

Ecography

E7886

Pittiglio, C., Skidmore, A. K., van Gils, H. A. M. J. and Prins, H. H. T. 2012. Elephant response to spatial heterogeneity in a savanna landscape of northern Tanzania. – *Ecography* 35: xxx–xxx.

Supplementary material

Appendix 1. Processing of the satellite data

We selected Landsat Thematic Mapper (TM, 30 m pixel size) and ETM+ (30 m) images based on 3 criteria: a) time-coincidence with the aerial surveys; b) cloud cover less than 20%; and c) availability from the GLOVIS website (<http://glovis.usgs.gov/>). Sixty-nine images acquired between 24 June 1984 and 31 May 2003 were inspected for our analysis. The ETM+ images acquired after May 2003 were affected by the Scan Line Corrector problem (SLC-off) and were not considered in this study. As most of the images acquired in the wet season were affected by high cloud cover (between 20% and 90%), only six images could be selected for our analysis: two adjacent TM images from 17 October 1988 (path/row: 168/62 and 168/63; 0% cloud cover), two ETM+ images from 21 February 2000 (path/row: 168/62 and 168/63; 0% cloud cover), one ETM+ image from 28 April 2001 (path/row: 168/63; 12% cloud cover), and one ETM+ image from 2 June 2002 (path/row: 168/63; 17% cloud cover). The images with the same date were first mosaicked using histogram matching (Richards and Jia 2006), resized to an area of 18,874 km², and then split into 20 squared quadrants for the wavelet analysis. Only quadrants included in the SRF survey area were considered for the analysis ($n=14$; total area=13,212 km²; see Fig. 2). Drought significantly affects the green vegetation cover and consequently the dominant scale. The ETM+ 2000 image was characterized by a prolonged dry season (see TWCM 2000). Hence only 8 quadrants of the ETM+ images (showing cultivation in 2000 or cloudless in 2001-2002) could be considered for the analysis (see table 1). Because a recent study by Pittiglio et al. (2011) demonstrated that the dominant scale of spatial heterogeneity in semi-natural areas is not affected by pixel size (e.g. ETM+ versus ASTER), we used the ASTER images for the remaining

quadrants. Nine adjacent ASTER 1B level (EOS, 15 m) cloudless images from 27 January and 5 February 2006 were first mosaicked using histogram matching (Richards and Jia 2006), then geometrically corrected using a first order polynomial transformation plus 14 GPS reference points collected on the ground (RMSE < 0.5 pixel size), resampled using the nearest neighbour resampling technique and split into 20 quadrants. The TM/ETM+ images were geometrically rectified and co-registered (RMSE < 0.5 pixel size) with the mosaicked ASTER image prior to performing the wavelet analysis. The wavelet energy curves from the NDVI of the ASTER 2006 were compared with those obtained from the NDVI of the ETM+ 2000, 2001 and 2002 for each shared quadrant. The dominant scale was obtained from the ASTER images if these curves were similar, and from the ETM+ images otherwise. All images were geometrically corrected, re-projected to the Universal Transverse Mercator, UTM zone 37, Spheroid Clarke 1880, Datum Arc 1960 and re-sampled (with the nearest neighbour method) to $15 \times 15 \text{ m}^2$ (for ASTER) or $30 \times 30 \text{ m}^2$ (for TM and ETM+) before performing the wavelet transform. The images were not atmospherically corrected because the dominant scale, as quantified by the wavelet transform for images of different dates, is not significantly affected by different atmospheric conditions (Pittiglio et al. 2011).

References

Pittiglio, C. et al. 2011. A common dominant scale emerges from images of diverse satellite platforms using the wavelet transform. — *Int J Remote Sens* 32: 3665-3687.

Richards, J. A. and Jia, X. 2006. *Remote sensing digital image analysis: an introduction*. — Springer-Verlag.

TWCM 2000. Total Count of Elephant and Buffalo in the Tarangire Ecosystem (including Lake Manyara National Park), March 2000. Wildlife Survey Report. — TWCM & FZS.

Appendix 2

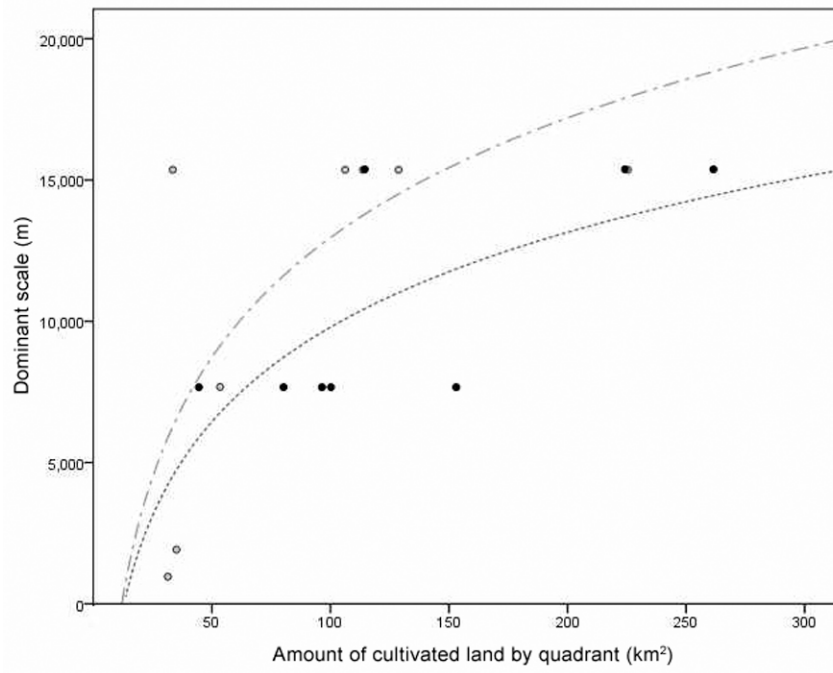


Fig. A1. The logarithmic relation between the dominant scale of landscape heterogeneity and the amount of cultivated land by quadrant in 1988 (gray dashed-dot line) and 2000 (black dotted line).

Appendix 3

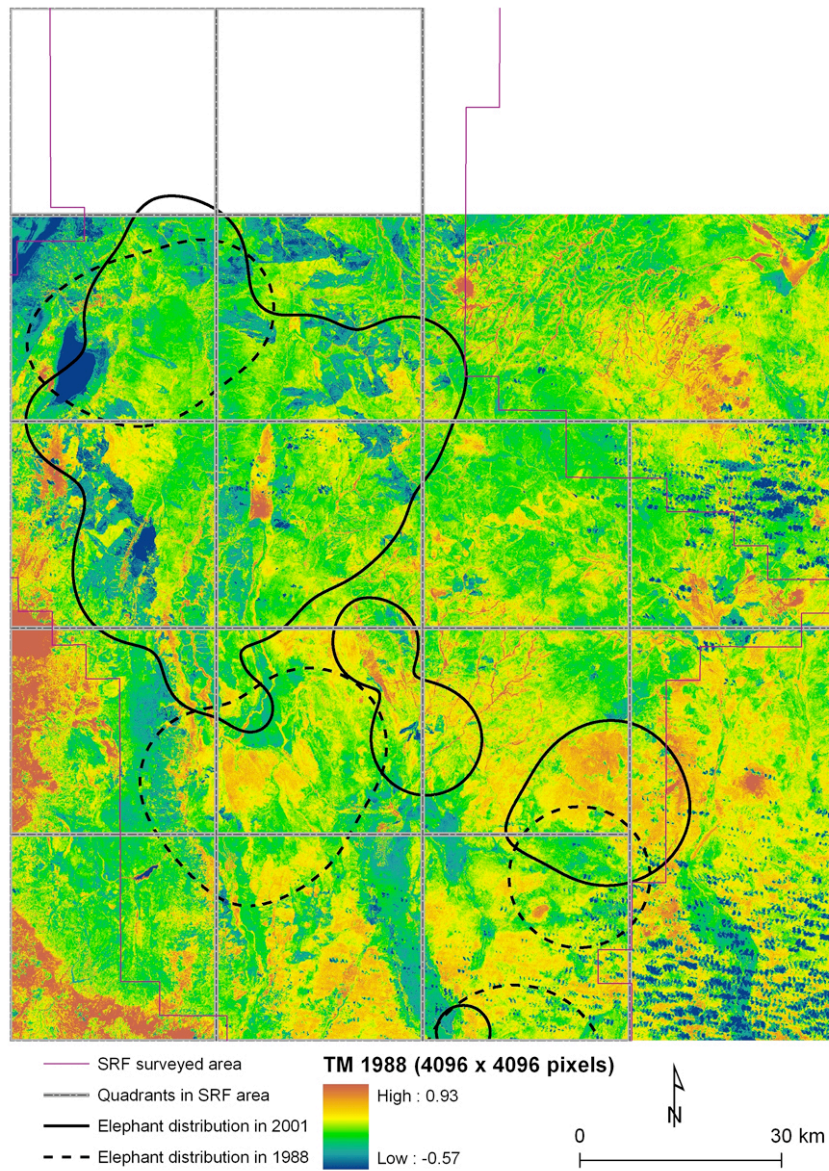


Fig. A2. The largest workable extent (TM 1988; 4096 × 4096 pixels) analyzed at once with Haar 2D DWT.

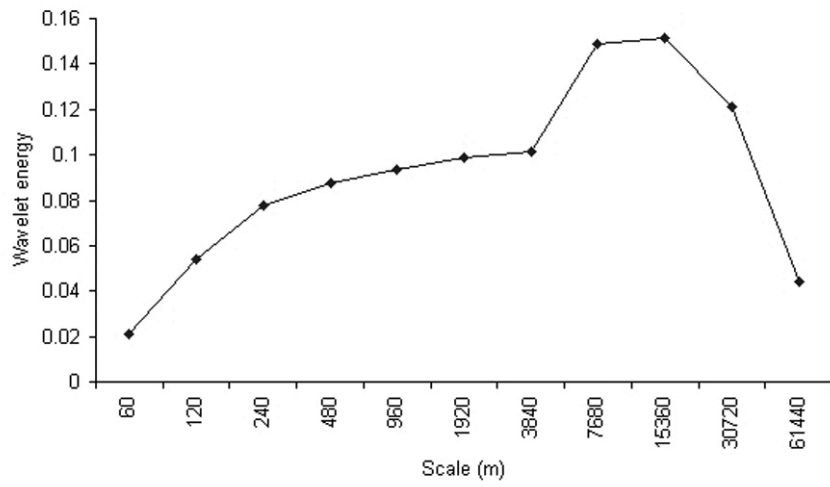


Fig. A3. The wavelet energy curve of the largest workable extent (TM 1988; 4096×4096 pixels).