

ID: W2608957863

TITLE: Extracting the intertidal extent and topography of the Australian coastline from a 28 year time series of Landsat observations

AUTHOR: ['Stephen M. Sagar', 'Dale Roberts', 'B. Kiran Bala', 'Leo Lymburner']

ABSTRACT:

The physical environment of the intertidal zone presents a number of challenges which make traditional surveying methods difficult to implement; whilst the acquisition cost of airborne elevation data can be prohibitive beyond localised applications. Remote sensing data from earth observation satellites has been well established as a method for mapping the extent and elevation profile of the intertidal zone; however the majority of these applications are local in nature, and based on analysis of a limited number of individual image observations. In this paper we outline an automated methodology to model the intertidal extent and topography of the Australian coastline, that leverages a full time series of Landsat observations from 1987 to 2015 managed in the Australian Geoscience Data Cube (AGDC). Our approach reframes the analysis from time of acquisition into the tidal domain through the use of a continental scale tidal model, combined with a median pixel compositing of Normalised Difference Water Index (NDWI) stacks, to robustly estimate the tidal extent and elevation profile across the observed tidal range. We demonstrate the ability of a median-based compositing approach to deal effectively with data quality, modelling outliers and other issues that commonly affect single scene methodologies. Our new framework enables us to produce a continental-scale intertidal model, detailing intertidal zone topography at a 25 m spatial scale. We then demonstrate the potential of the modelling framework to derive digital elevation data based on tidal model attribution, validating our models against in-situ GPS observations, before discussing issues that must be addressed to move this capability to a continental scale. The ability of the model to examine coastal stability is introduced, in the context of the conceptual reframing of the data into the tidal domain, with a view to furthering this application in future versions of the model.

SOURCE: Remote sensing of environment

PDF URL: None

CITED BY COUNT: 138

PUBLICATION YEAR: 2017

TYPE: article

CONCEPTS: ['Intertidal zone', 'Remote sensing', 'Compositing', 'Elevation (ballistics)', 'Digital elevation model', 'Scale (ratio)', 'Geology', 'Geospatial analysis', 'Shuttle Radar Topography Mission', 'Cartography', 'Computer science', 'Geography', 'Oceanography', 'Image (mathematics)', 'Artificial intelligence', 'Geometry', 'Mathematics']