



Machine learning in classifying morphological changes in the Brahmaputra River using multi-spectral Landsat images in the Google Earth Engine

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Understanding morphological changes in river basins is important for efficient river basin management. Such studies on morphological changes can be efficiently carried out by processing remote sensing images. In this respect Google Earth Engine (GEE) provides an efficient platform for processing of such images. In this research an automatic identification of land and water from satellite imageries was carried out by using the water index based unsupervised classification approach. Multiple water indices were compared for the Brahmaputra River (Assam reach). Landsat images from 1990 to 2020 were used in the study. Various thresholding approaches available in the literature were applied to determine which particular index in combination with which thresholding approach provides the best classification. We found the Normalized Difference Water Index (NDWI) as the best index for unsupervised classification. Subsequently, a supervised classification approach was adopted to classify land and water from satellite images. In particular, three classification methods were used, namely: Classification and Regression Tree (CART), Random Forest (RF) and Support Vector Machine (SVM). The classifiers were trained with B2, B3, B5 and B6 (Blue, Green, NIR and SWIR1) bands as the input and the pre-classified pixel class as the output. The resulting classified images were compared with the Joint Research Centre (JRC) monthly water maps and a good accuracy was observed. Among the three methods RF gave the best results. For the Brahmaputra basin we noticed a lot of morphological changes during 1990 and 2020. This research showed that given good quality training data classifiers can be built, which can automatically extract water bodies from Landsat or similar images and can be used in morphological assessment of any river basin.

Keywords: Surface water extraction, supervised classification, Brahmaputra, Google Earth Engine (GEE).