

## **Selforganized morphodynamic patterns in the nearshore**

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### **Abstract:**

The nearshore region exhibits many striking morphological patterns with a variety of spatial and temporal scales. Their formation has been initially ascribed, depending on the pattern in question, to spatial structures in the hydrodynamics or geological constrains. These forcing templates have been hypothesized to provide the spatial structure that becomes imprinted on the coastal morphology. More recently, new explanations for these patterns have involved interactions between fluid flow and sediment transport that create morphological feedbacks and lead to pattern self-organization. While forcing-template models do not explicitly treat transport of the sediment that makes up the pattern, self-organization models focus on the strong couplings within flow/sediment systems, and on interactions between emergent structures. We illustrate the sweeping shift from template explanations to self organization by discussing several nearshore patterns: beach cusps, surfzone crescentic sandbars, inner-shelf bedforms, large-scale cusped shorelines and tidal basins. We will show how different modelling techniques can all lead to the emergence of morphological patterns once the appropriate feedbacks are reproduced. Models involving self organization show that local interactions between flow and sediment transport can collectively give rise to patterns with large-scale coherence and that the driving feedbacks can be associated with either topographical or grain-size composition instabilities.