

Assessment of empirical relationship among cross-shore beach profile morphotypes, sediment characteristics, and wave signature in beaches in estuaries and bays (BEBs)

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1. Background

- Beaches in estuaries and bays (BEBs) are prominent features in semi-enclosed coastal settings like estuaries, bays, harbours, and lagoons [1].
- BEBs are characterized by limited fetch, low wave heights, narrow foreshores and back shores, limited beach lengths, and poorly developed or non-existent dunes [2].
- BEBs are usually distinct from open coast beaches in terms of environment, process, and morphology.

2. Research Objectives

- To determine the profile morphotypes and their spatio-temporal variations.
- To assess the relationship among these morphotypes, sediment characteristics, and hydrodynamic forces.

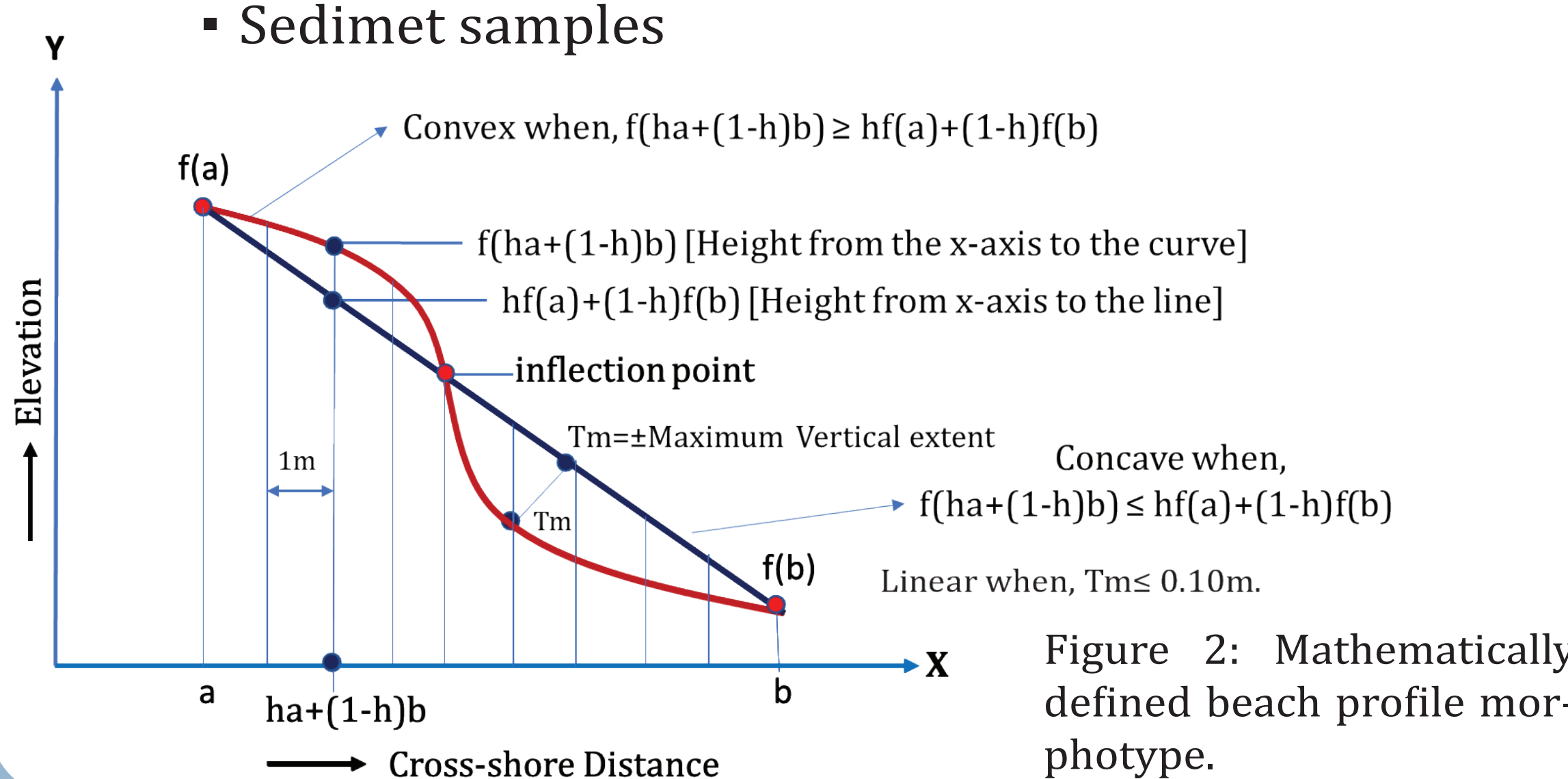
3. Site Descriptions



Figure 1: Gamay Bay and beach profile locations

4. Methods

- Monthly-Quarterly profiles since 2016.
- Wave data from offshore buoys.
- Sediment samples



5. Results

5.1. Profile Morphotypes

We have identified 11 possible subaerial profile morphotypes for the BEBs.

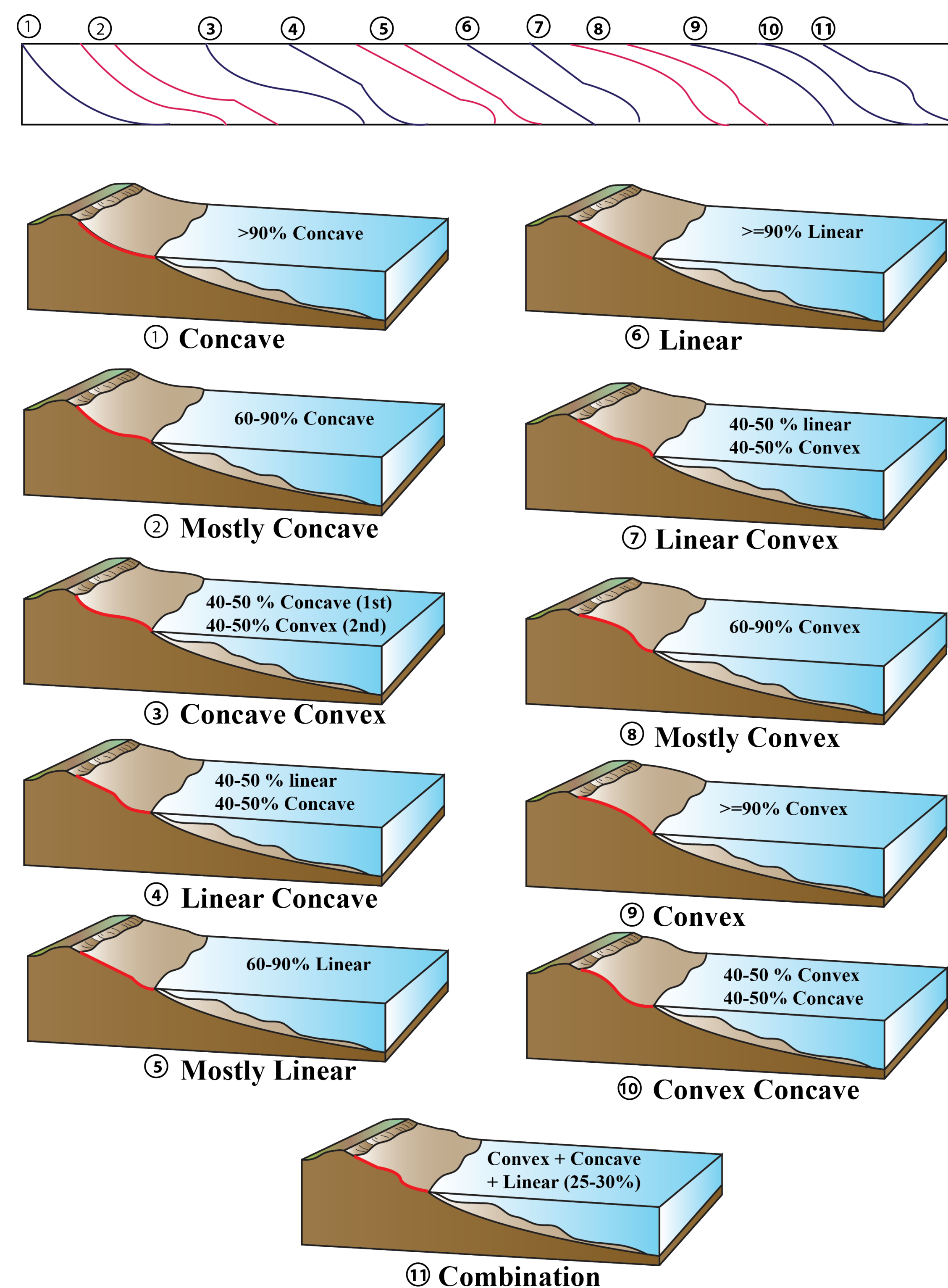


Figure 3: Proposed Profile Morphotypes

5.2. Beach profiles and Principal Component Analysis

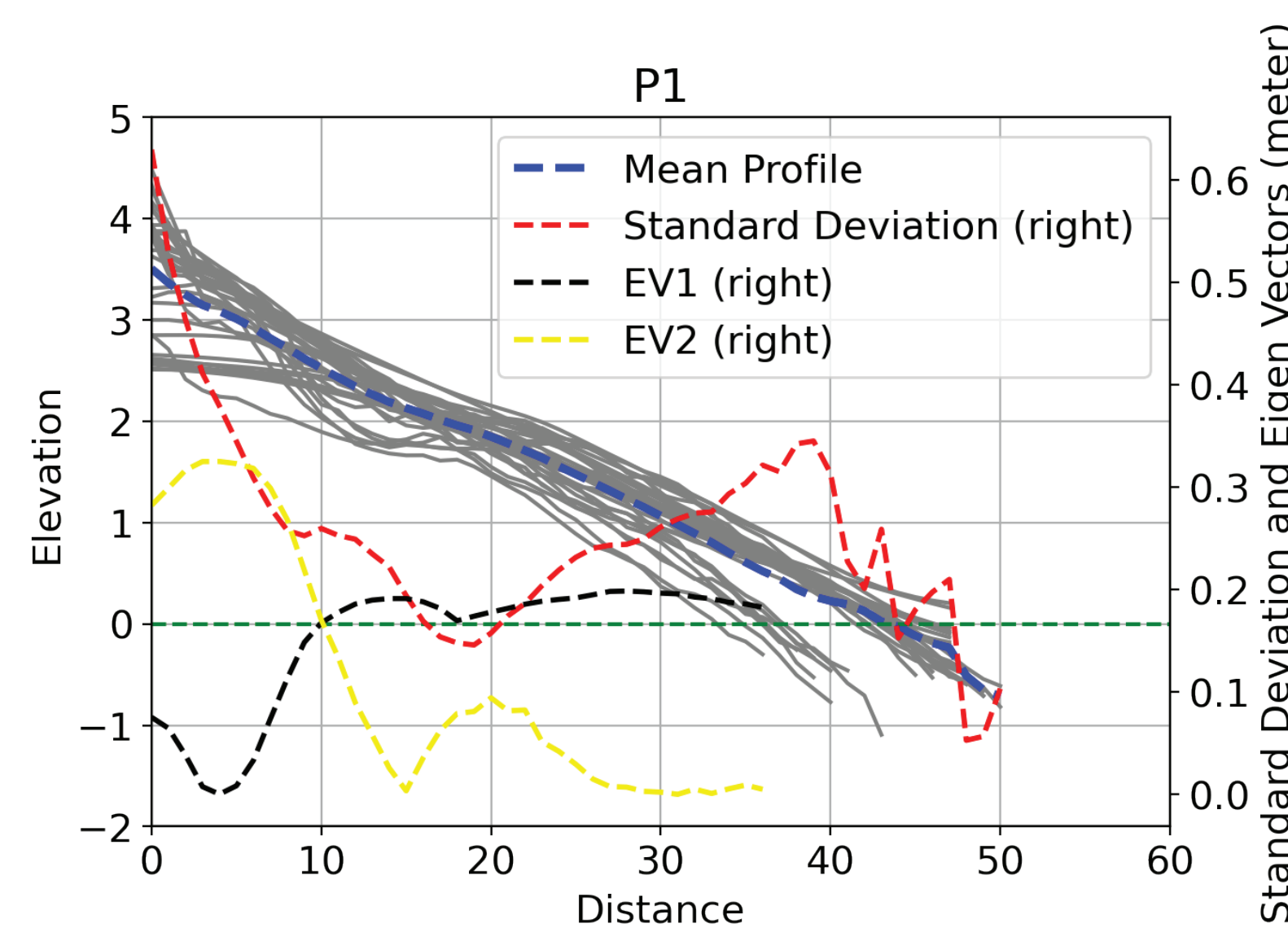


Figure 4: Profile-1, Congwong beach. Showing mean profile, standard deviation, and Eigenvector (EV)

- EV1 and EV2 combinedly represent about 90% of the total variance.

5. Results (Cont.)

5.3. Occurrence of Morphotypes

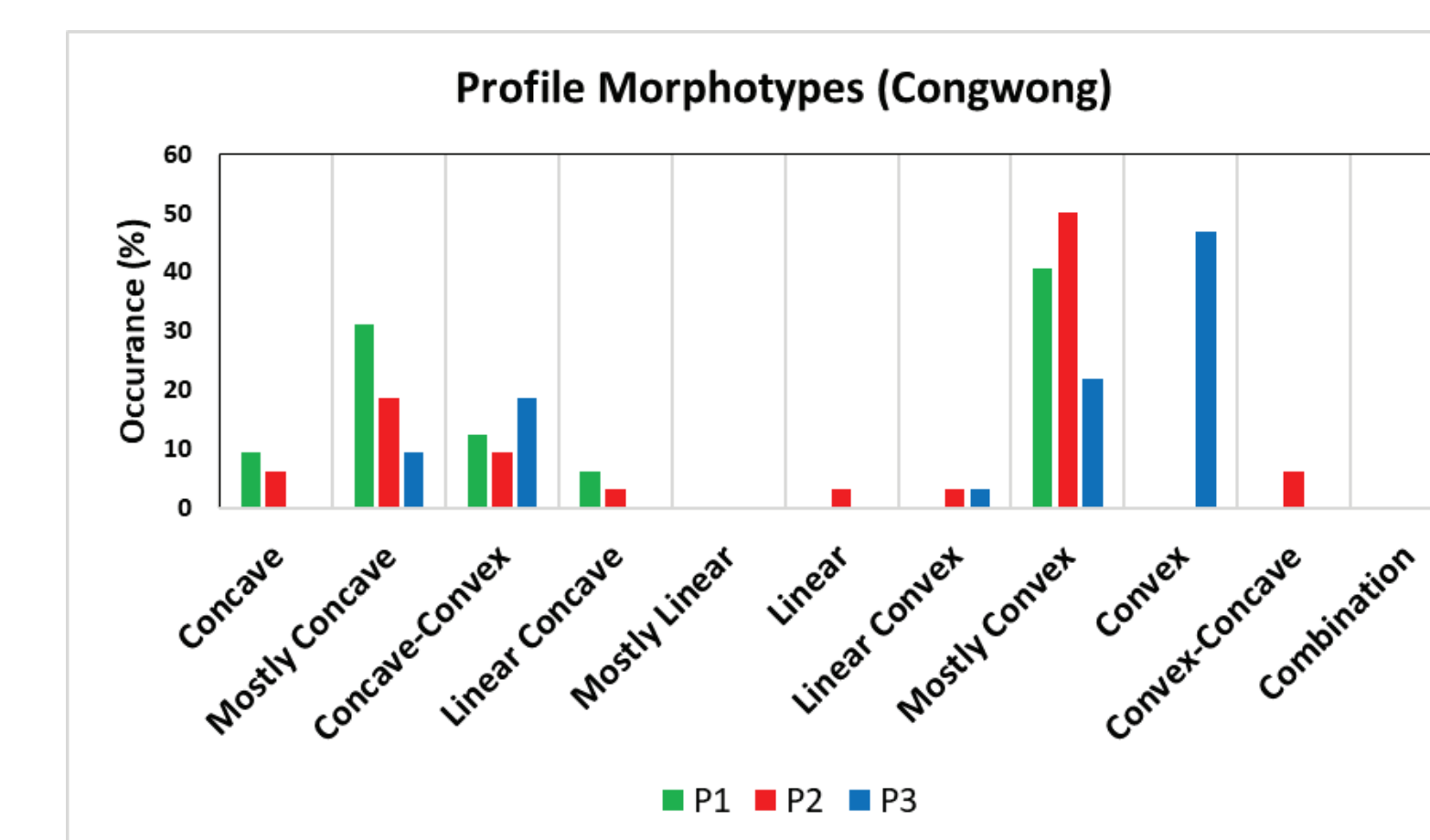


Figure 5: Occurrence of Morphotypes as Percentage in Congwong Beach. Here, the dominant morphotype is Mostly Convex

5.4. Temporal Dynamics of Morphotypes and Wave Environment

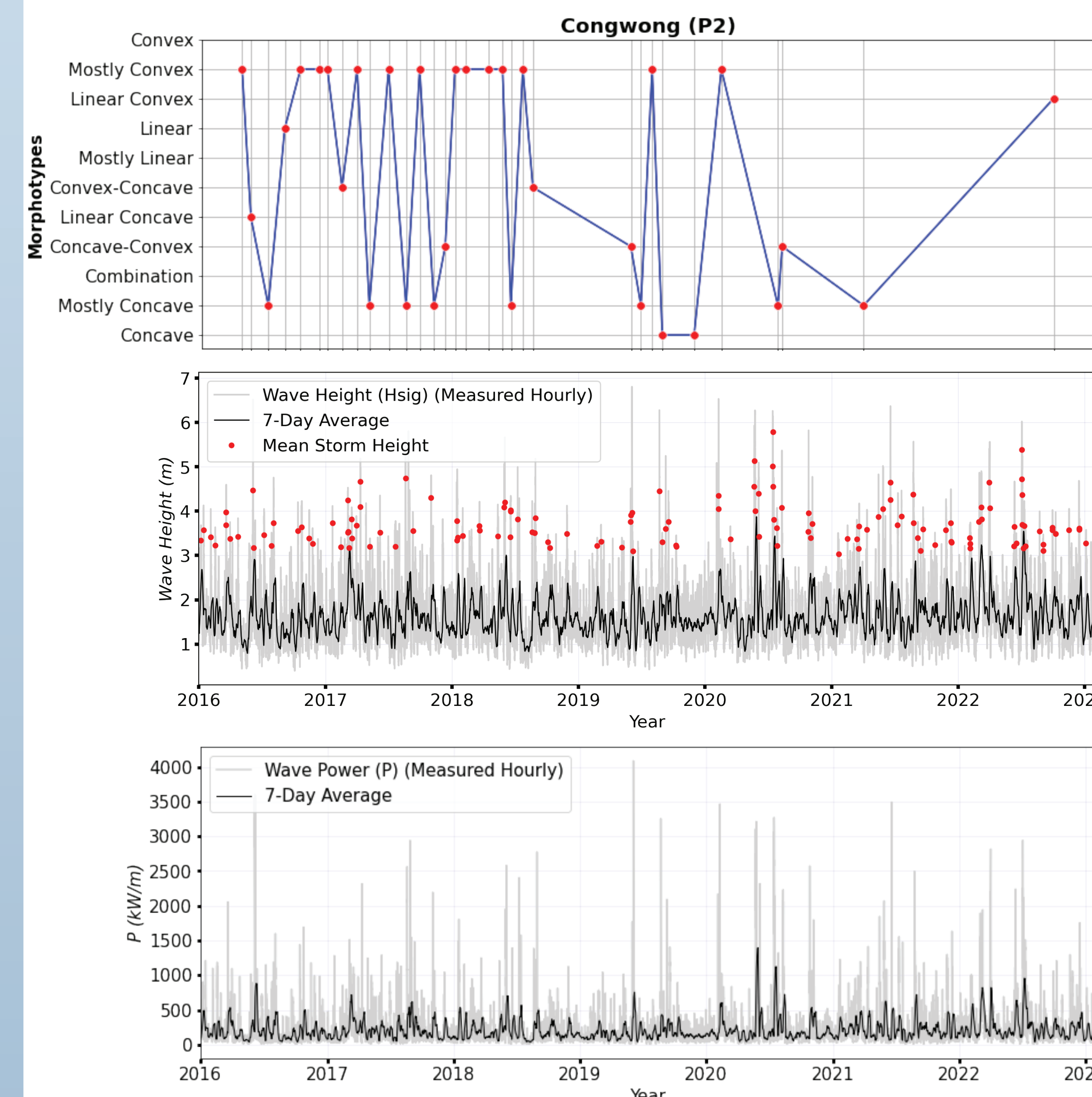


Figure 6: Temporal variations of profile morphotypes. Significant wave height and wave power with storm signatures.

5.5. Sediment characteristics

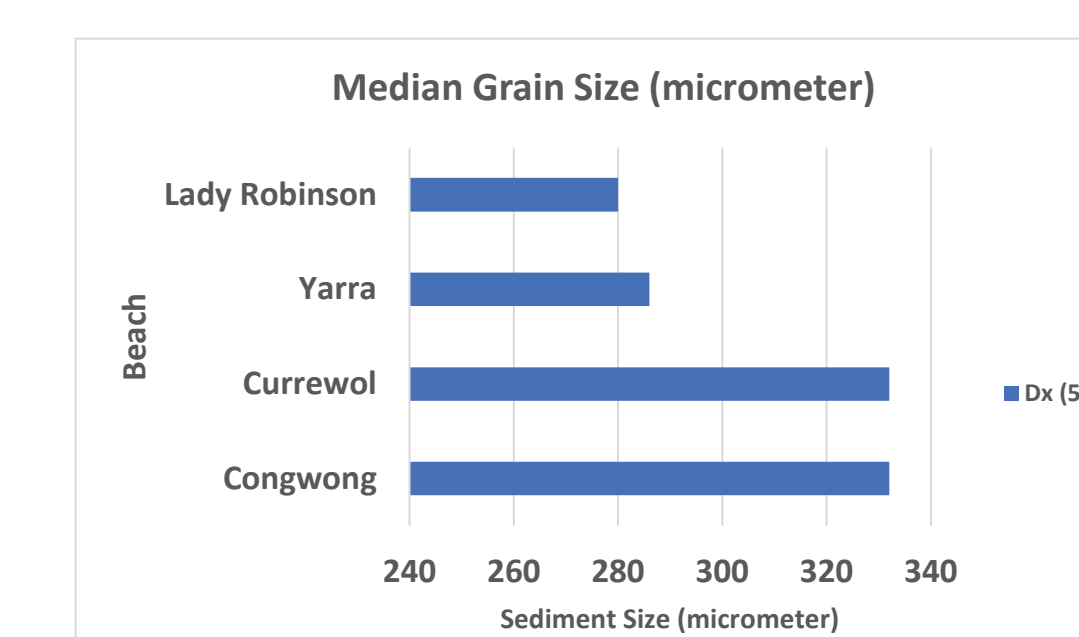


Figure 7: Sediment Characteristics

- Coarser sediments-Concave
- Finer Sediments-Concave

6. Conclusions

- We have proposed 11 profile morphotypes for BEBs in the microtidal settings.
- This method is a new approach for BEBs profile characterization.
- These morphotypes undergo temporal variations due to extreme wave climates and seasonal variations

7. What's Next?

- The method is still semi-quantitative.
- We will define each morphotype with a numerical index.
- We will also extend the method incorporating mesotidal environment.

References

- [1] Vila-Concejo, A., Gallop, S. L., & Largier, J. L. (2020). Sandy beaches in estuaries and bays. In *Sandy Beach Morphodynamics* (pp. 343–362).
- [2] Nordstrom, K. F., & Jackson, N. L. (2012). Physical processes and landforms on beaches in short fetch environments in estuaries, small lakes and reservoirs: A review. In *Earth-Science Reviews* (Vol. 111, Issues 1–2, pp. 232–247).

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Poster Abstract