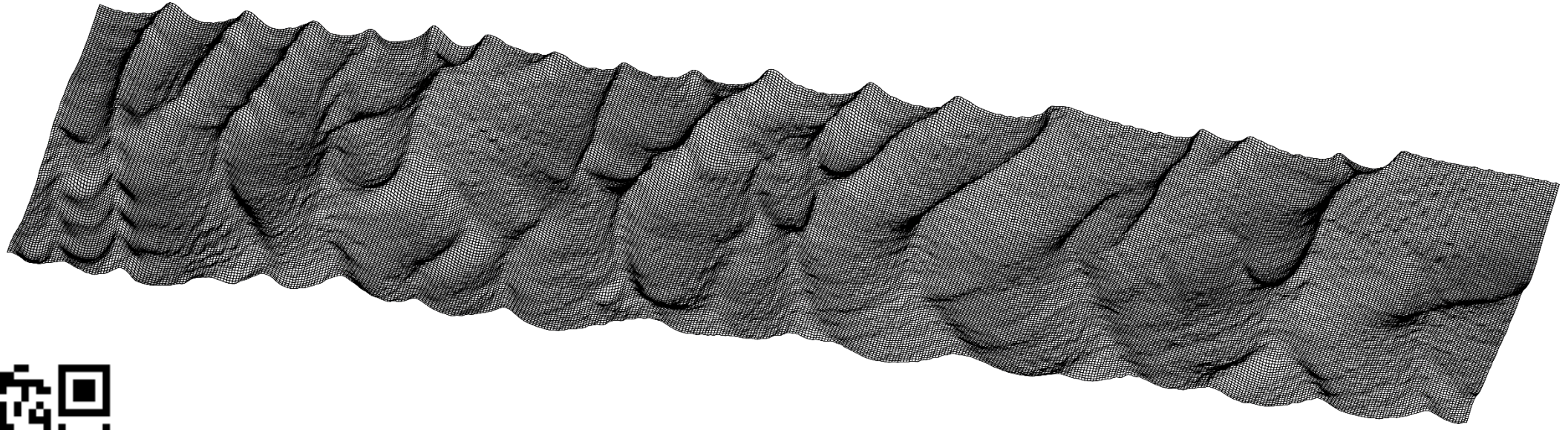
Applying PIV algorithms to understand the dynamic behaviour of tidal compound dunes



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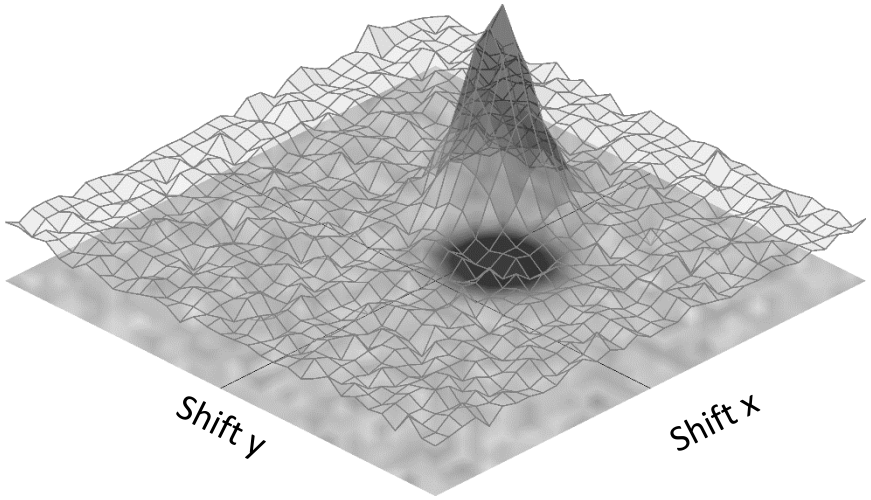
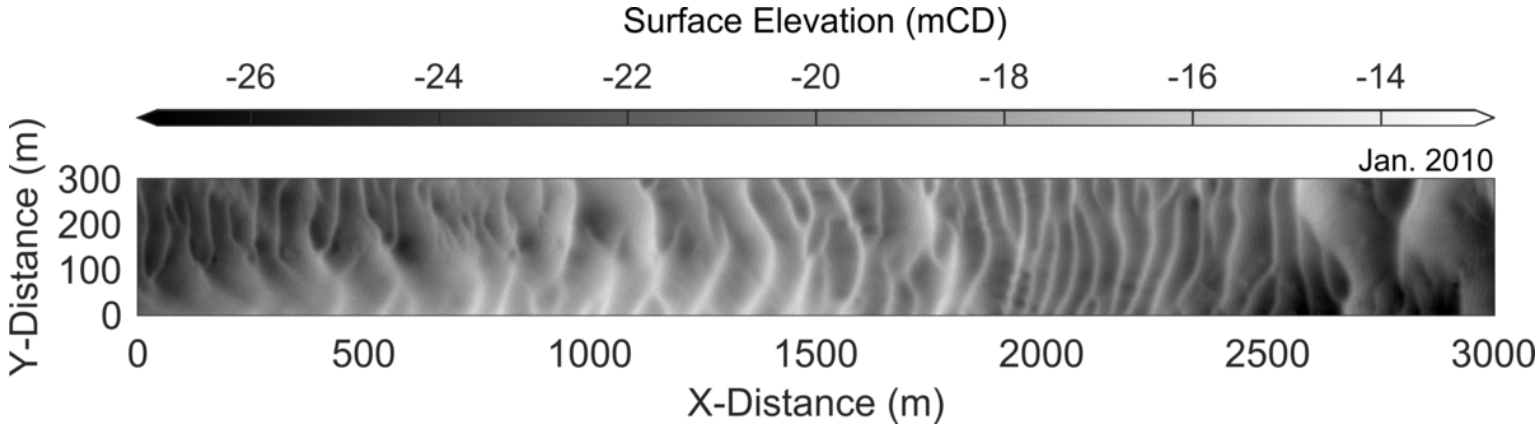
Motivation

Applying PIV algorithms to understand the dynamic behaviour of tidal compound dunes

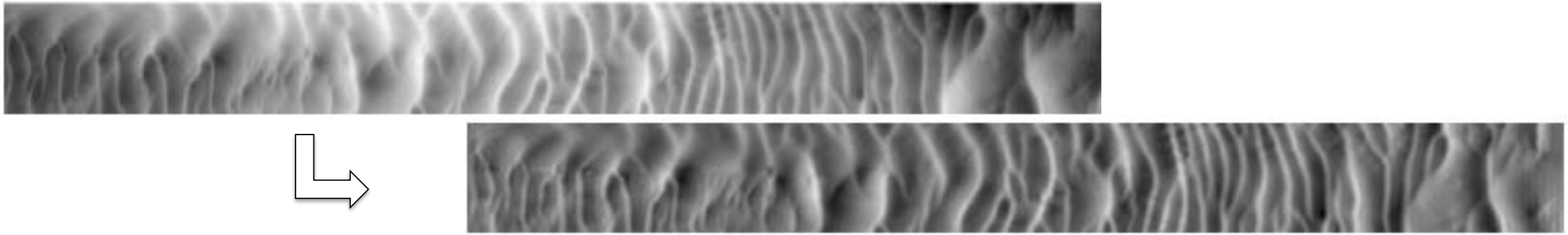




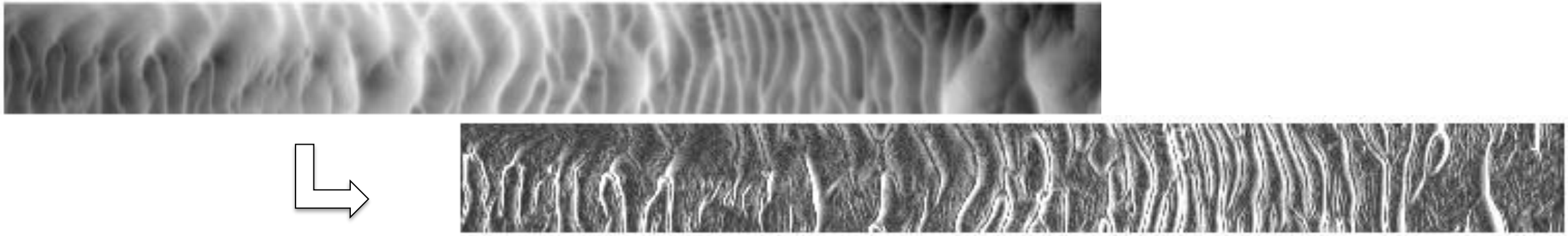
Methodology

1. Pre-Processing

- Bandpass-filtering physical scales: (original), primary, secondary



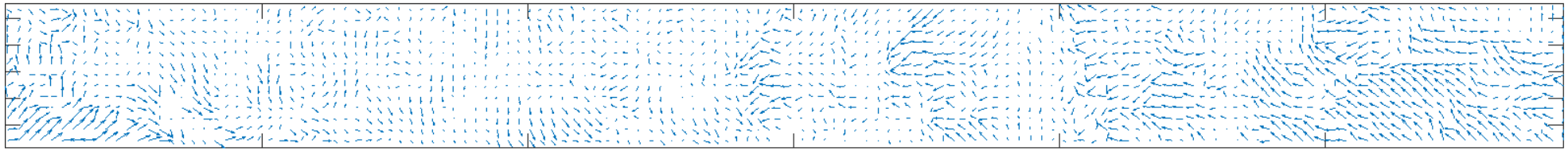
- Calculating topographic derivatives: (original), slope, curvature, variability



Methodology

2. Processing

- Calculating consecutive vector fields in PIV-Software DaVis 8 (LaVision)

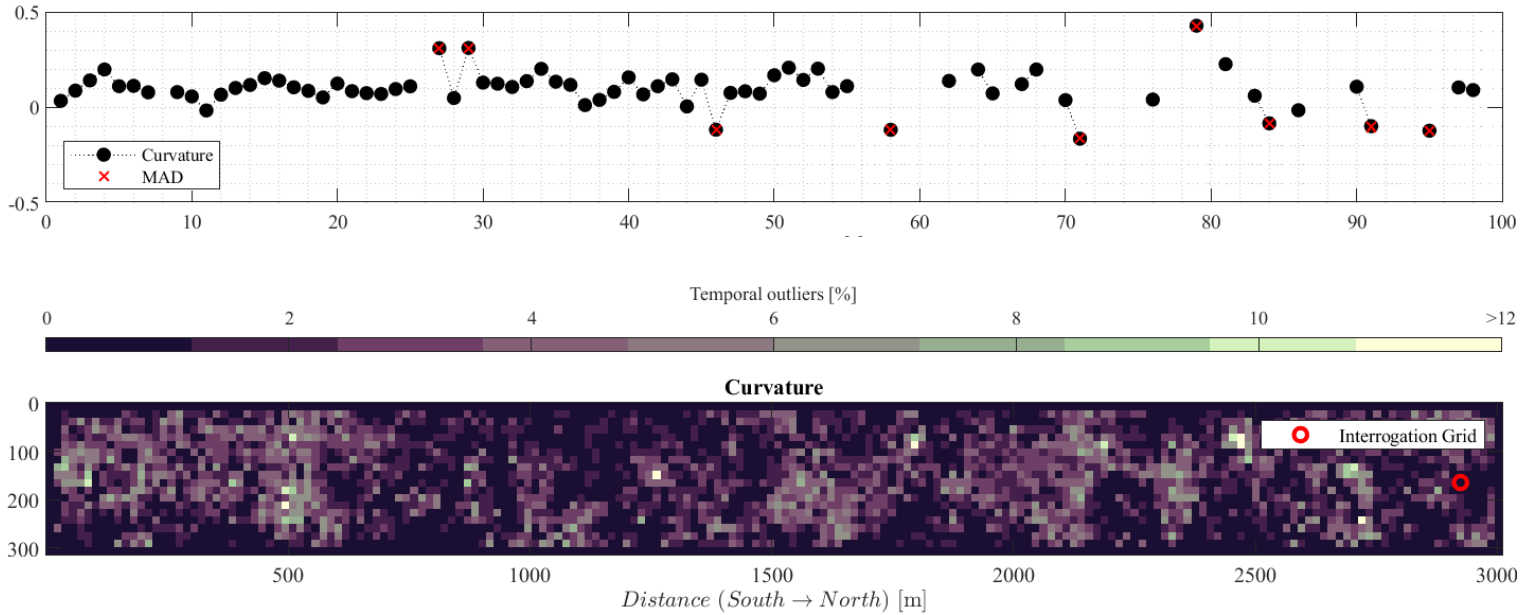


3. Post-Processing

- Counting total of temporal outliers*

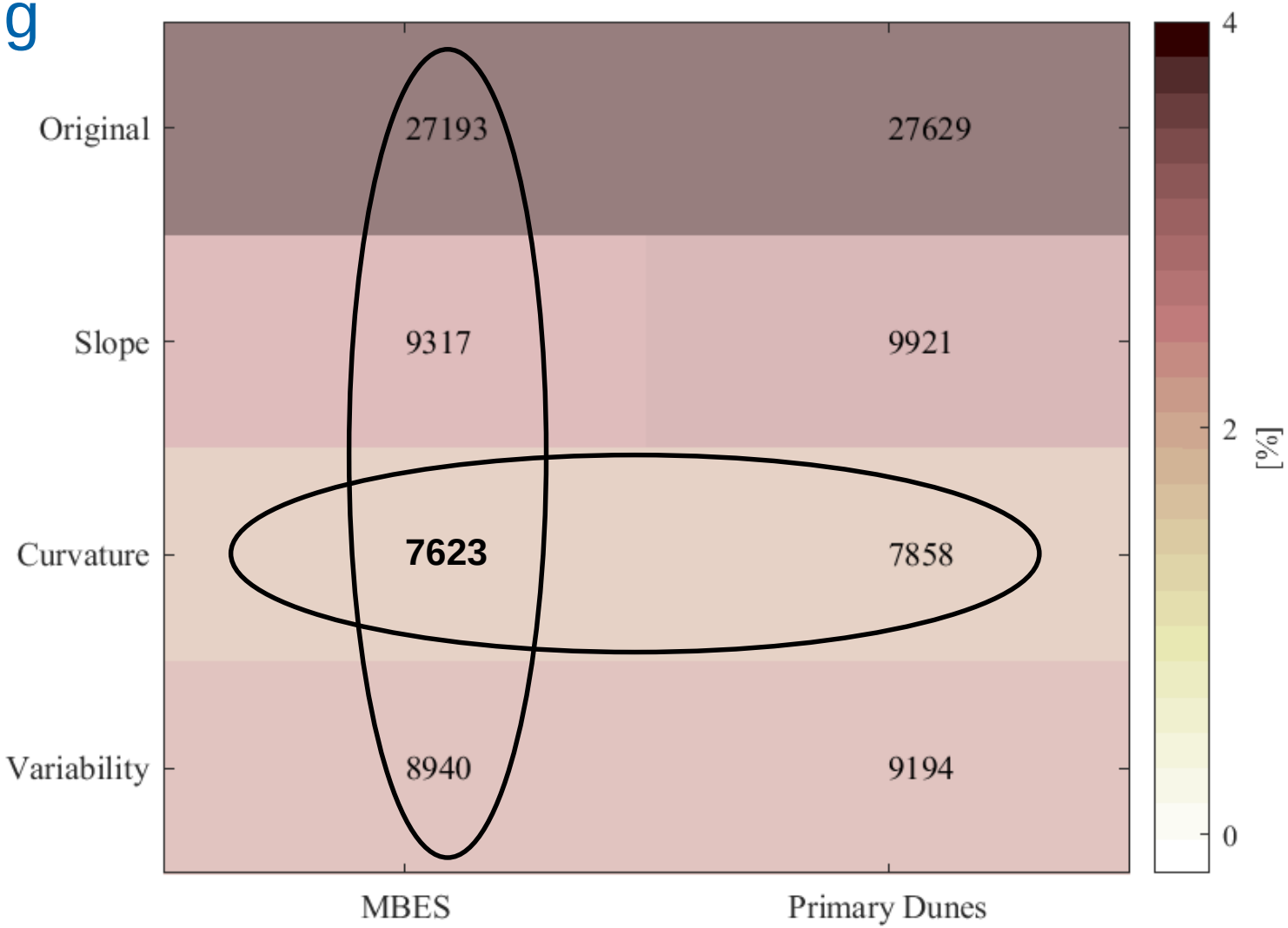
  as a proxy for PIV robustness

*(MAD, percentiles, moving median)



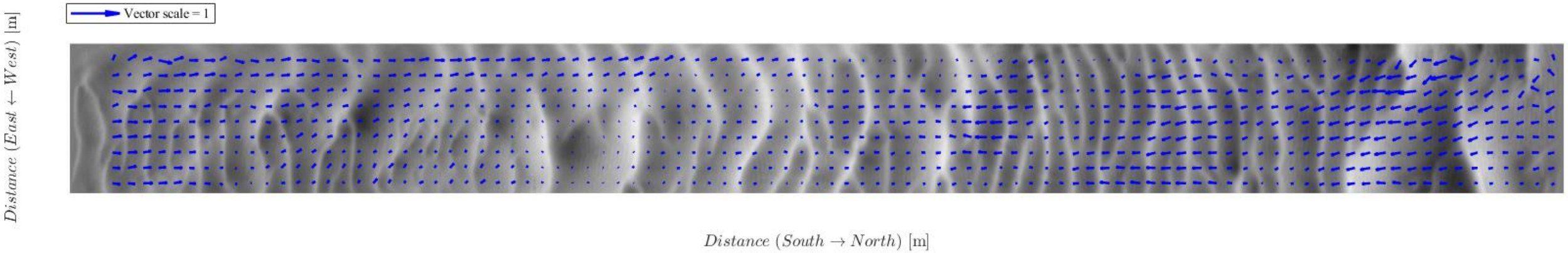
Recommended Pre-Processing

- Bandpass-filtering (primary/secondary) has **no positive effect** on PIV clarity
- Derivatives (slope/curvature/variability) generally show **better PIV results**
- Assessing curvature of original MBES leads to **clearest vector field**



Resulting vector field

- Complex dune convergence as proposed by *Kubicki et al. (2017)* and *Scheiber et al. (2021)*



PIV algorithms can indeed help us understand the dynamic behaviour of tidal compound dunes.