Techniques for Producing Coastal Land/Water Masks from Landsat and Other Multispectral Satellite Data

Coastal areas and land/water boundaries continue to threaten many areas in the United States. Landsat data has been used to identify regional coastal change since the 1970s. Various techniques can be used to produce coastal land/water masks, including image classification and object-oriented analysis. This study compared the results of these methods to the data of the National Land Cover Database (NLCD). The study focused on the use of a modified version of the Normalized Difference Water Index (NDWI) to detect water bodies in coastal regions. The results showed that the NDWI can be used to identify water bodies with high accuracy, but it may also have limitations in certain areas. The study also discussed the use of other techniques, such as object-oriented analysis and image classification, for producing more accurate land/water masks.

Figure 1: Landsat image of coastal area showing water bodies detected using the NDWI (Normalized Difference Water Index).

Figure 2: Comparison of NDWI results with and without cloud correction.

Figure 3: Comparison of NDWI results with and without cloud correction.

Figure 4: Comparison of NDWI results with and without cloud correction.

Figure 5: Comparison of NDWI results with and without cloud correction.
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Coastal erosion and land loss continue to threaten many areas in the United States. Landsat data has been used to monitor regional coastal change since the 1970s. Many techniques can be used to produce coastal land water masks, including image classification and density slicing of individual bands or of band ratios. Band ratios used in land water detection include several variations of the Normalized Difference Water Index (NDWI). This poster discusses a study that compares land water masks computed from unsupervised Landsat image classification with masks from density-sliced band ratios and from the Landsat TM band 5. The greater New Orleans area is employed in this study, due to its abundance of coastal habitats and its vulnerability to coastal land loss. Image classification produced the best results based on visual comparison to higher resolution satellite and aerial image displays. However, density-sliced NDWI imagery from either near infrared (NIR) and blue bands or from NIR and green bands also produced more effective land water masks than imagery from the density-sliced Landsat TM band 5. NDWI based on NIR and green bands is noteworthy because it allows land water masks to be generated from multispectral satellite sensors without a blue band (e.g., ASTER and Landsat MSS). NDWI techniques also have potential for producing land water masks from coarser scaled satellite data, such as MODIS.