



## Advancing Understanding of the Sea Breeze for the Romanian Black Sea Coast: A Comparative Analysis Using the SBI Index

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The studies on Romanian sea breeze remain relatively underdeveloped, posing a significant gap in climate research. This study aims to utilize the Sea Breeze Index (SBI) to identify cases of sea breeze occurrences along the Romanian coastline. The overarching goal is to enhance our understanding of local climatology and validate the empirical findings through a theoretical approach.

The study employs data from the Copernicus European Regional ReAnalysis (CERRA) database, which is available at 3-hour intervals. The first phase of this study is to validate the empirical findings for the year 2018. By utilizing the SBI index, we aim to delineate patterns of sea breezes and their temporal variations throughout the year.

Preliminary findings suggest that the theoretical approach based on the SBI index yields results that offer a more robust investigation and constitute a comprehensive exploration of the dynamics of sea breezes along the Romanian coastline. Using the SBI method, sea breeze occurrences have been classified into four distinct types: sea breezes blocked by offshore synoptic flow, sea breeze regime, sea breeze embedded into onshore synoptic current, and sea breeze inhibited by negative thermal gradient. The results revealed a significant increase in the identification of sea breeze cases, compared with the empirical results, with over 70% more instances detected. Notably, over 80% of these cases were found to be associated with incorporated maritime breezes within the synoptic current.

By comparing the outcomes of both approaches, we aim to validate the efficacy of the SBI index in identifying and characterizing sea breezes on the Romanian coast. Additionally, the study seeks to elucidate any discrepancies between the two methods, providing insights into the strengths and limitations of each approach. The comparative analysis of theoretical and empirical results will facilitate a more comprehensive understanding of the sea breeze in Romania. Furthermore, it will contribute to the refinement of methodologies for studying and predicting local weather phenomena, thereby enhancing the accuracy of climate models and forecasts.

In conclusion, this study highlights the importance of studying sea breezes in Romania and introduces the SBI index as a valuable tool for identifying and analyzing these types of circulation. Through comparative analysis, we demonstrate the applicability and reliability of the SBI index in the Romanian, providing a basis for further research.

