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OPTICAL REMOTE SENSING IMAGERIES WERE USED TO RECONSTRUCT TIME-VARYING TIDAL FLAT TOPOGRAPHY

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ABSTRACT

Tidal flats (TFs) make up around 7% of the entire coastal shelf area on the planet. Due to the water-impermeable nature of current remote sensing methods (e.g., radar used for WorldDEMTM and Shuttle Radar Topography Mission DEM, and optical stereo-pairs used for ASTER Global Digital Elevation Map Version 2), TFs are not accessible in most global digital elevation models (DEMs). This issue, however, may be avoided by utilizing remote sensing imageries to monitor land exposure at various tide heights on each return. This study uses Landsat-4/-5/-7/-8 Thematic Mapper (TM)/Enhanced TM Plus/Operational Land Imager imageries to rebuild topography of a TF, the Hsiang-Shan Wetland in Taiwan, in order to reveal its creation and temporal changes since the 1980s. To generate an inundation probability map, we first identify water regions by applying a modified normalized difference water index to each Landsat picture and normalizing the odds of water exposure. To turn the probabilities into real heights, this map is scaled using tidal amplitudes derived from the DTU10 tide model. A water level-area curve is constructed after the DEM is built in the intertidal zone, and the accuracy of the DEM is verified by sea level (SL) at the time of each Landsat snapshot. A 22-year dataset of 227 Landsat sceneries (1992–2013) is examined and compared to tide gauge data. With a correlation value of 0.93, the root-mean-square differences in SL exceed 48 cm, indicating that the current method is effective for creating accurate coastal DEMs and those products may be used to estimate immediate SL. This research demonstrates how an archive of optical remote sensing imageries may be used to investigate the development of intertidal zones. The method proposed in this research has the potential to aid in the quantification of SL since the dawn of the optical remote sensing era.

KEYWORDS: *Tidal Flat Digital Elevation Model Landsat Radar Altimetry Tide Model*

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