

Landscape hydro-geomorphological insights from termite mound spatial distribution

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CAO
Carnegie Airborne Observatory

Spatial pattern in savannas

- Insights into ecological processes
- Consequences
 - Ecological functioning
 - Biodiversity

Spatial pattern in savannas

“ There are regions of Africa – quite apart from deserts – where the landscape is notable to the casual glance chiefly for ‘its monotony’.

Yet only the most unobservant would say that the scene lacks variety of any kind.

The monotony consists rather in the repetition of the same limited series of changes, or more correctly differences, over huge tracks of country”.

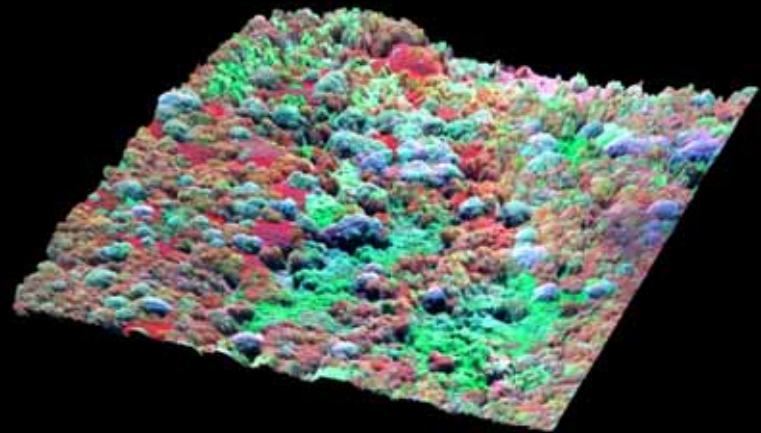
Morison, C. G. T., Hoyle, A.C. and Hope-Simpson, J. F. (1948). "Tropical Soil-Vegetation Catenas and Mosaics: A Study in the South-Western Part of the Anglo-Egyptian Sudan." The Journal of Ecology **36(1): 1-84**



- Soil-vegetation catenas – Milne 1935
- A grouping of soil-vegetation types linked in their occurrence by conditions of topography and its influence on water movement
- Morison 1948 – patch mosaic perspective
- Three-dimensional perspective and spatial understanding are lacking
 - Khomo – variation across stream order and climatic gradients

Carnegie Airborne Observatory (CAO)

- Remote sensing system designed specifically for studying the 3D structure and function of ecosystems
- Integration of light detection and ranging (LiDAR) and hyperspectral imagery

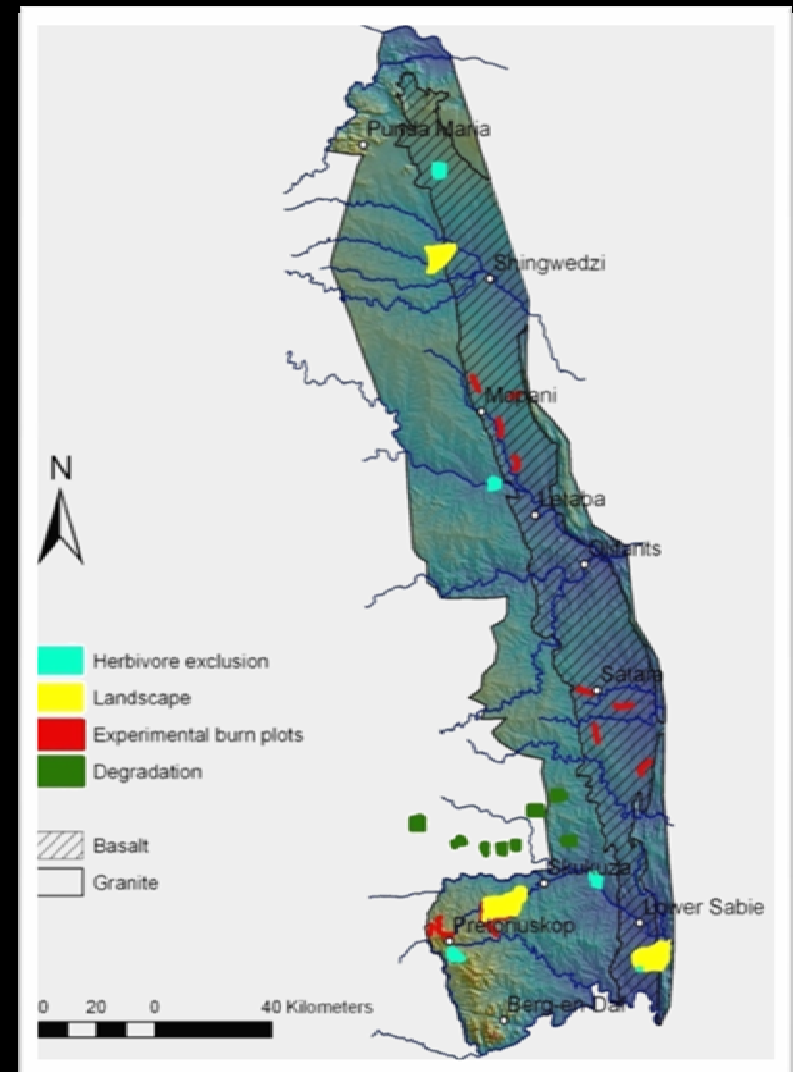


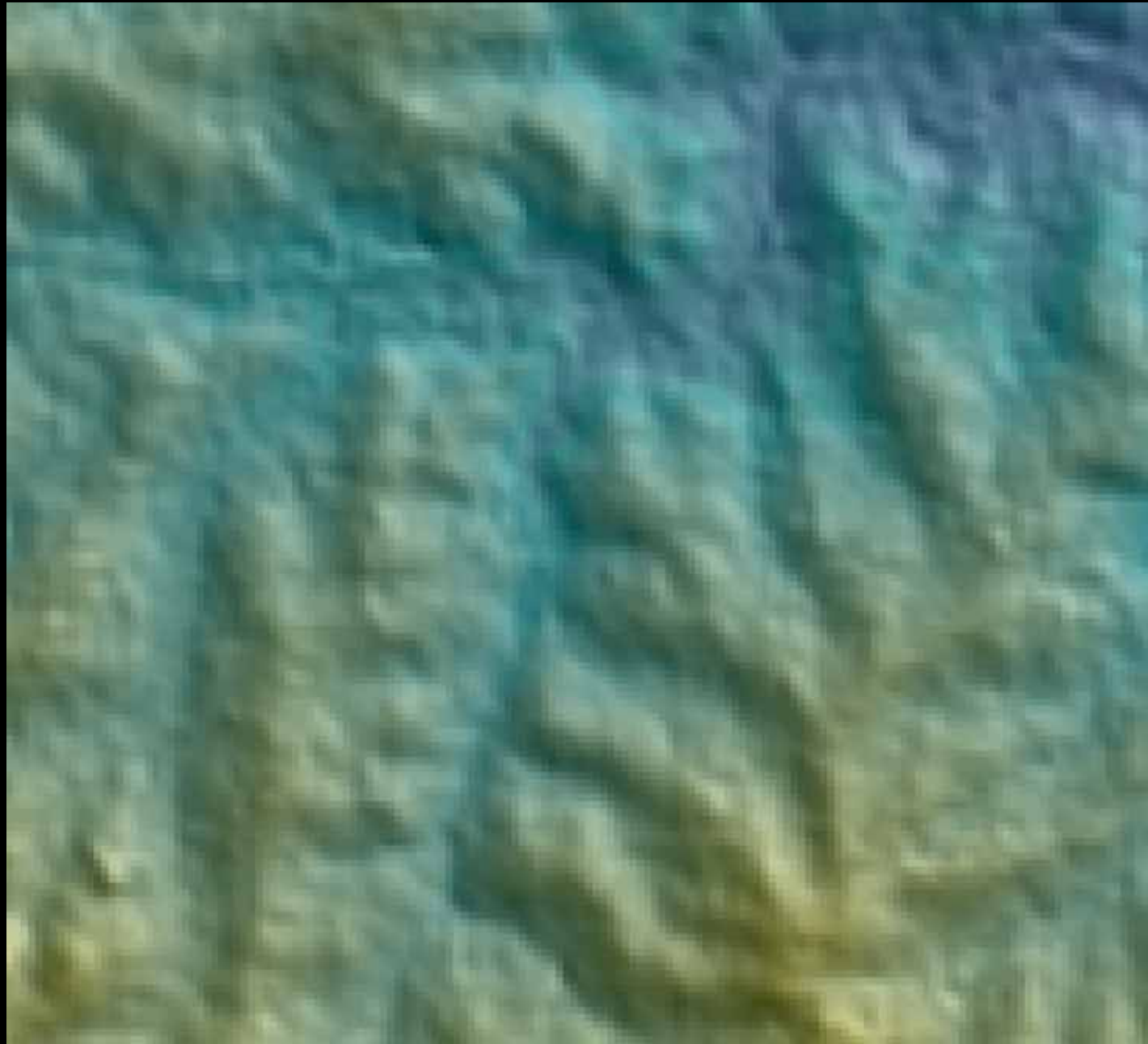
April/May 2008

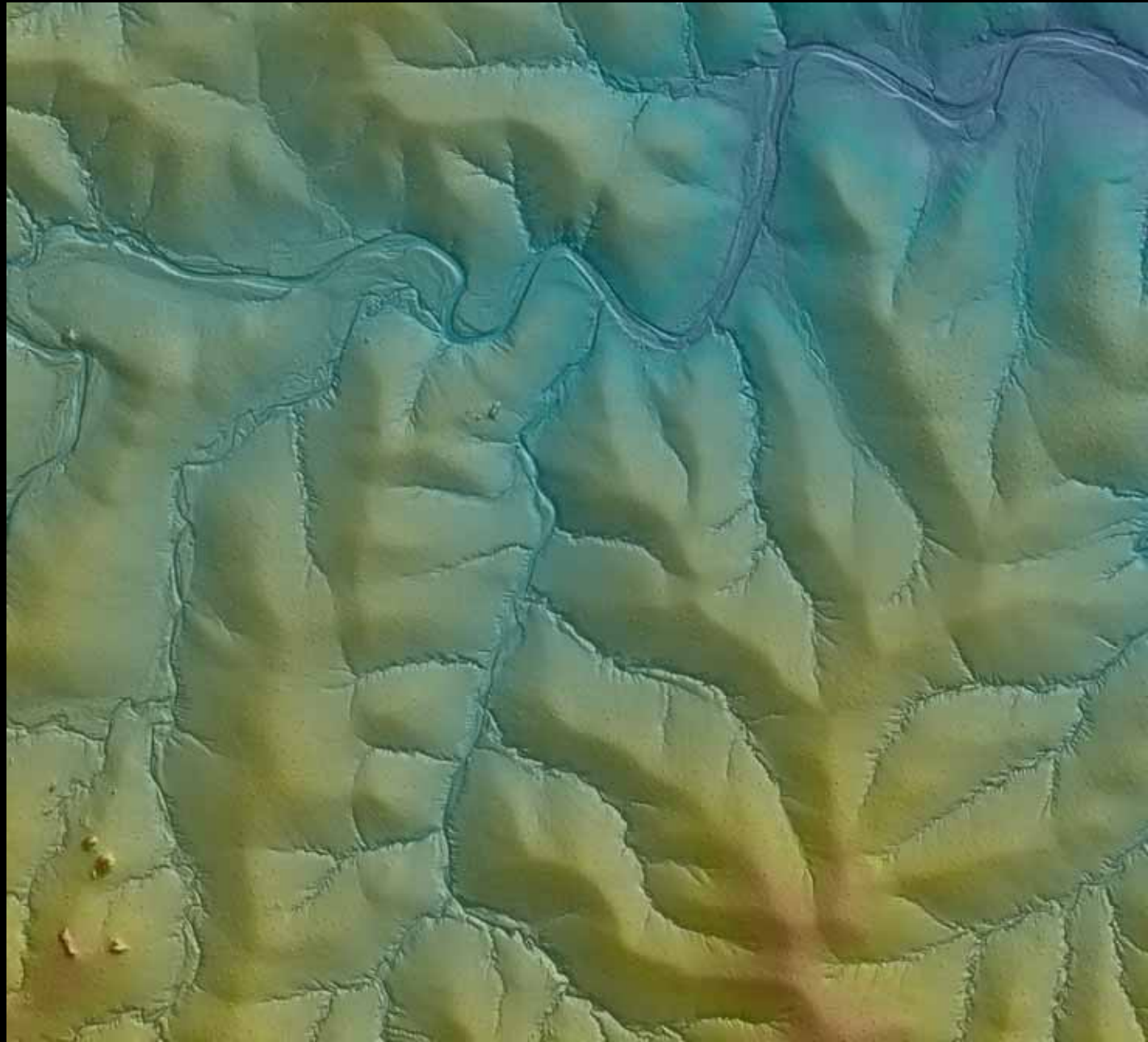


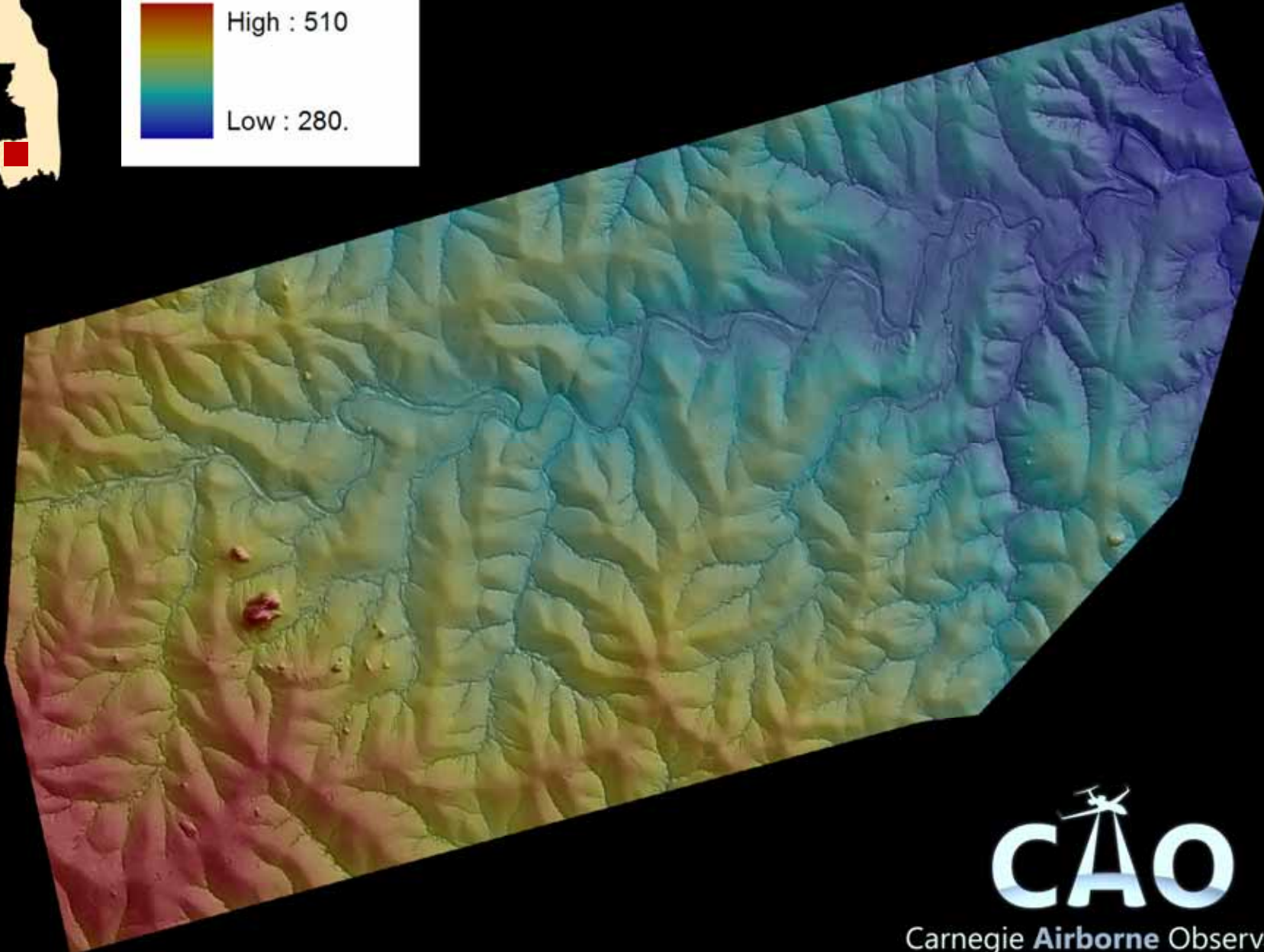
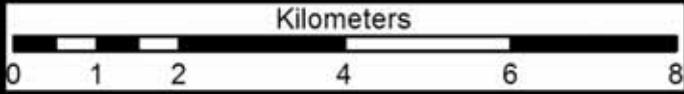
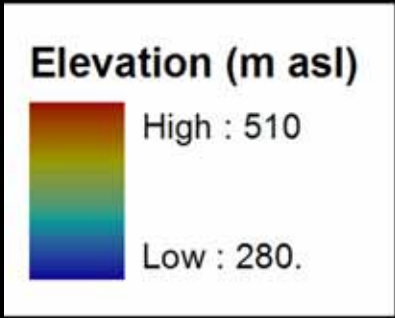
KNP campaign 2008

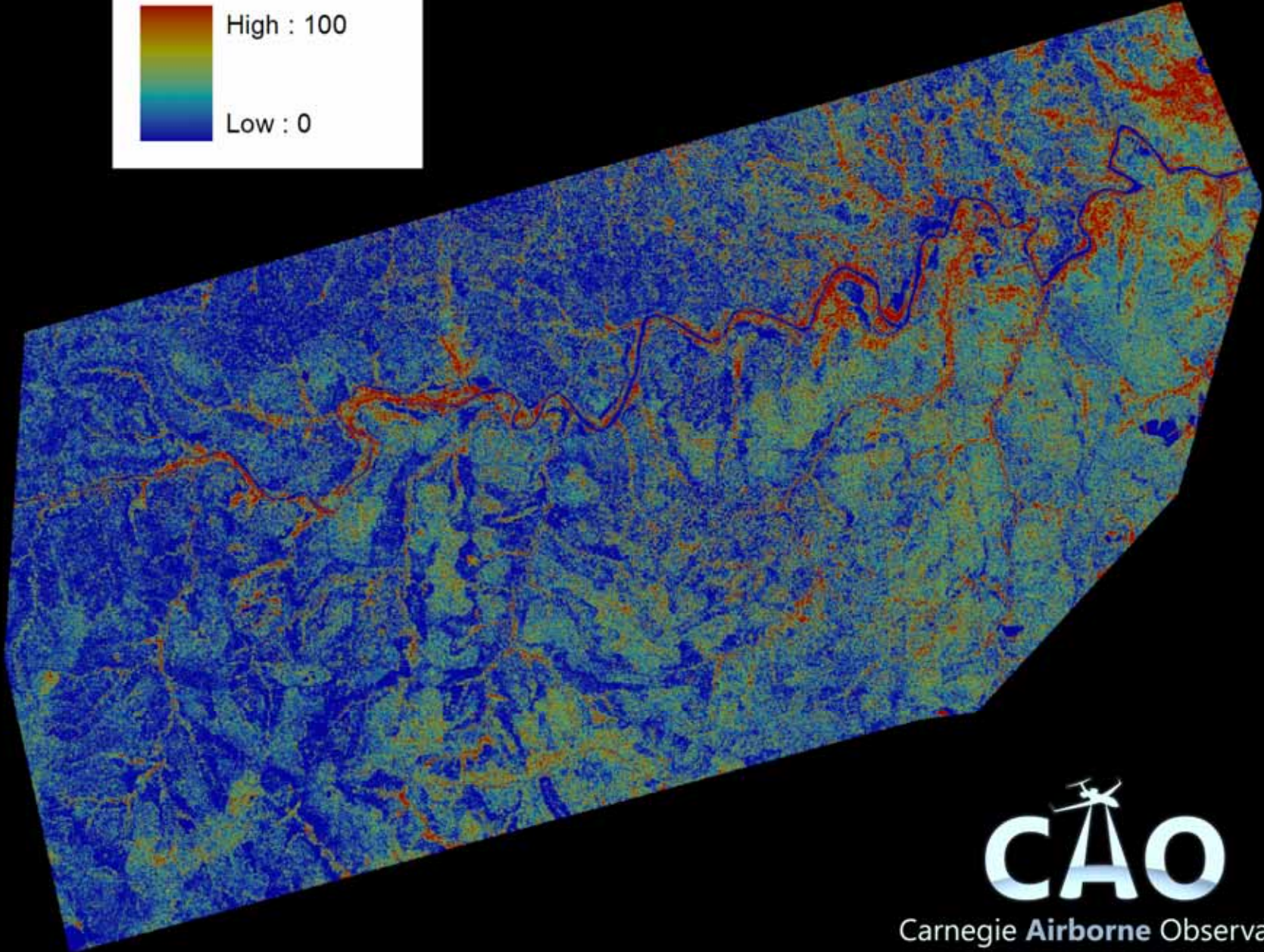
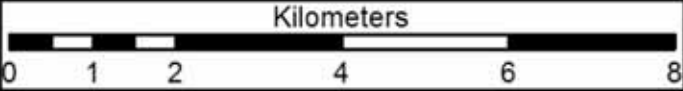
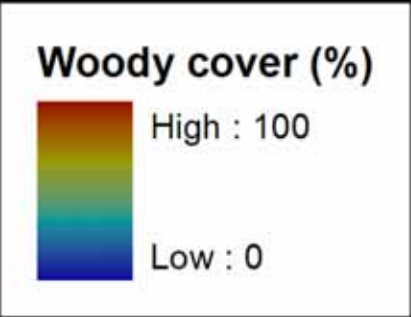
- Structure and function of savanna ecosystems
- Landscape heterogeneity
 - Spatial pattern/process
 - Context dependency
- Experimental sites
 - Herbivory, fire, land-use, flux-tower



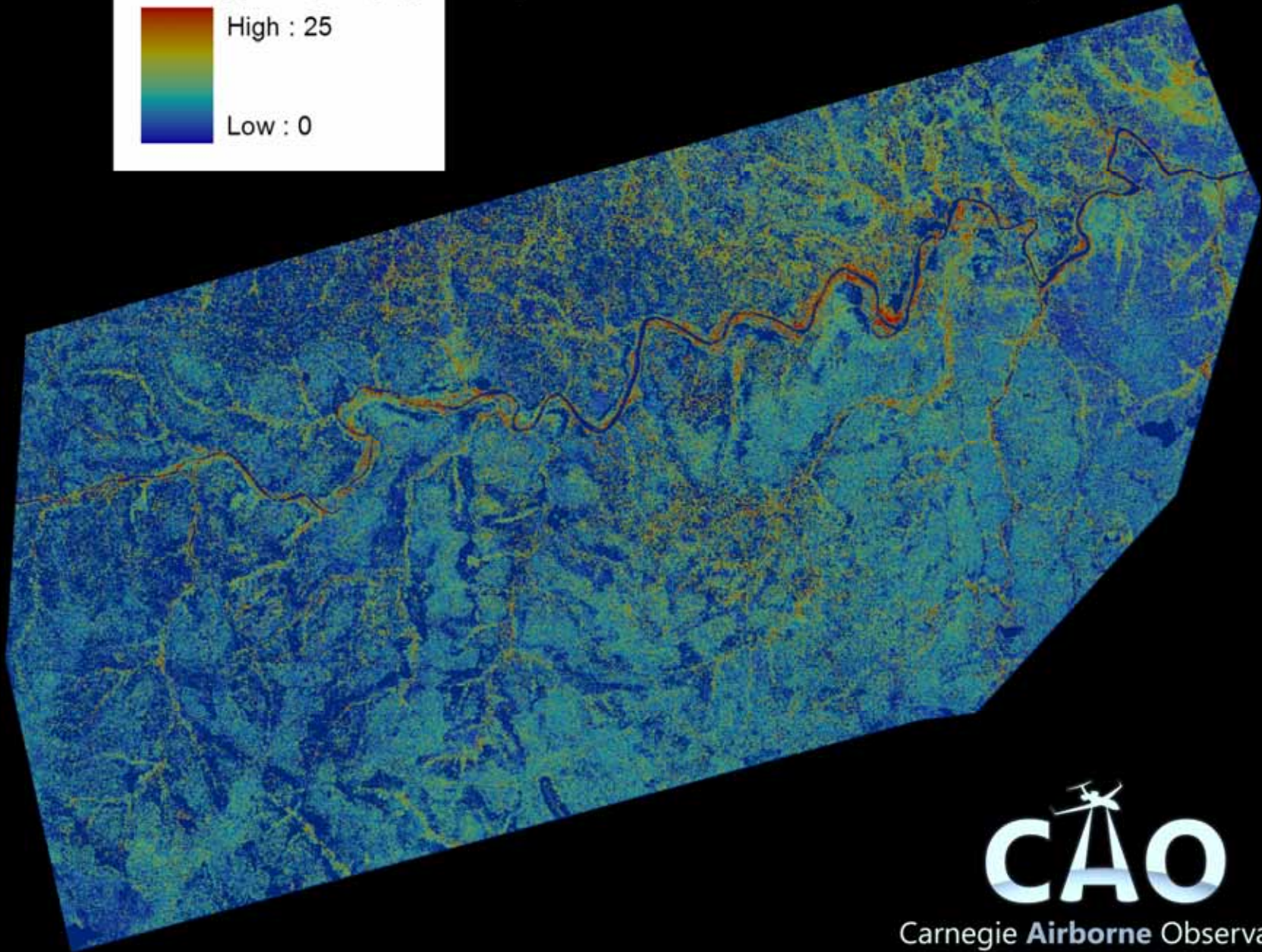
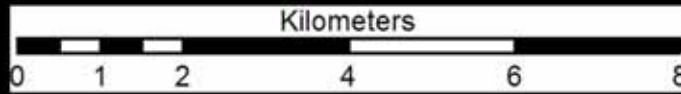
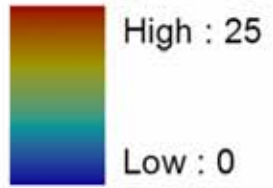






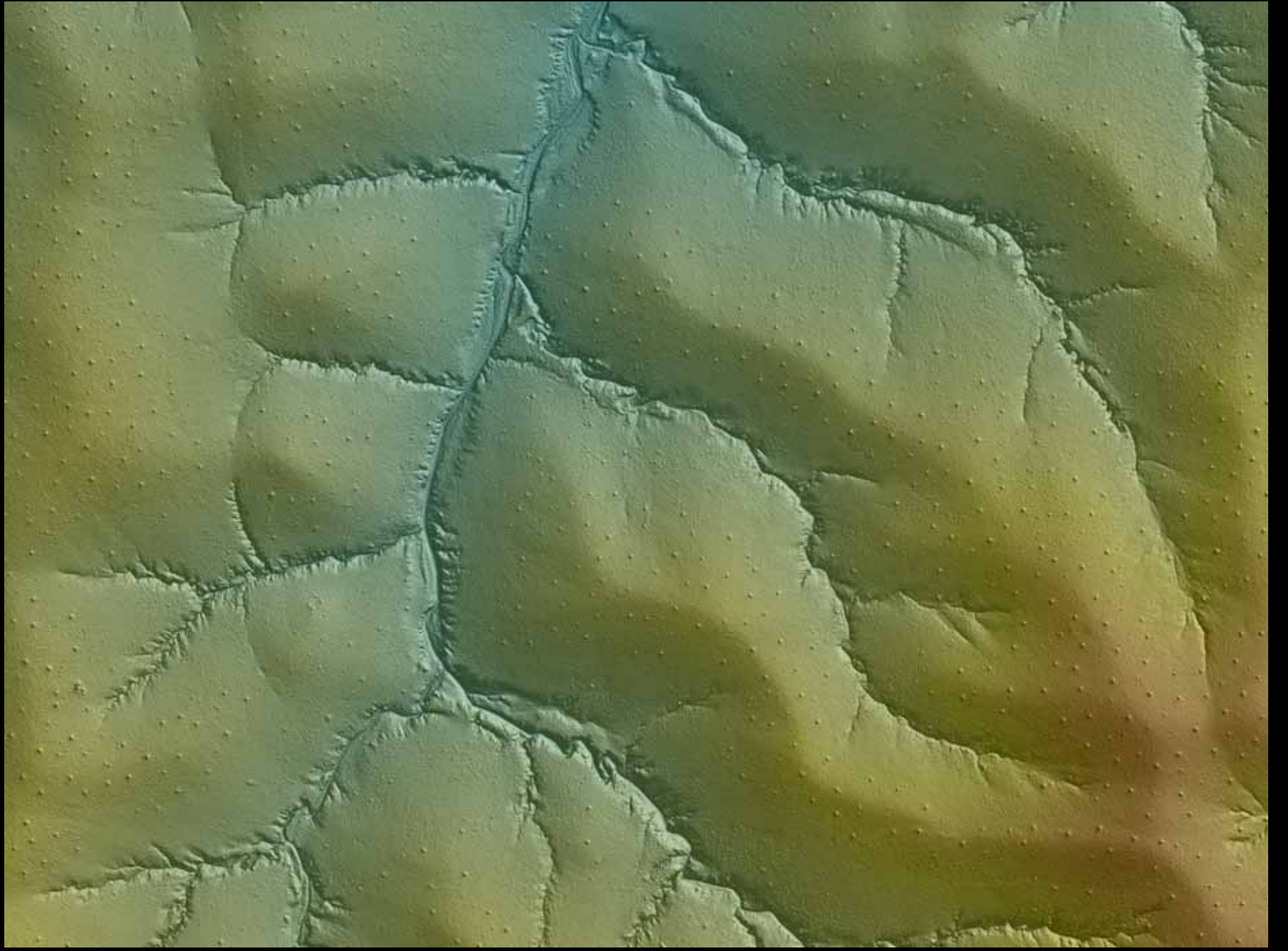


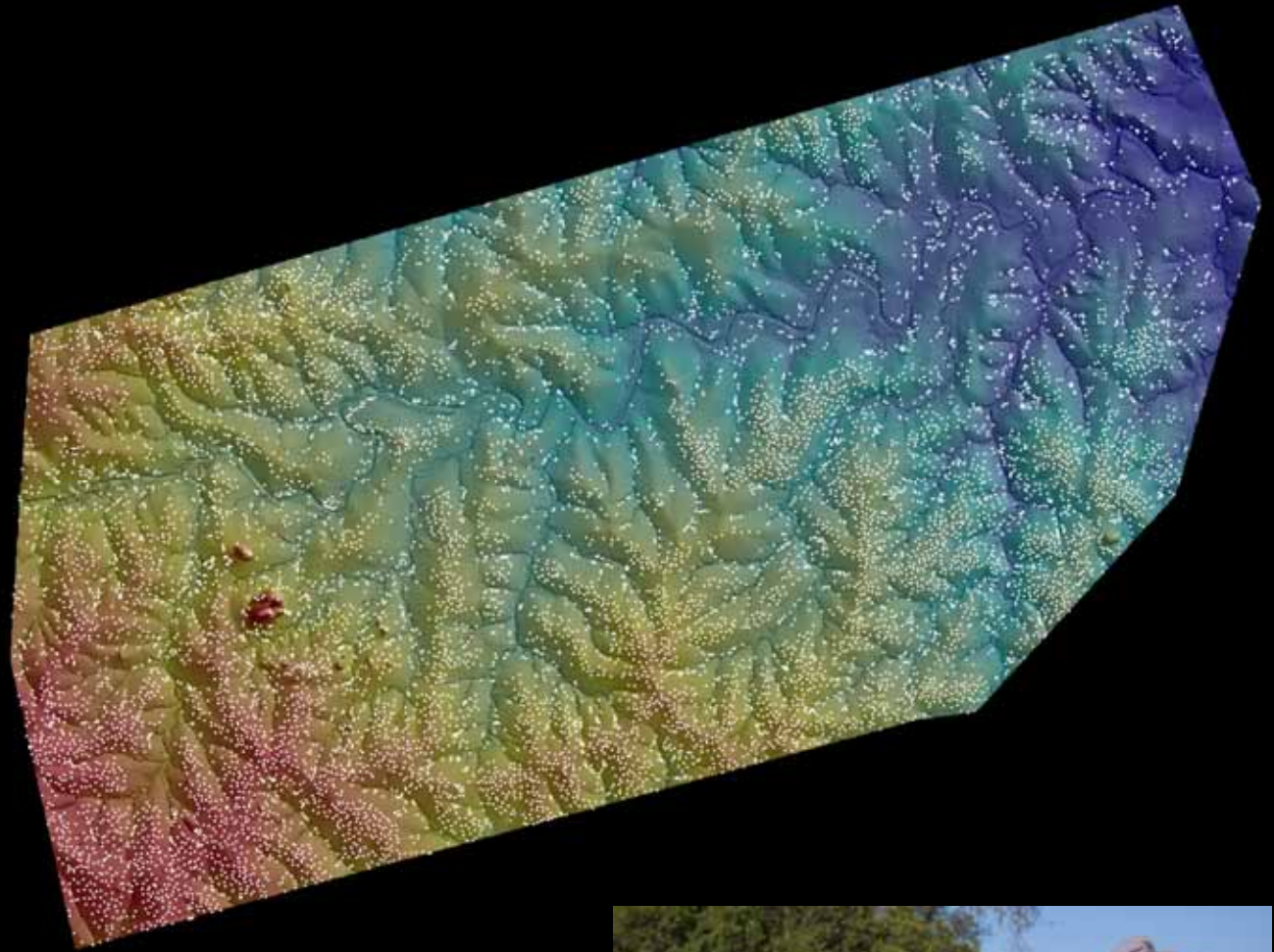
Canopy height (m)



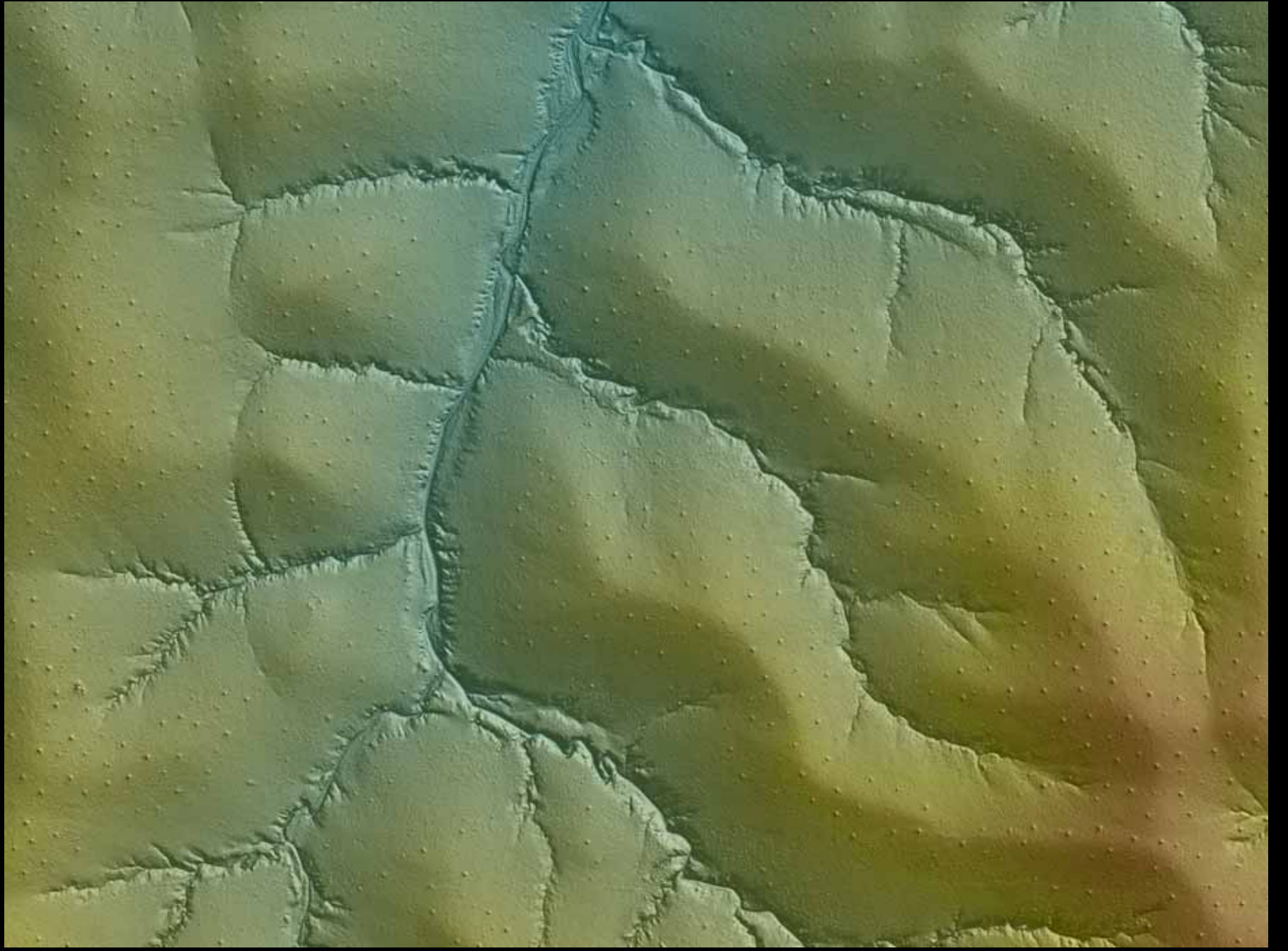
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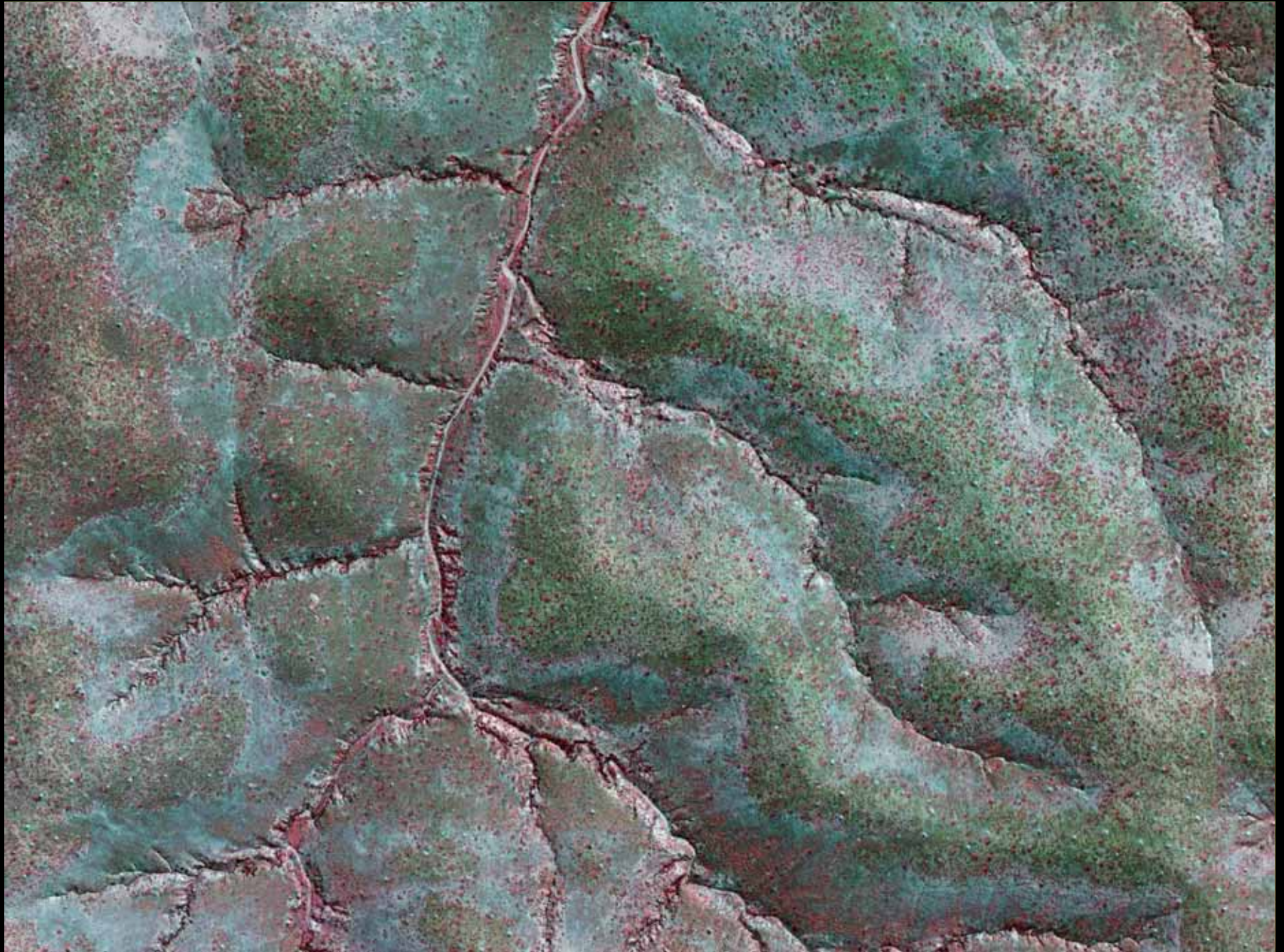




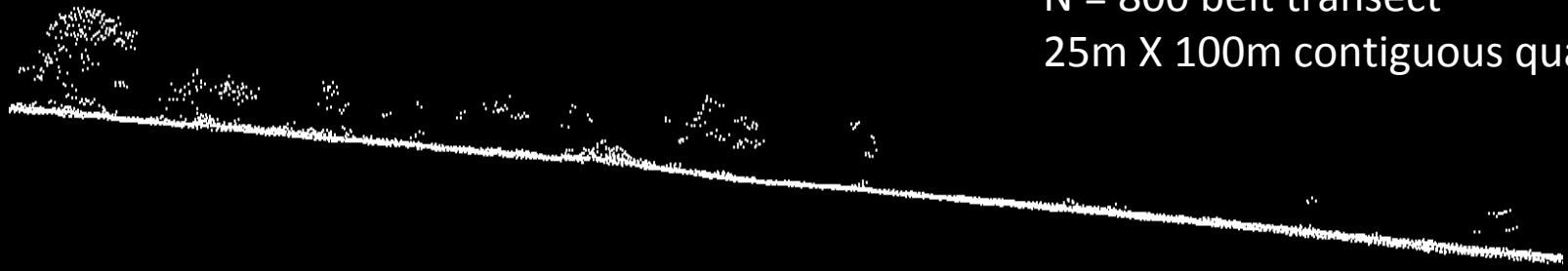






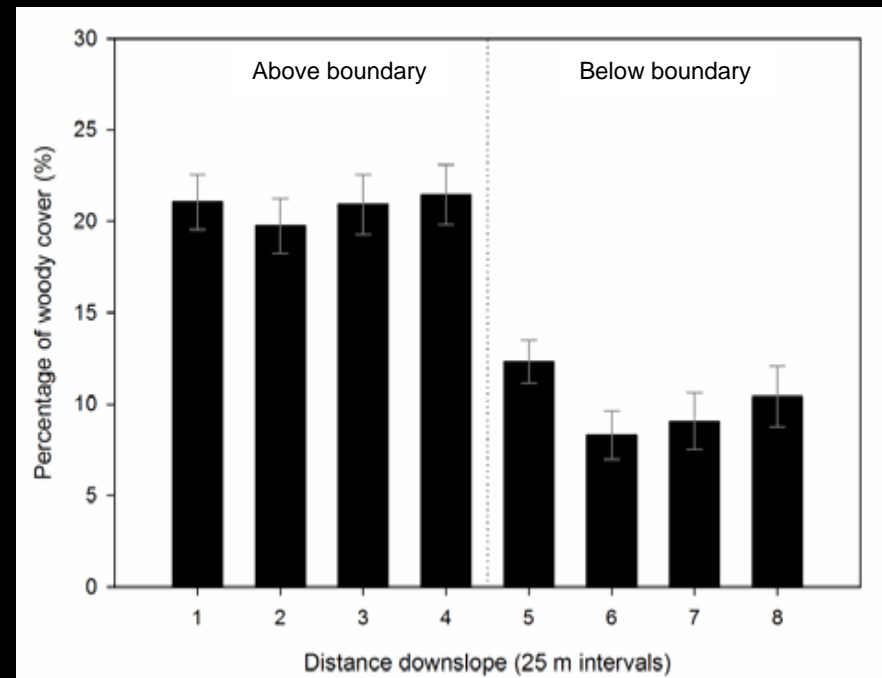
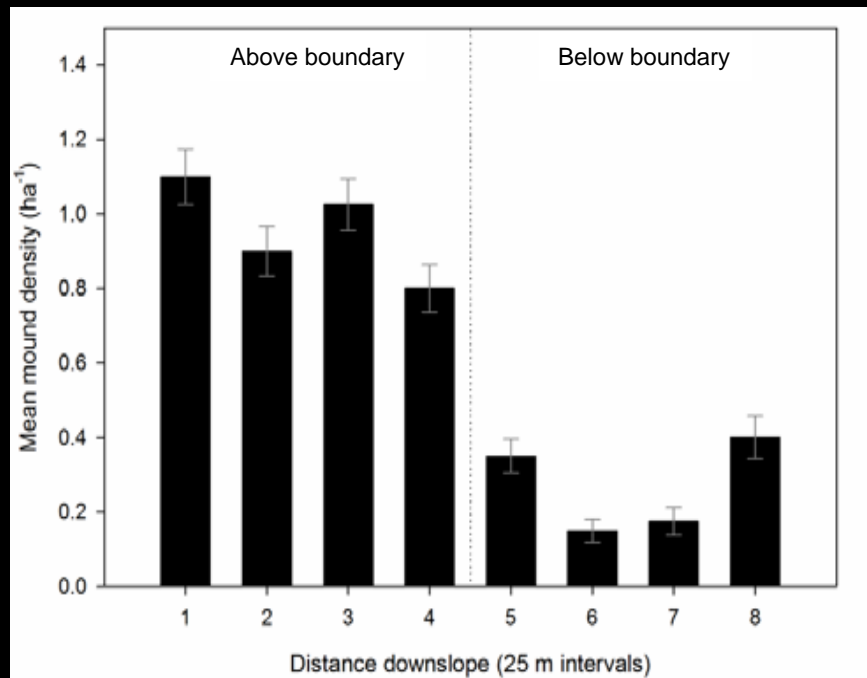


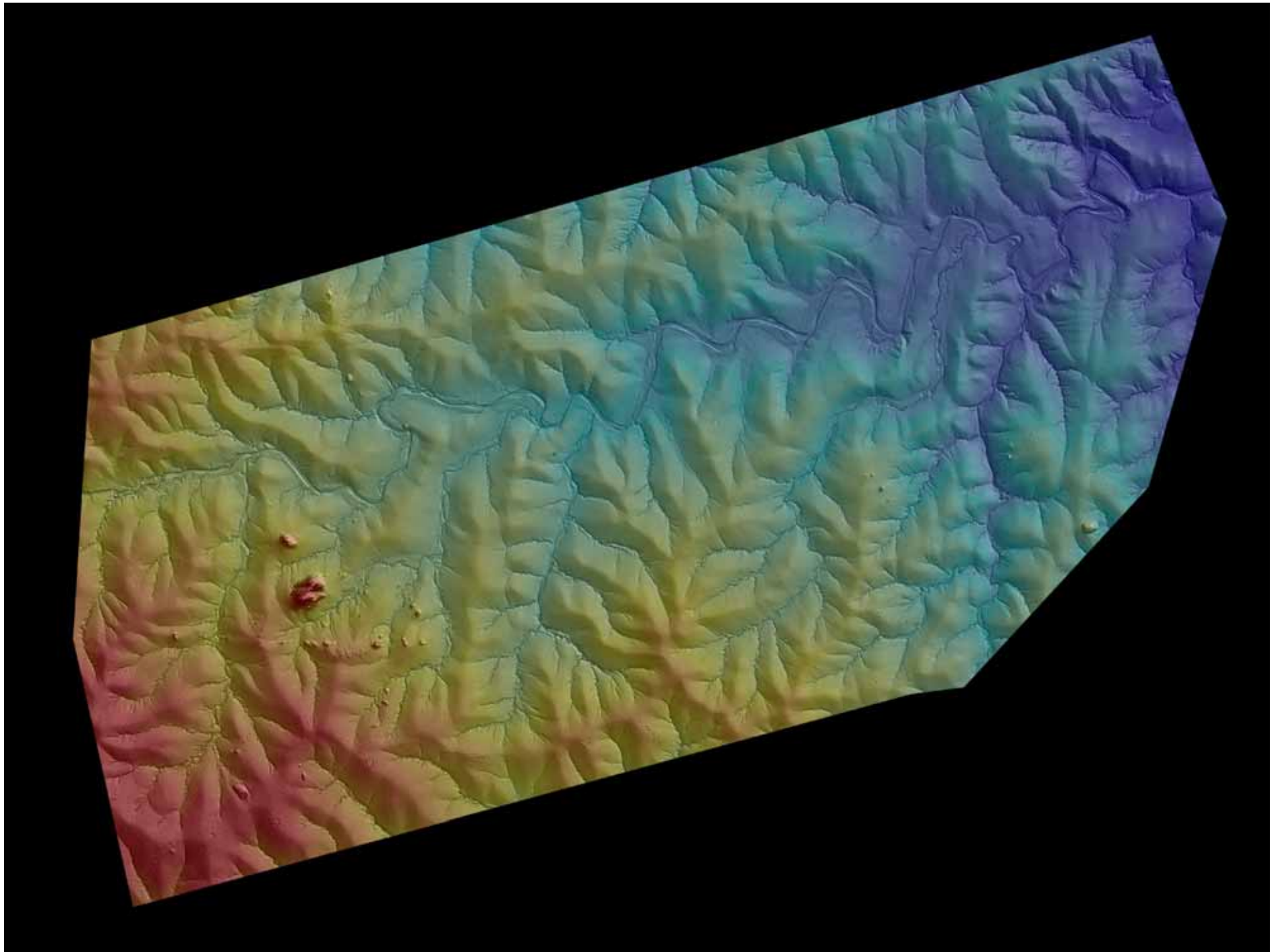
N = 800 belt transect
25m X 100m contiguous quadrats

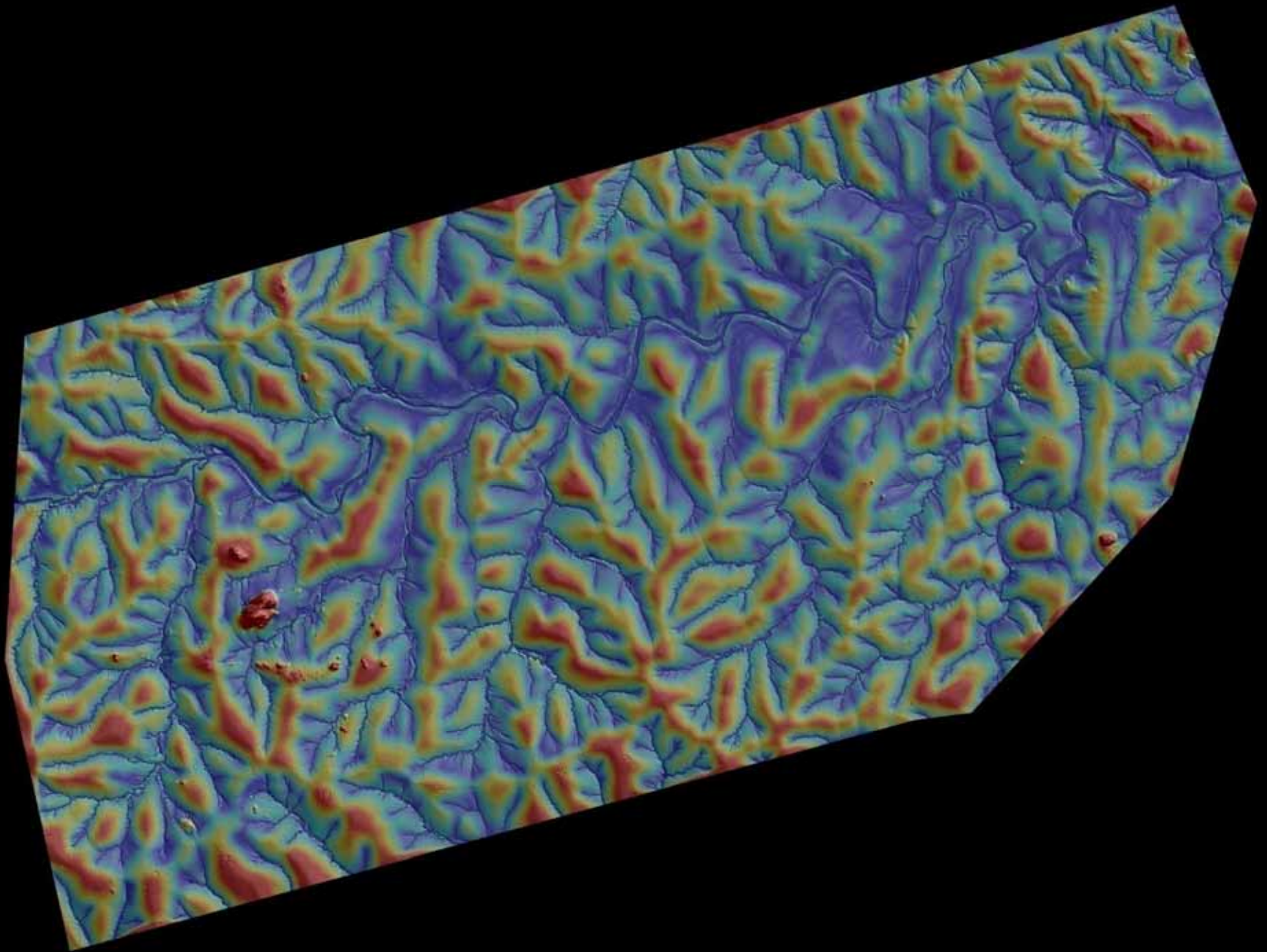


Termite mounds

Woody vegetation

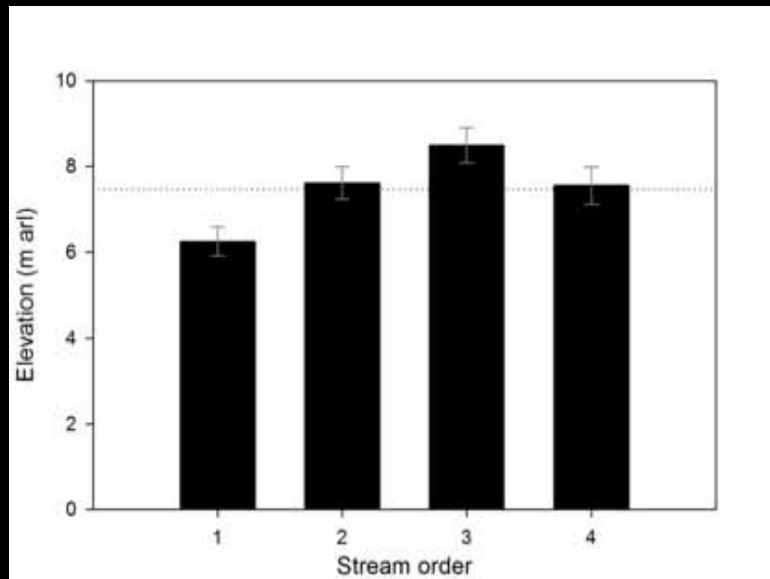




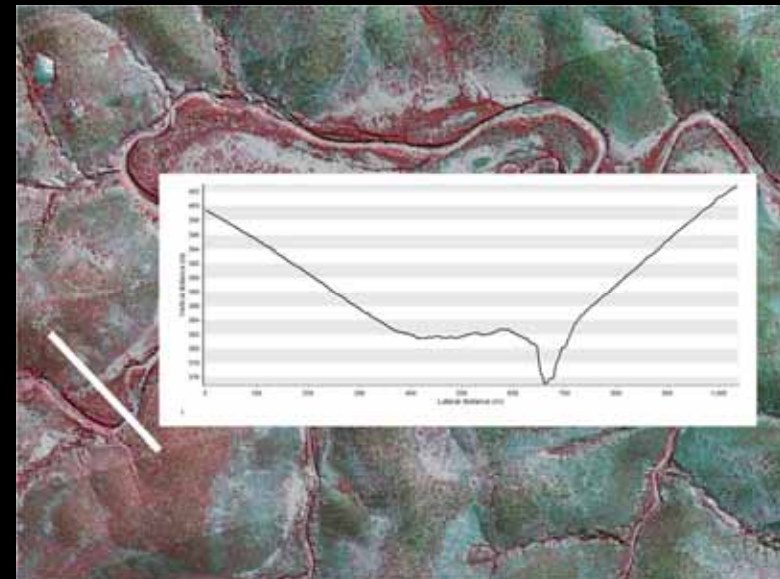


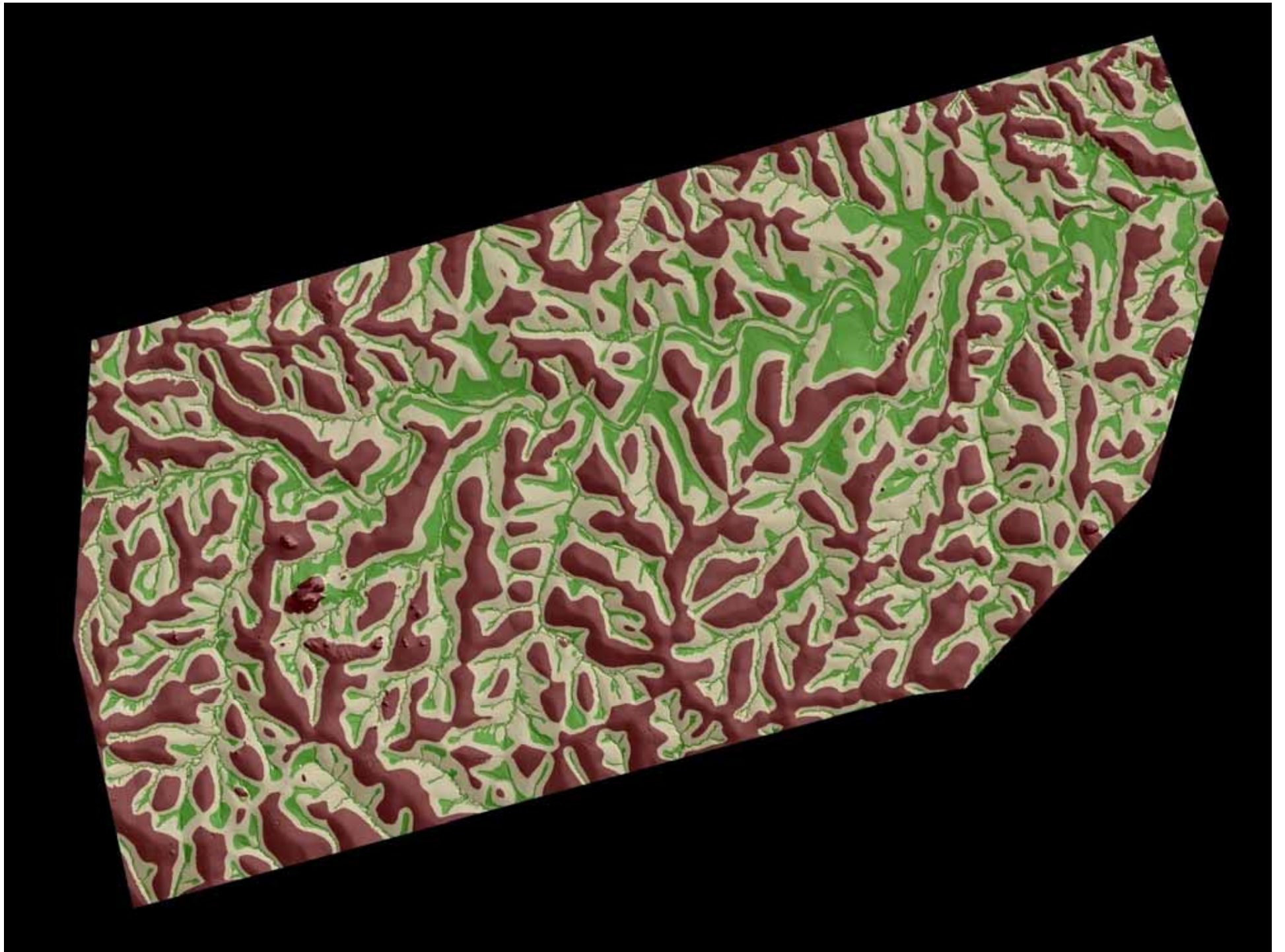
Boundary locations

Crest / Slope

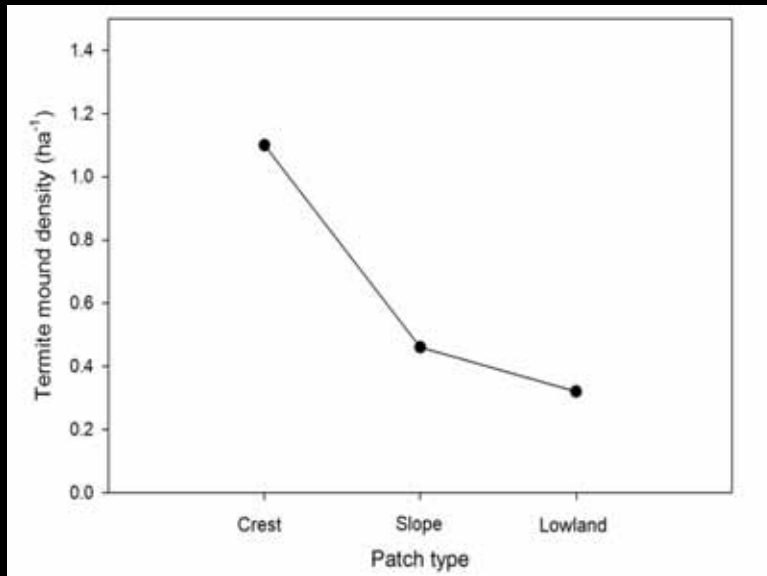


Slope / Lowland

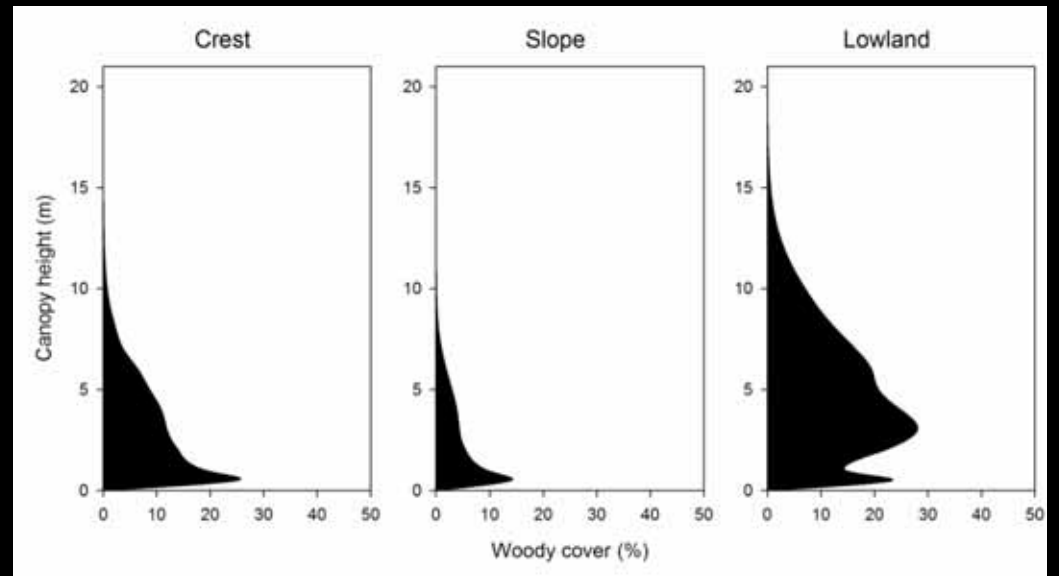




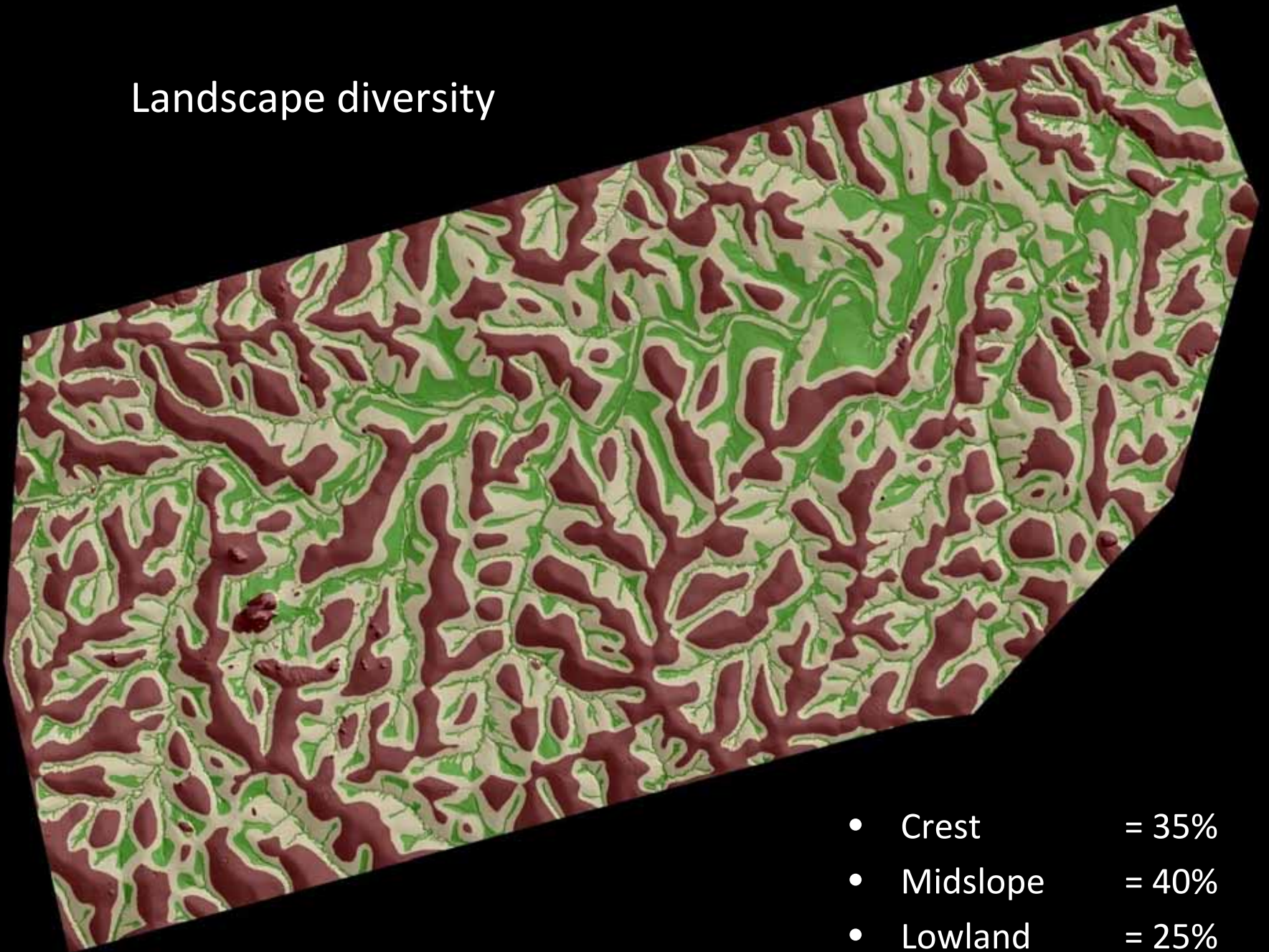
Mound density



Vegetation vertical structure



Landscape diversity



- Crest = 35%
- Midslope = 40%
- Lowland = 25%

Moving forward with a 3D, spatially explicit and dynamic perspective of catenal formations

Context

Scale

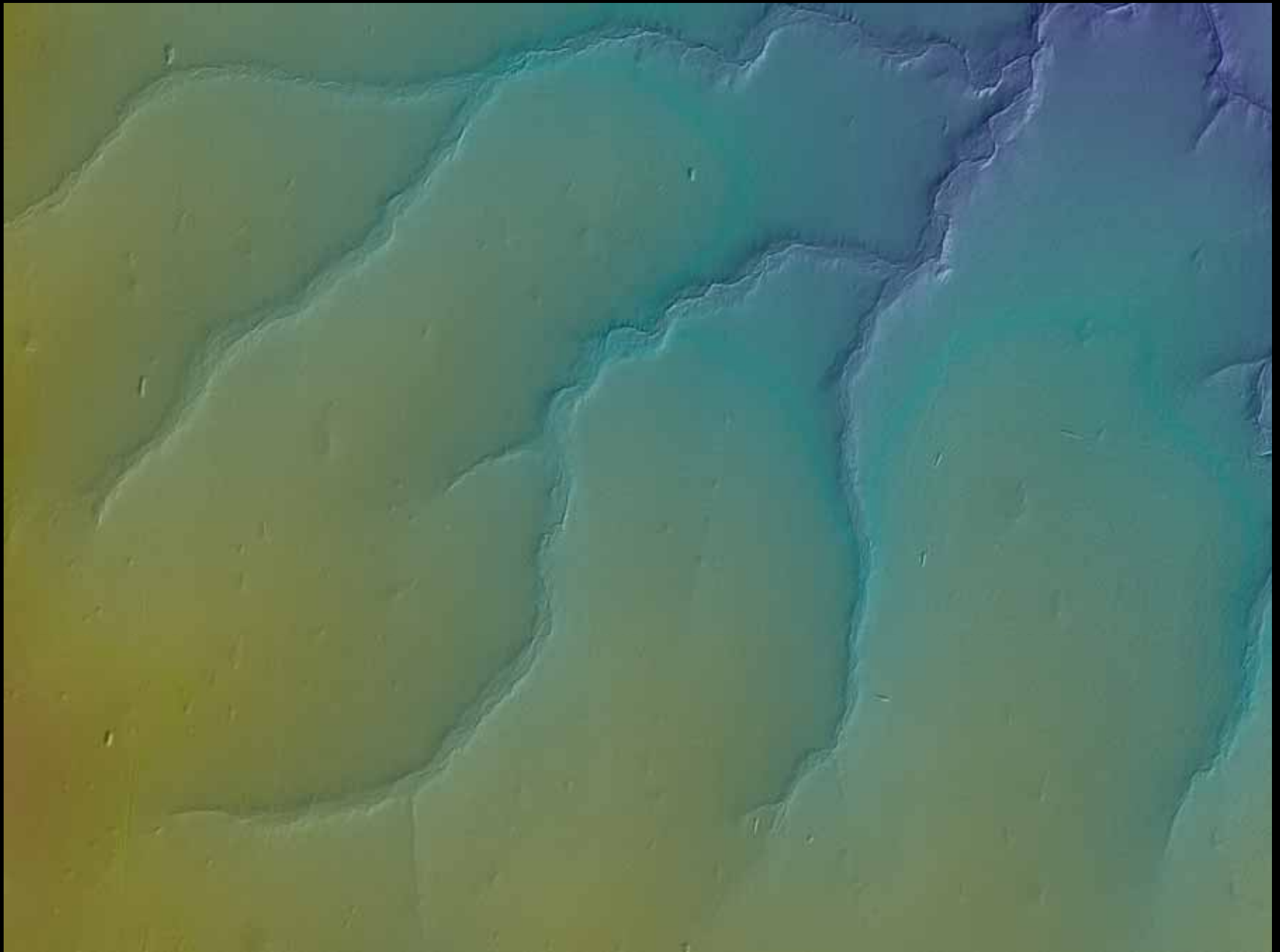
Feedbacks



Context









Scale

Differences in degree
rather than kind



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Feedbacks

Vegetation / Hydrology /
Organisms

Acknowledgements

- Andrew Mellon Foundation
 - Science
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 - Development of CAO
- SANParks