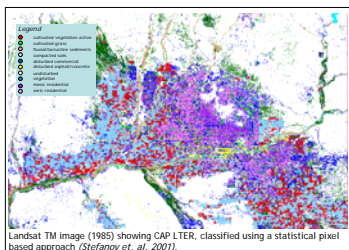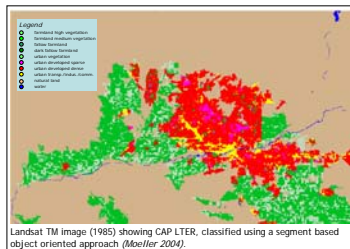# Monitoring LULC Dynamics in the Phoenix Metropolitan Area
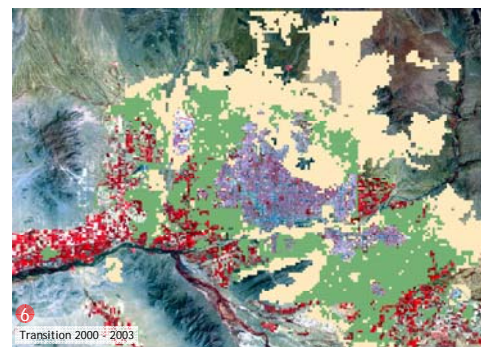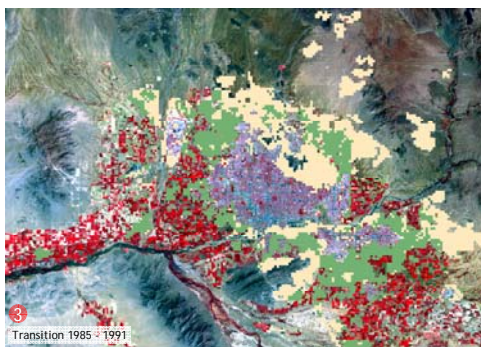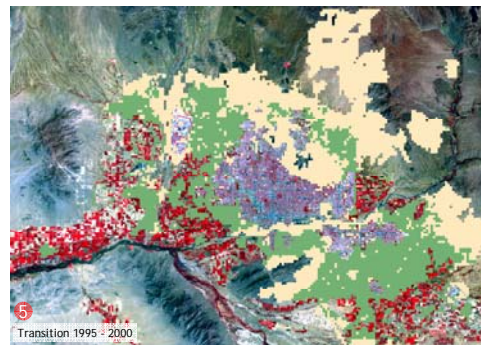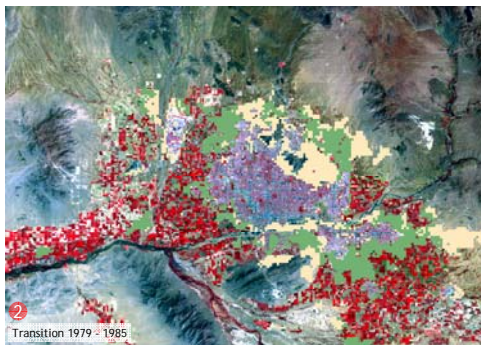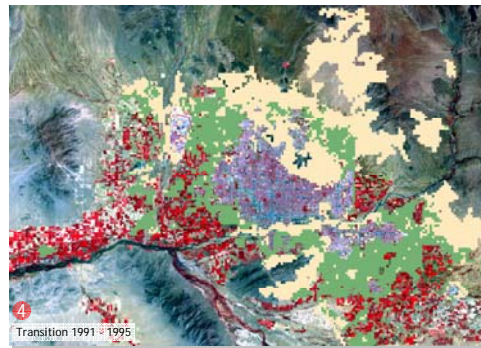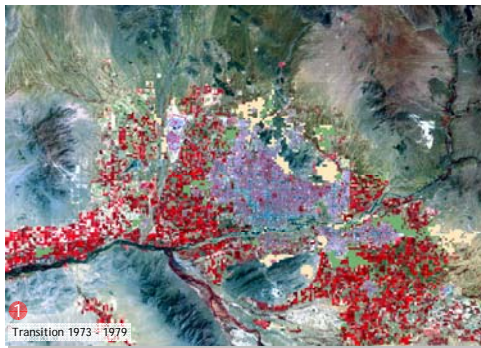
Matthias S. Moeller

For the long term monitoring of CAP LTER at least seven satellite imagery have been used. Those were acquired in 1973, 1979, 1985, 1991, 1995, 2000 and 2003 each during a six week period in spring. The satellites/sensors vary by individual technical properties (e.g. spectral band width, number of spectral bands, radiometry, spatial resolution).

The imagery have been classified following the National Land Cover Data scheme (NLCD) using a segment based and object oriented approach.

Final results of this classification appear more homogeneous compared to the results of a pixel based statistical approach.
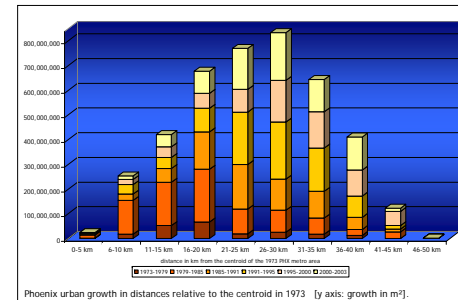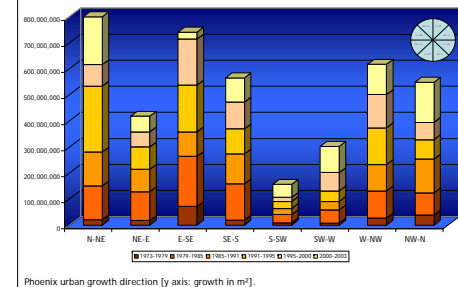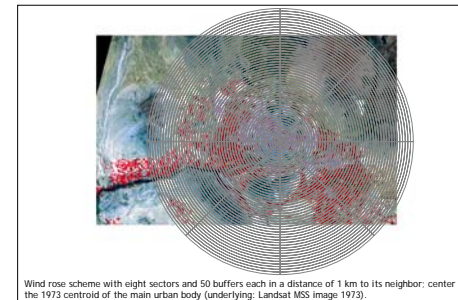
Landsat TM image (1985) showing CAP LTER, classified using a segment based object oriented approach *(Moeller 2004)*.

Landsat TM image (1985) showing CAP LTER, classified using a statistical pixel based approach *(Stefanov et. al. 2001)*.

The classification has been aggregated on 500 m grid cell level by the major/dominant underlying land use land cover class This results in a time series of six images (right 1 – 6):

Phase ❶: Conversion from natural land to an urban use north east of Phoenix and Scottsdale. Farmland is converted into an urban use south of Tempe and north east of Mesa.

Phase ❷: Huge conversion from farmland to an urban use south of Tempe and west of Phoenix. Tempe and Chandler are connected. Surprise growth west of Sun City.

Phase ❸: Isolated settlement spots in the Sonoran Desert start north east of Scottsdale.

Phase ❹: Gaps between isolated settlements and main urban area start shrinking. Sun City and Surprise now connected with the main urban area.

Phase ❺: Ongoing expansion towards north east.

Phase ❻: First and expansive settlements north of Phoenix.

References:
Moeller, M. Monitoring Long Term Transition Processes of a Metropolitan Area with Remote Sensing. IEEE proceedings of the IGARSS 2004 annual conference, Anchorage AK, pp. 3398-4001, CD-ROM, 2004.
Stefanov, W. L.; Ramsey, M. S.; Christensen, P. R. Monitoring urban land cover change: An expert system approach to land cover classification of semiarid to arid urban centers. Remote Sensing of Environment. 77, pp. 173-185, 2001.

Transition 1973 - 1979

Transition 1979 - 1985

Transition 1985 - 1991

Transition 1991 - 1995

Transition 1995 - 2000

Transition 2000 - 2003

The growth direction and the growth distance relative to the Phoenix city center have been analyzed in a GIS environment. As a representative center point the 1973 centroid of the main urban body has been selected. For the final analysis a wind rose scheme consisting of eight sectors and a series of 50 buffers have been created and superimposed over the aggregated results for each transition period.

Wind rose scheme with eight sectors and 50 buffers each in a distance of 1 km to its neighbor; center is the 1973 centroid of the main urban body (underlying: Landsat MSS image 1973).

Phoenix urban growth direction [y axis: growth in m²].

Phoenix urban growth in distances relative to the centroid in 1973 [y axis: growth in m²].