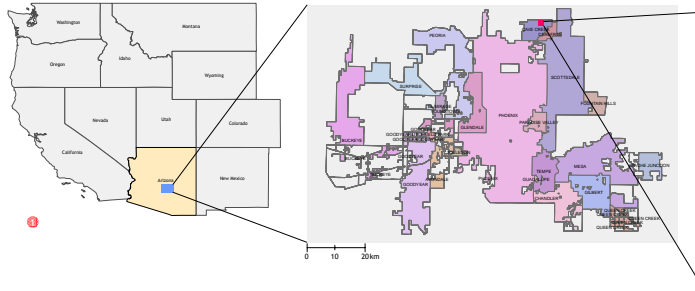


Monitoring LULC Dynamics in the Phoenix Metropolitan Area

Matthias S. Moeller



Quickbird image acquired January 2nd 2003. CIR band combination: IR:red bd., red:green bd., green:blue bd.
 Quickbird image acquired January 12th 2005. CIR band combination: IR:red bd., red:green bd., green:blue bd.
 Superimposed objects: triangle: building, circle: surface; green: change; red: no change

The Quickbird satellite sensor belongs to a series of recently launched very high resolution (0.61m) spaceborne digital scanner systems. Advantages of these scanners are the entire line of digital image acquisition, image calibration for system influences, digital image analysis, GIS integration and visualization.

The two image subsets (3,4) outline a part of the city of Cave Creek (1) north of Phoenix (500m x 500m in size). Between the years 2003 through 2005 some new buildings have been newly constructed.

The main task in this study was to find a reliable index usable for a detection of altered surfaces and newly constructed buildings. Several indices like the NDVI (Normalized Differenced Vegetation Index) and the Hue component separated from an IHS (Intensity, Hue, Saturation) transformation have been proofed successfully for those kind of large scale imagery. Changes can be detected visually in a multispectral composite, e.g. fig. 7 (NDVI) and 12 (Hue). A new change index was derived from the first component of a PCA transformation as displayed in fig. 17.

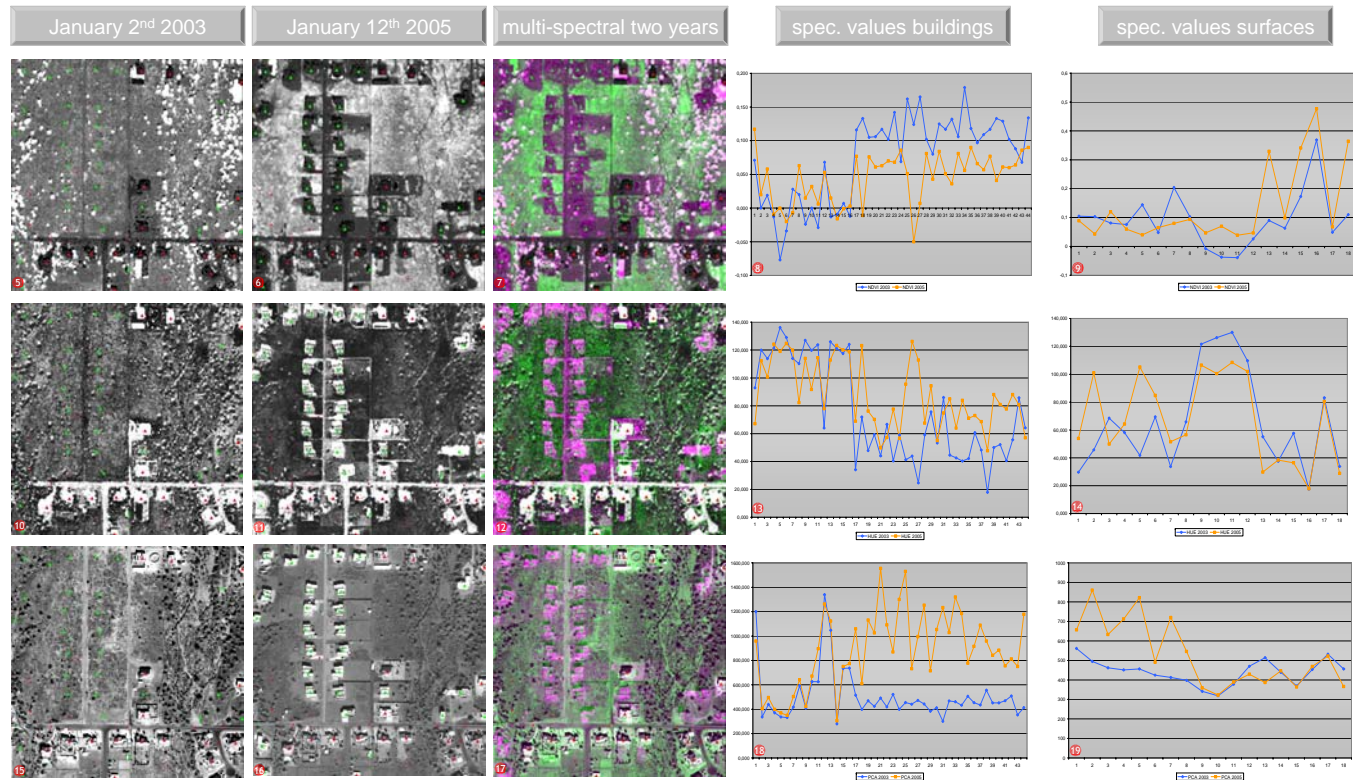
The visual inspection is a reliable method for outlining changes and thus can be used for a manual change interpretation. What index works best for a differentiation based on pure value statistics? To answer this question 44 buildings (16 unchanged, 28 changed) and 16 surface points (10 unchanged, 8 changed) have been chosen. These reference points, each with a 2m diameter, are superimposed on the 2005 CIR image 4. Finally the mean DN values of the two dates of acquisition have been calculated and charted for all three indices (8,9[NDVI], 13,14[Hue], 18,19[PCA]).

The outcome of this research is a clear differentiation between changed and unchanged features by the use of the first PCA component. The resulting charts show a high correlation for unchanged features (18,19), while changed features can be clearly differentiated.

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NDVI

Hue

PCA