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# The Role of Image Properties in Determining Change Detection Accuracy

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There have been a large number of studies comparing land use/cover change detection methods. The results of these studies tend to be contradictory, and consequently no clear consensus on the optimal methods for change detection has emerged. One possible reason for this lack of agreement is that, with a few notable exceptions, change detection studies tend to be anecdotal, using just a single data set for a single site. Thus, the degree to which the results of each study can be generalized may be small. We have therefore studied the relationship between image properties and change detection accuracy in a systematic manner. The image properties examined were class separability, radiometric normalization and image band correlation. The change detection methods used were post-classification comparison, direct classification of multidate imagery, image differencing, principal component analysis (PCA), and change vector analysis (CVA). Simulated data were used to identify general relationships. The potential for using these relationships to guide change detection analysis methodological design was evaluated using real Landsat Thematic Mapper data of three cities in the United States: Las Vegas, Nevada; Phoenix, Arizona, and Atlanta, Georgia.

The simulated data experiments showed that the relative accuracy of the change detection methods varied with changes in image properties, thus confirming the hypothesis that the results of single change detection studies should generalized with caution. For the class separability experiments, post-classification comparison, direct classification, image differencing, and PCA with a large number of the principal components, were all found to have higher accuracies than CVA and PCA with a small number of the principal components. For classes with very good separability, image differencing produced relatively high accuracies; for classes with poor spectral separability, image differencing was found to have the lowest accuracy. The negative effects of error in radiometric normalization between the image dates varied as a function of class separability and change detection method. For example, image differencing showed the greatest sensitivity to large changes in radiometric error, especially when class separability was weak. Image differencing was also found to be more sensitive to band correlation effects. The change detection analysis using pairs of real Landsat imagery showed that image differencing was relatively consistent in producing good results, and PCA produced satisfactory results. On the other hand, the CVA produced mixed results, depending on whether the classification included the identification of the different unchanged classes.