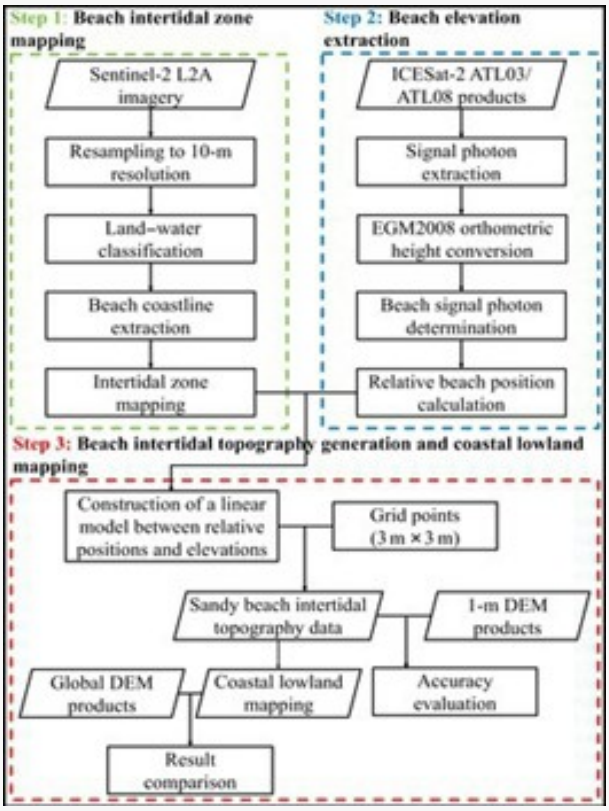
Coastal revelations from space: new satellite tech maps sandy beaches

GA, UNITED STATES, December 17, 2024 /EINPresswire.com/ -- Scientists have developed a groundbreaking method to map sandy beach intertidal zones with unprecedented accuracy using satellite data. This innovative approach allows for precise measurements of coastlines that are constantly shaped by tides and waves, providing crucial information for managing and protecting these dynamic ecosystems. By relying solely on space-based observations, this method promises to revolutionize coastal monitoring and offers new insights into how beaches respond to climate change, sea-level rise, and severe weather events.



Flow chart for deriving the sandy beach intertidal topography using Sentinel-2 and ICESat-2 data.

Sandy beaches are crucial natural barriers, protecting coastlines from erosion and storm surges while also supporting diverse ecosystems and human activities like tourism. However, accurately mapping these areas has always been challenging. Traditional methods involve labor-intensive and expensive fieldwork, often limited to small regions, and do not capture rapid changes in beach topography caused by tides and storms. Based on these challenges, there is a pressing need for new research that leverages advanced satellite technology to produce large-scale, high-precision coastal maps.

Researchers from Hohai University, along with international collaborators, have addressed this need in a study (DOI: 10.34133/remotesensing.0305) published on November 7, 2024, in Journal of Remote Sensing. Using data from ICESat-2 and Sentinel-2 satellites, the team developed a novel technique to accurately map the intertidal zones of sandy beaches. This method, validated along the Texas coastline, represents a significant step forward in monitoring coastal environments and provides a vital tool for understanding beach dynamics and assessing flood risk.

The research team combined ICESat-2's photon-counting lidar, which delivers high-resolution elevation data, with Sentinel-2's optical imagery to create detailed maps of intertidal zones. By processing over 300 cloud-free Sentinel-2 images from 2019 to 2020, they delineated the land-water boundaries and integrated this data with ICESat-2's elevation points. Their linear regression model produced a topographic map with a resolution of 3 meters and an impressive accuracy of 0.35 meters. The method's ability to cover extensive coastlines with precision, without needing on-the-ground measurements, is a game-changer for coastal monitoring. The Texas coastline served as a prime testing ground, where the team mapped 38.3 square kilometers of sandy beaches and highlighted vulnerable lowland areas, paving the way for better risk assessment and conservation strategies.

"Our work marks a significant advancement in understanding and protecting sandy beaches," said Dr. Lin Wang, the study's lead researcher. "With climate change accelerating sea-level rise and increasing the frequency of extreme weather events, this satellite-based mapping tool provides essential data for coastal communities worldwide. By enabling us to monitor beaches from space, we are better equipped to safeguard ecosystems and infrastructure against future threats."

This satellite mapping technology has far-reaching applications, from guiding coastal development and planning to improving disaster response and climate change adaptation strategies. The ability to accurately monitor beach topography over large areas can help scientists and policymakers identify erosion hotspots, prepare for storm surges, and assess the impact of rising seas. As global coastlines face mounting pressures, this innovation will play a crucial role in enhancing resilience and sustainable management efforts.

DOI
10.34133/remotesensing.0305

Original Source URL
https://doi.org/10.34133/remotesensing.0305

Funding information
This work was supported by the National Natural Science Foundation of China (42101343), Key Laboratory of Land Satellite Remote Sensing Application, Ministry of Natural Resources of the People's Republic of China (KLSMNR-K202309), and Jiangsu Marine Science and Technology Innovation Project (JSZRHYKJ202302).

Lucy Wang
BioDesign Research
email us here

This press release can be viewed online at: https://www.einpresswire.com/article/769656881

EIN Presswire's priority is source transparency. We do not allow opaque clients, and our editors

try to be careful about weeding out false and misleading content. As a user, if you see something we have missed, please do bring it to our attention. Your help is welcome. EIN Presswire, Everyone's Internet News Presswire™, tries to define some of the boundaries that are reasonable in today's world. Please see our Editorial Guidelines for more information.
© 1995-2024 Newsmatics Inc. All Right Reserved.