

Long-term Change Detection of the Coastal Zone in Bangladesh Using Multiple Satellite Data

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The Bangladesh floodplain covers approximately 80% of the country which is formed by the deposition of alluvium by the network of the Ganges-Brahmaputra-Meghna Rivers.

Bangladesh has a subtropical monsoon climate characterized by rainy and dry seasons. In particular, floods occur frequently in the rainy season causing erosion and deposition due to intense rainfall and unexpected river discharge. The people living in the riverine and lowland areas are substantially affected by flood and storm surge. Satellite remote sensing is crucial to the understanding of natural disasters in coastal areas of Bangladesh because earth observation data can detect long-term coastal changes at the large scale. In particular, SAR can observe all weather conditions such as rain, cloud cover, and night. The main objective of this study, is to analyze the temporal and spatial changes along the coastline of the Ganges Estuary using SAR images from 1993 to 2015. Moreover, we will clarify the relationship between coastal line temporal changes and hydrological events such as precipitation in the selected pilot area.

First, geometric corrections were processed for multiple satellite data including JERS-1 SAR and ALOS PALSAR (copyright JAXA, Japan). Next, the coastline was traced into polylines on each image in order to convert to GIS data in ArcMap (copyright ESRI, USA). Erosion and sedimentation were extracted from the changes of the coastline based on a supervised classification. Finally, correlations between erosion, sedimentation, precipitation and water level were analyzed to understand the mechanism of the coastal changes.

The preliminary results showed that erosion and sedimentation occurred simultaneously in the Ganges Estuary area between 1993 and 2015. We found that precipitation and water levels contributed significantly to the changes of erosion and sedimentation. Severe erosion and sedimentation processes have been occurred continuously along the coastal areas over 22 years. At the same time, short-term (intra-annual) sandbar appearance and disappearance were observed in the middle of the channel. Then, we extracted from APHRODITE the precipitation level series data for near Dahka areas. Correlation between erosion/sedimentation processes at the mouth of Ganges and rainfall patterns was clarified.

Periodic topographical changes in the current Ganges estuary area are very important for forecasting coastal disasters due to climate change. Therefore, integrated risk assessment / analysis considering socioeconomic factors is one of the most important and urgent future work.