Shoreline Response to the Southern Annular Mode at WEC site: Satellite Analysis

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Keywords: shoreline change, beach morphology, beach rotation, wave energy converter.

Understanding shoreline dynamics is a key step towards the successful management of coastal environments. This study investigates shoreline response to the Southern Annular Mode (SAM) at Grassy Beach. Grassy is a sandy embayment on the southeast side of King Island in Bass Strait, Australia, and is a testing site for a nearshore wave energy converter (WEC). The study uses Sentinel and Landsat satellite imagery and the CoastSat Python toolkit to measure shoreline position from 1987 to 2021 (n = 420 images). Empirical orthogonal function (EOF) analysis found seasonal beach rotation to be a dominant mode of variability (20% of total variability) at Grassy, with opposing shoreline movement at either end of the embayed beach and a zone of stability near the middle. The corresponding temporal EOF reversed in sign between winter and summer. These results show shoreline retreat (erosion) as common at the exposed eastern end of the beach in winter compared to erosion at the western end during summer. The Bass Strait wave climate is influenced by SAM, with more powerful waves likely in Austral autumn and winter months when the SAM index is positive. The positive phase of SAM during winter months was found to increase shoreline retreat at the eastern end and led to a stronger beach rotation signal with the beach rotation EOF describing 24% of the total variability for this case. These results provide new insights into the influence of the SAM on shoreline dynamics and highlight the importance of considering relevant climate drivers in coastal assessments. This study also highlights the importance of multi-decade spatio-temporal analysis of beach morphology for coastal management decision-making, with significant alongshore variability in shoreline movement identified here as a consideration for nearshore WEC site selection and other coastal projects at Grassy.

Abstract requirements:

* Abstract must be 250-300 words and should clearly state aim of paper, paper contents and main conclusions
* No references or reference list, no diagrams or tables
* Title max 12 words
* Max 5 keywords
* Presenting author underlined
* Abbreviations used must be listed in full at first use

Other possible text / old text…

The Bass Strait wave climate is influenced by SAM, with more powerful waves in Austral autumn and winter months when the SAM index is positive. This study found that SAM-positive winters lead to increased shoreline retreat at the exposed eastern end of the beach and a stronger seasonal beach rotation response (x %?). Therefore, SAM plays a significant role in modulating shoreline dynamics at Grassy Beach. SAM is on a positive trend due to anthropogenic climate change and this could lead to gradual, small shifts in the morphology of Grassy Beach and similar southern beaches. This research highlights the importance of considering relevant climate drivers in coastal assessments as well as demonstrating the utility of satellite imagery and EOF analysis for medium- to long-term coastal monitoring studies.

SWAN modelling will be used to further investigate this response to the summer and winter wave conditions.

The area of shoreline stability found through EOF analysis compared to the highly variable shoreline position at the ends is two different (environments/problems/scenarios…) for coastal development. These results highlight the need for a comprehensive spatial and temporal analysis of shoreline movement as part of the site selection process for nearshore structures.

The study of shoreline dynamics has become increasingly important with the rapidly changing climate and increased coastal infrastructure.

ChatGPT attempt at opening statement…

The Southern Annular Mode (SAM) plays a significant role in coastal dynamics and shoreline evolution. This study investigates the shoreline response to the SAM at a wave energy converter (WEC) site using satellite analysis. The results of this research provide new insights into the influence of the SAM on shoreline dynamics and the potential for coastal vulnerability assessments to inform protection measures for nearshore structures. The findings of this study have important implications for coastal management and planning efforts globally.

Shoreline dynamics play a crucial role in coastal vulnerability assessments and the design and management of coastal infrastructure, making it an important field of research. This study investigates the shoreline response to the Southern Annular Mode (SAM) at a wave energy converter (WEC) site using satellite analysis, contributing to our understanding of the impact of climate drivers on shoreline dynamics and informing coastal management decisions.

The study of shoreline dynamics has gained significant attention in recent years due to the impacts of climate change on coastal environments.

The study of shoreline dynamics has become increasingly important in light of rapidly changing climate conditions and growing human pressures on coastal environments.