Comment on:Spatial Patterns of Sandy Beaches in China and Risk Analysis of Human Infrastructure Squeeze Based on Multi-Source Data and Ensemble Learning

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This study has made valuable contributions to coastal resource research by addressing long-term challenges in beach identification and human impact assessment. Its most obvious advantage lies in the innovative integration of multi-source remote sensing data and integrated learning, which effectively overcomes the limitations of traditional single data or single model methods. By combining Sentinel-1/2 images, terrain data, and nighttime light data, and extracting four-dimensional features, this study constructed a stacked ensemble model that integrates RF, SVM, CART, and GBDT. The consistent high accuracy from 2016 to 2023, as well as comparisons with three reference datasets, confirm the robustness of this method, particularly in reducing misclassification of bare land and urban areas, which is a common issue in existing research. The resulting 10 meter resolution beach dataset and regional pattern analysis have filled the gap in long-term beach monitoring nationwide, providing a reliable data foundation for coastal ecological management.

This study also provides practical insights into the risk of human infrastructure crowding. By establishing a 100 meter buffer zone and analyzing impermeable surface data from 1990 to 2023, the increase in risk areas and regional differences were quantified. Linking risk trends with economic factors further reveals the coupling relationship between coastal urbanization and beach degradation, providing targeted guidance for policy-making, such as prioritizing protection in high-risk areas such as Shandong and Guangdong.

However, there are several aspects that deserve improvement. Firstly, tidal disturbances have not been fully resolved. Although years of data can alleviate tidal effects, the lack of tidal phase matching may introduce spatial inconsistency in beach extraction. Future work can integrate tidal prediction models or on-site tidal data to select time series images with consistent tidal conditions, improving spatiotemporal accuracy. Secondly, the assessment of infrastructure squeeze is relatively simple: relying solely on impermeable surface expansion and buffer zone analysis cannot capture dynamic and detailed impacts . Higher resolution data and multi criteria models will improve the granularity of risk attribution.

In addition, it can enhance the interpretability of integrated models. This study did not analyze the importance of features or the collaborative or redundant

relationships between underlying models. Adding SHAP values or permutation importance analysis will clarify the contribution of each feature and optimize the model structure, reducing computational costs without sacrificing accuracy.

Overall, this study establishes a solid benchmark for coastal beach research, balancing methodological rigor and practical value. Addressing the aforementioned limitations will further enhance its scientific impact and practicality for sustainable coastal area management.

References

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