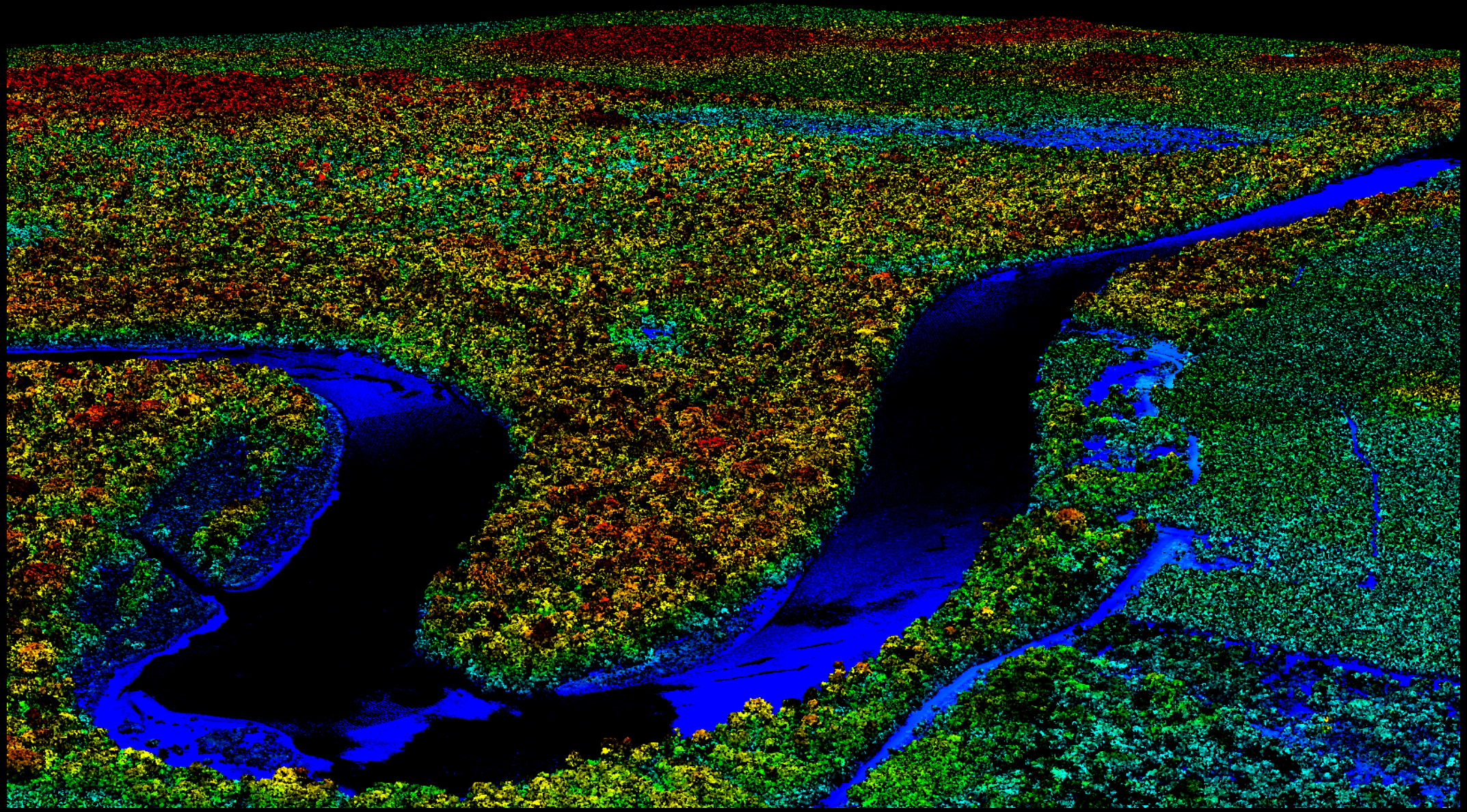
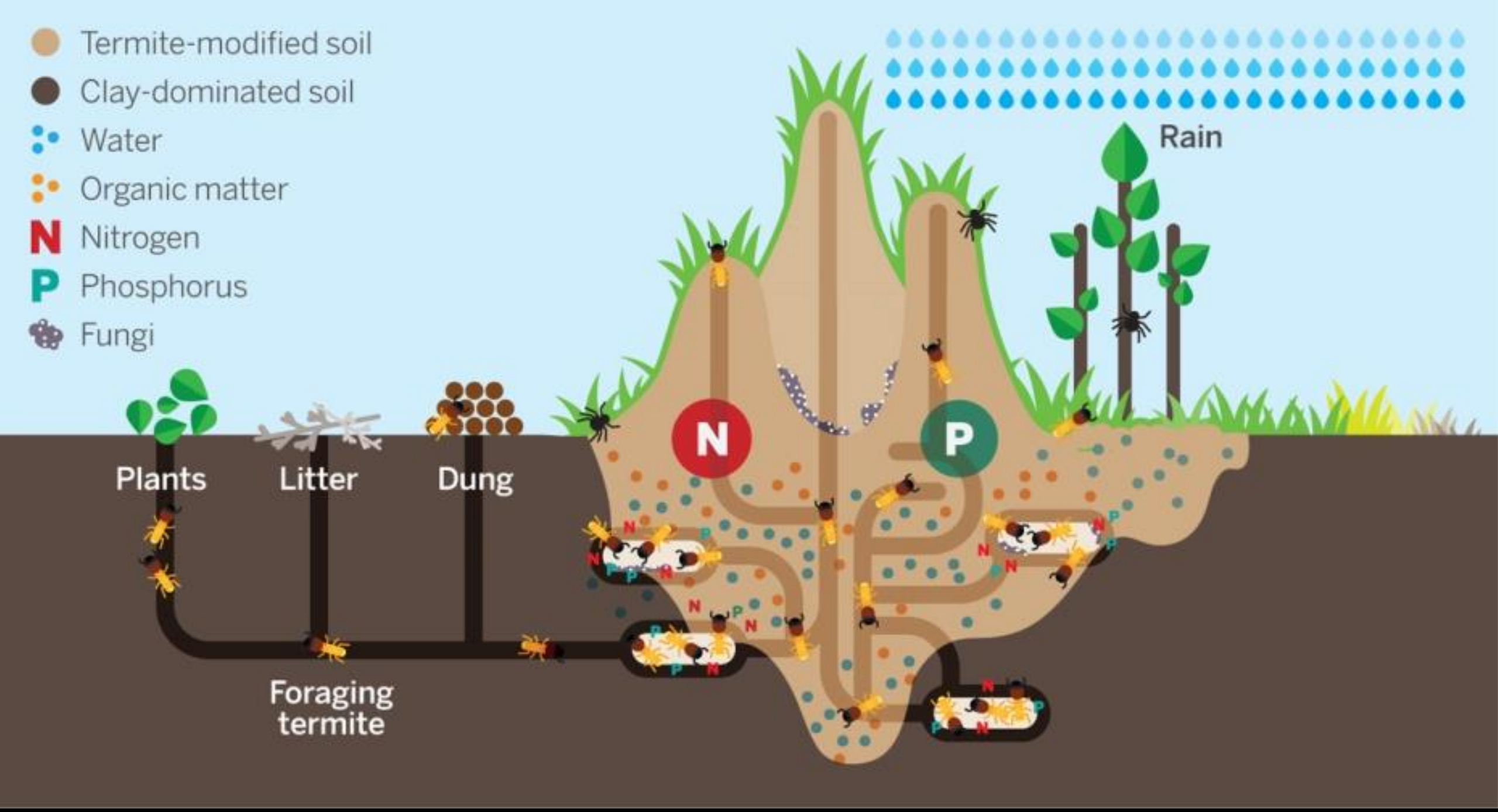
Using AI in ‘large’ ecological datasets



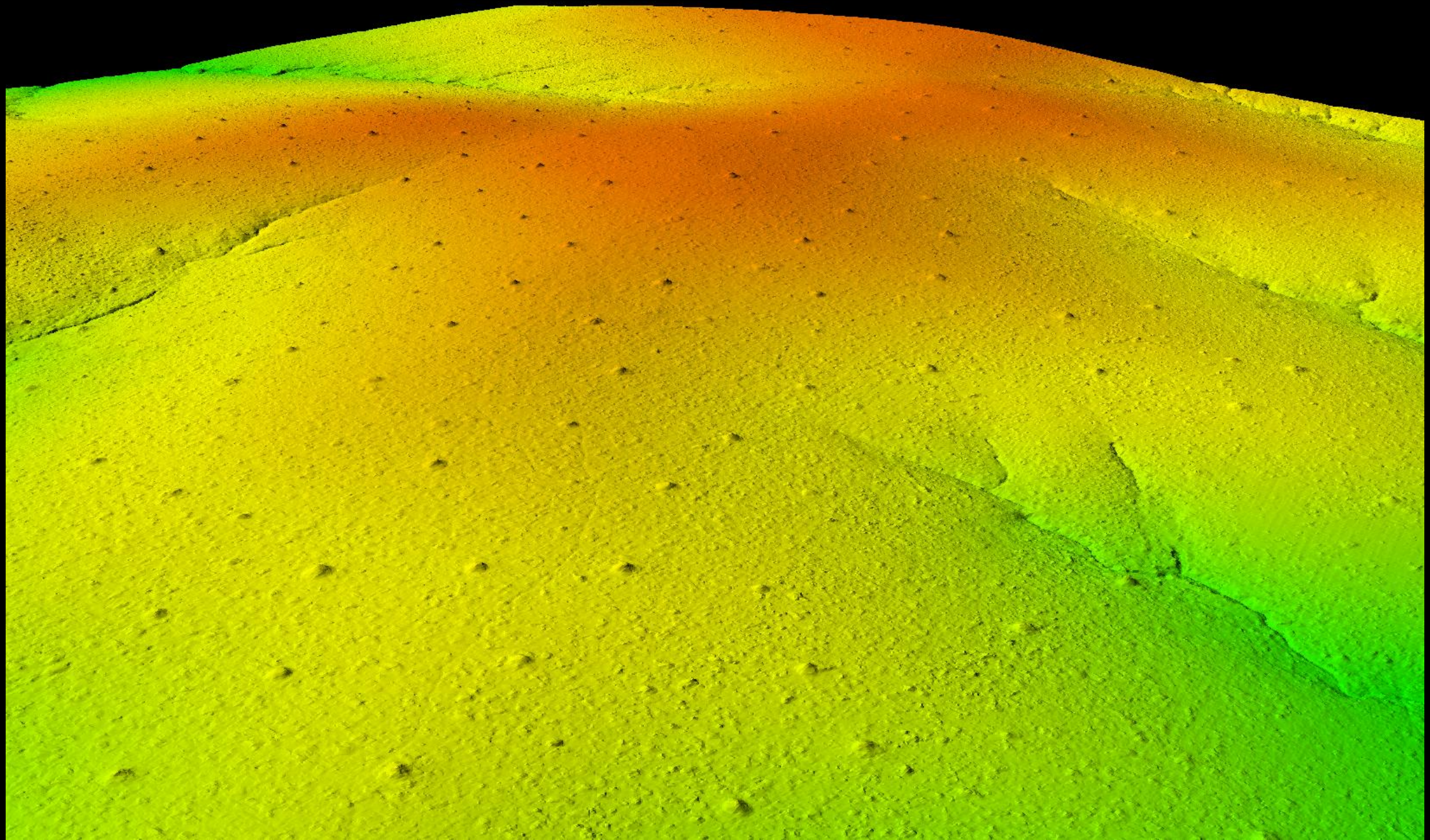
Andrew B. Davies, Organismic & Evolutionary Biology, Harvard University

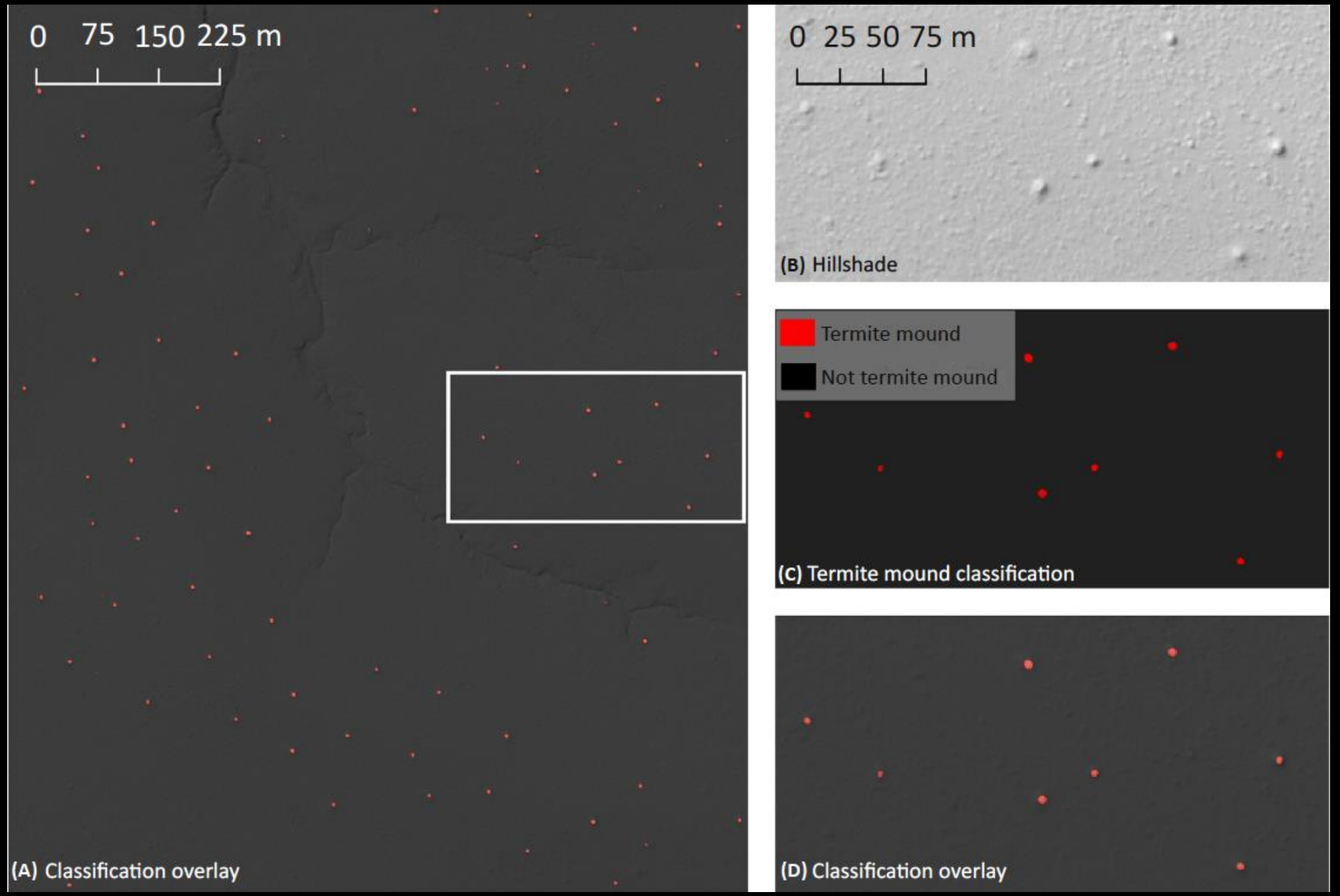
Ecological datasets

- Historically small datasets from field measurements
- Recent advances in remote sensing (satellite, airborne, drones)
- Camera trapping
- Genomics
- Computational resources and skills
- Present day datasets are large and getting larger
- Many ecologists still lack computer science and ‘big data’ analytical skills



Credit: G. GRULLÓN/SCIENCE





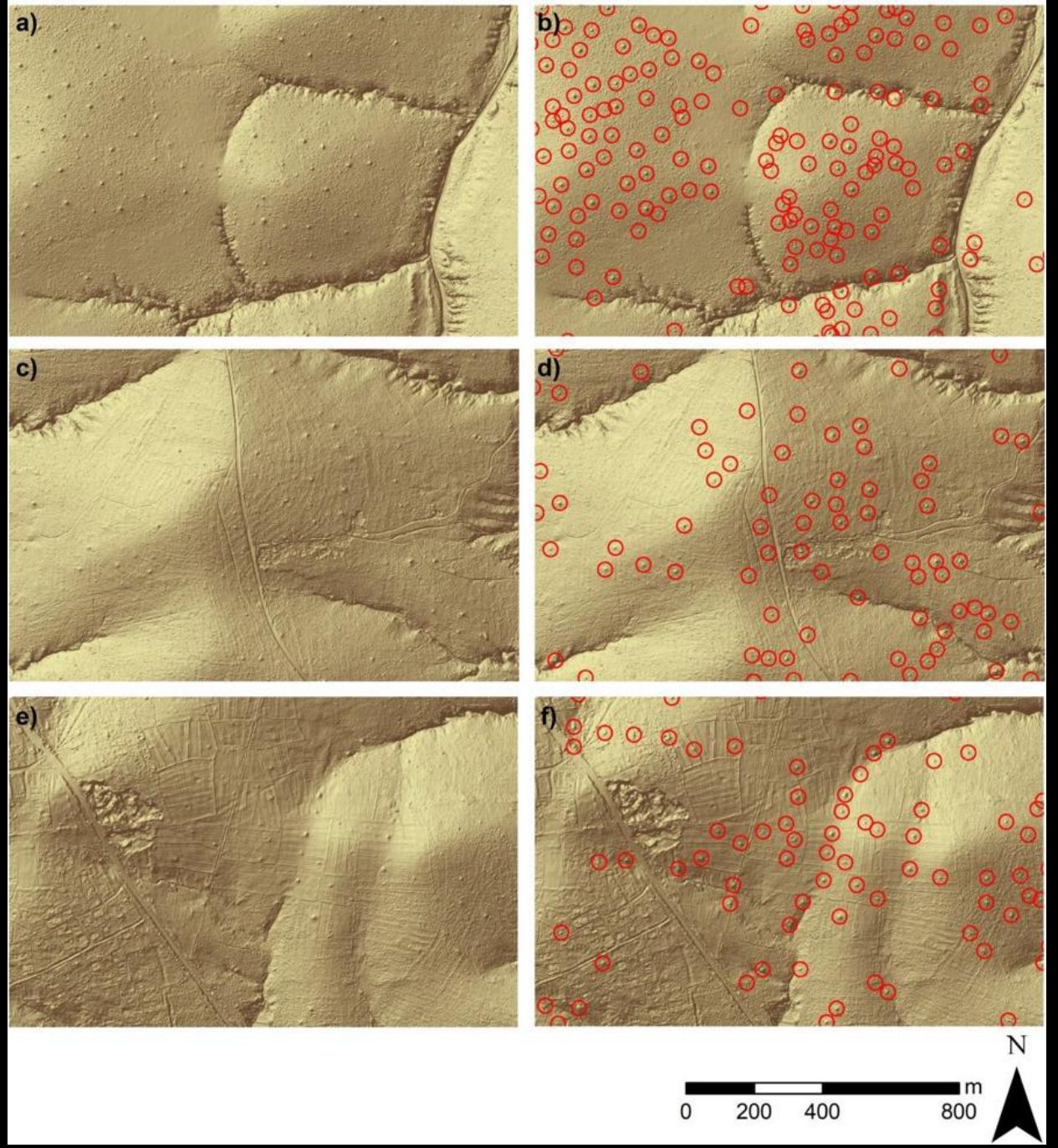
Brodrick, Davies & Asner 2019 Trends in Ecology and Evolution

Davies, Brodrick, Parr & Asner 2020 Environmental Research Letters

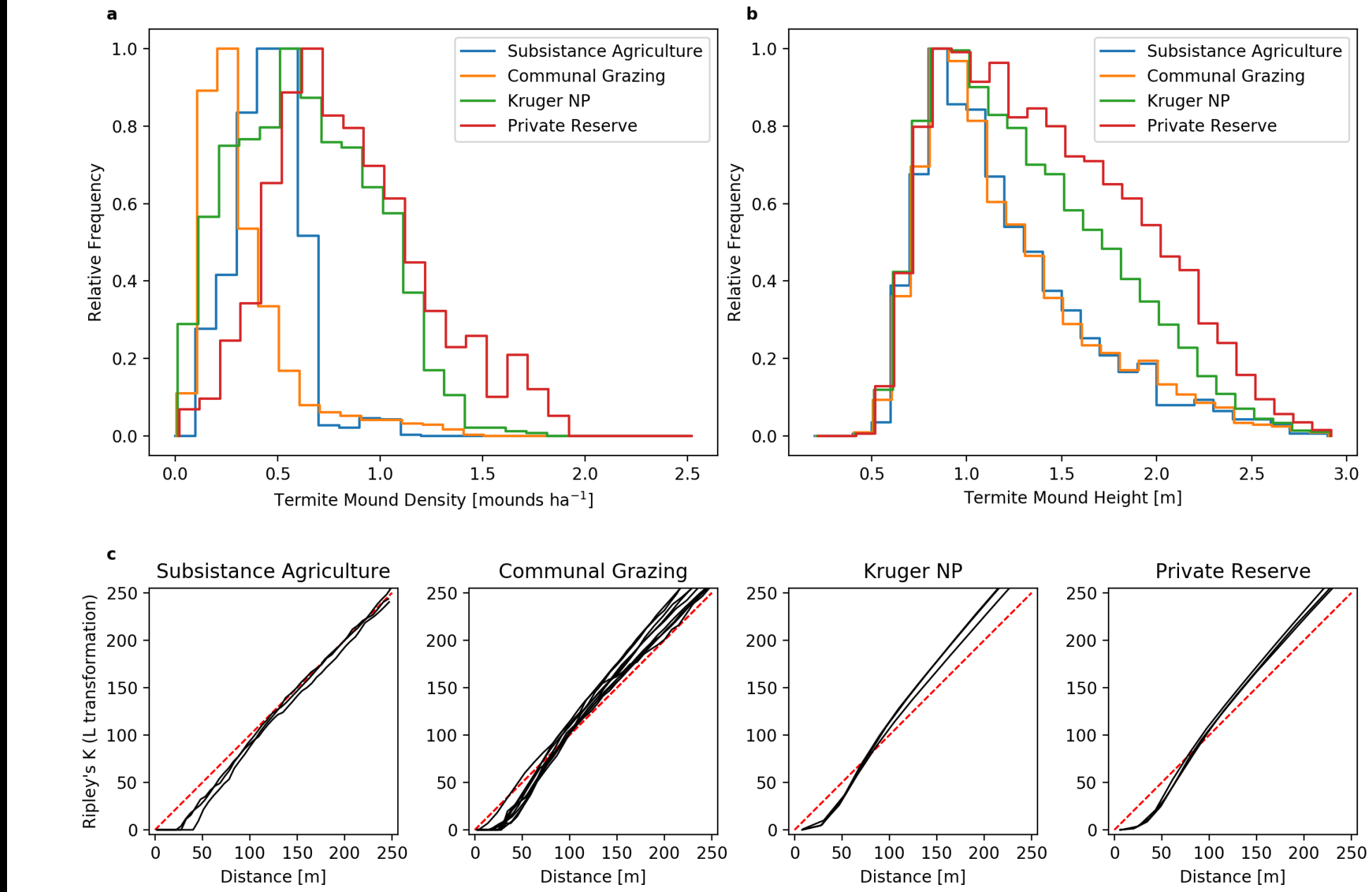
Protected Area

Grazing

Agriculture



Davies, Brodrick, Parr & Asner 2020 Environmental Research Letters



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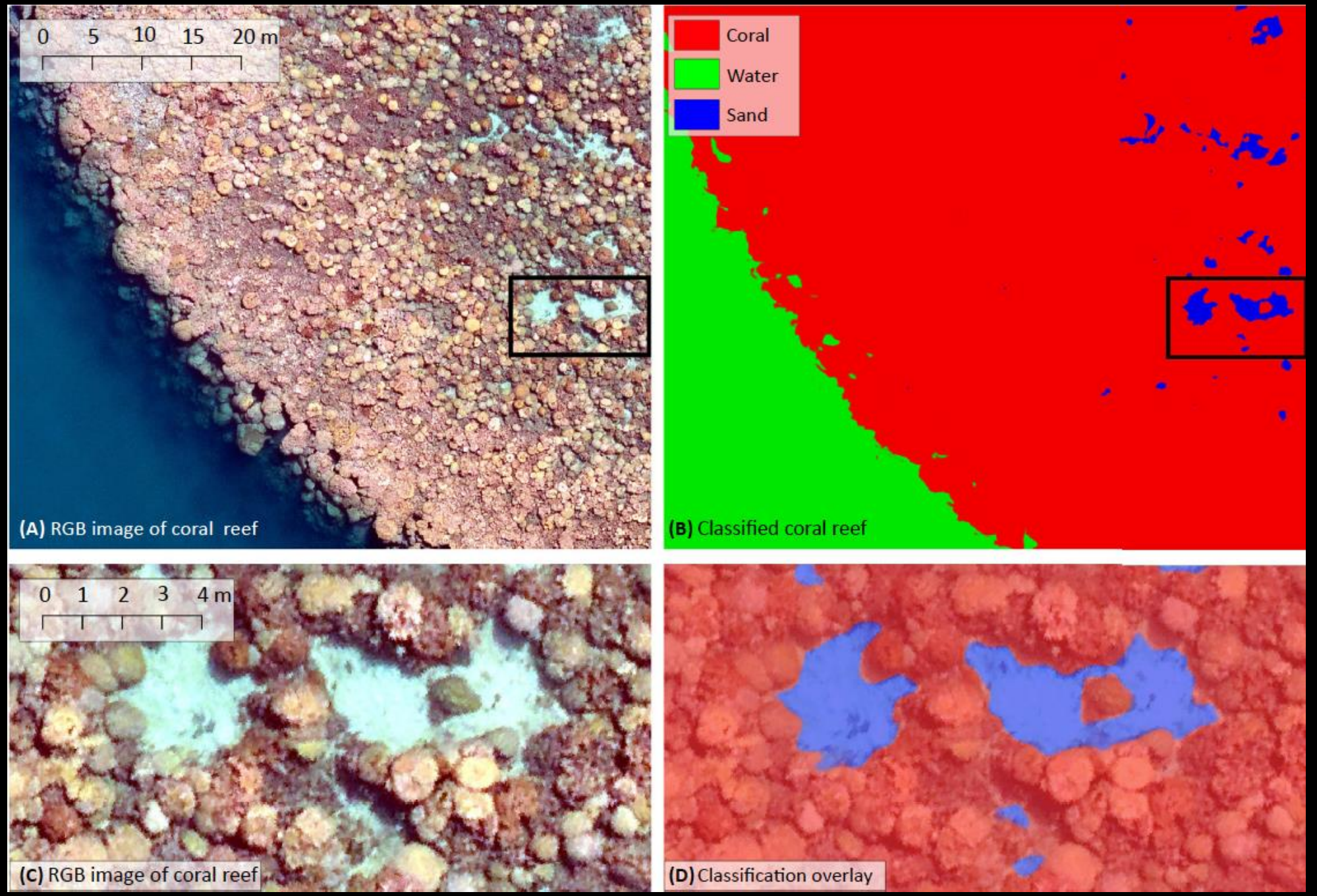

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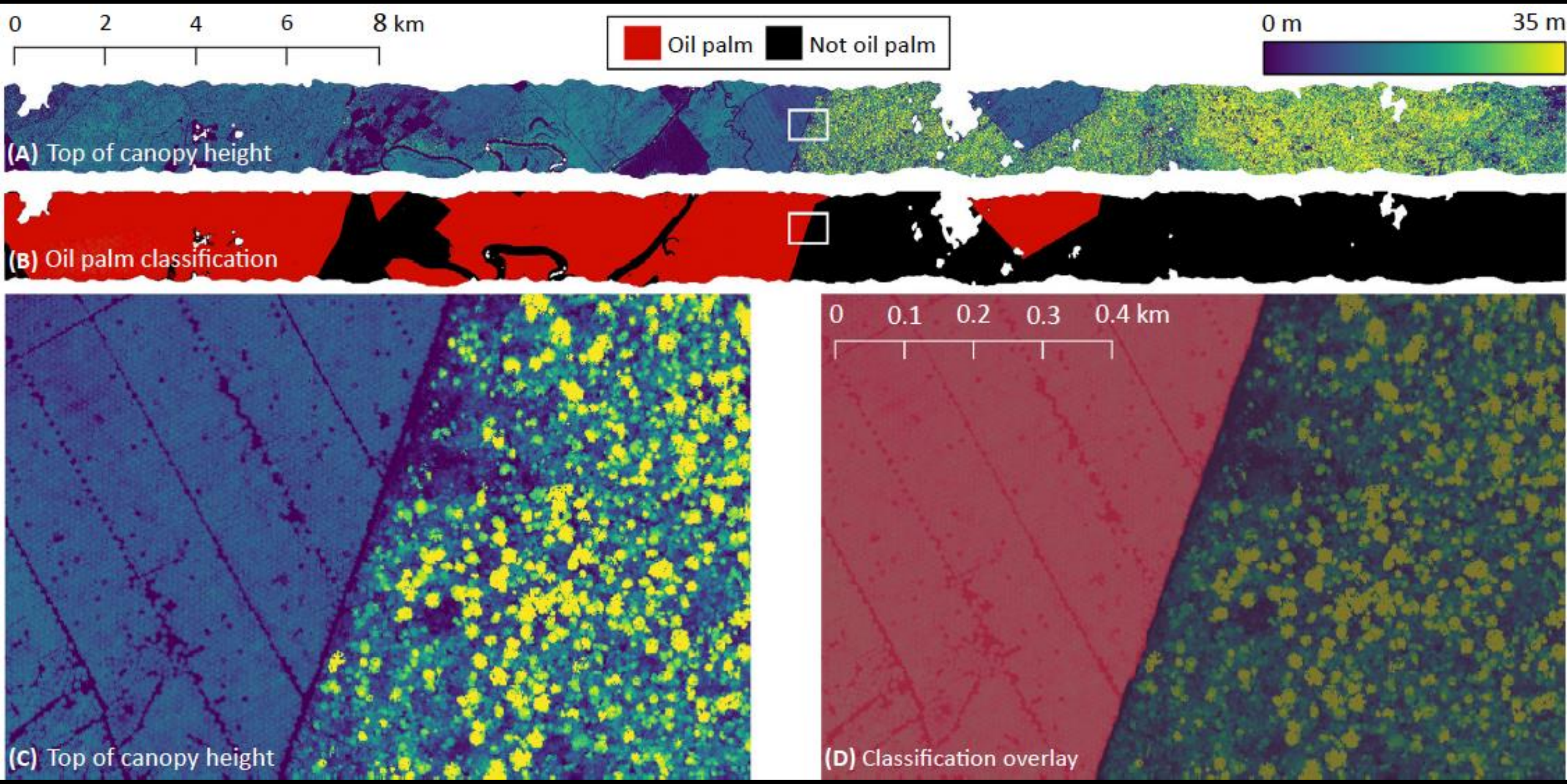

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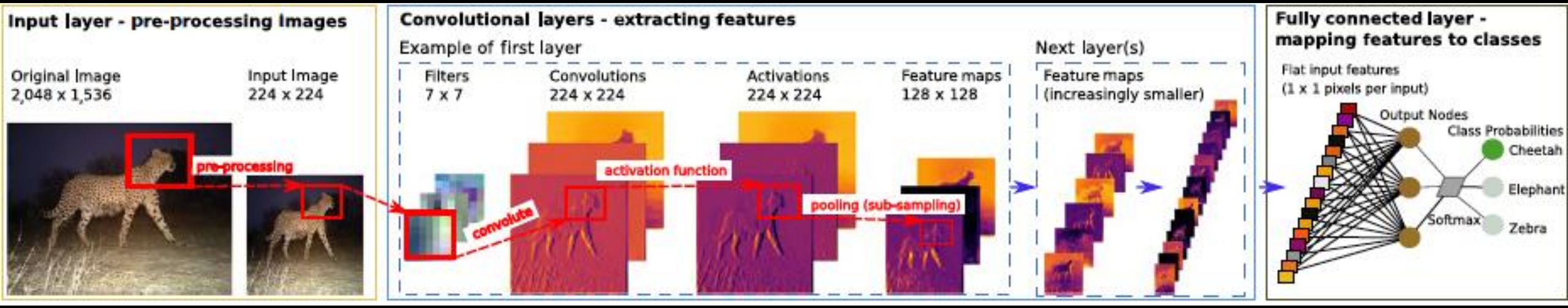
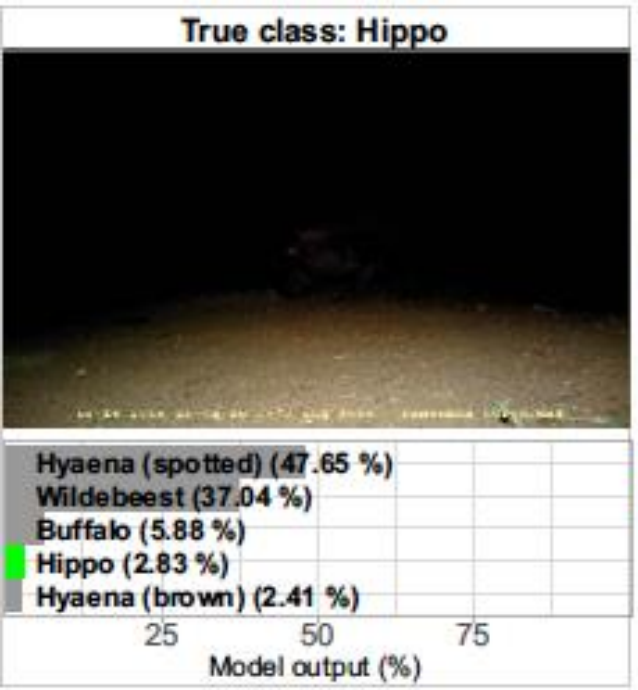
RESEARCH ARTICLE

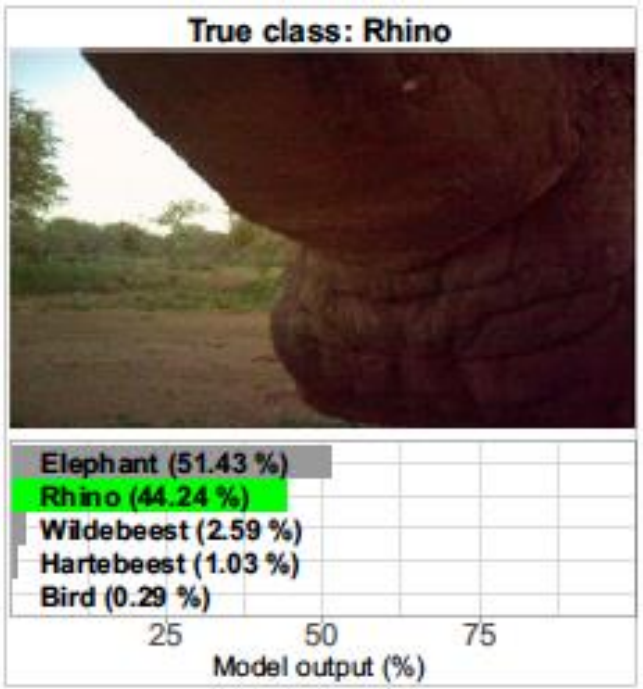
Methods in Ecology and Evolution BRITISH ECOLOGICAL SOCIETY

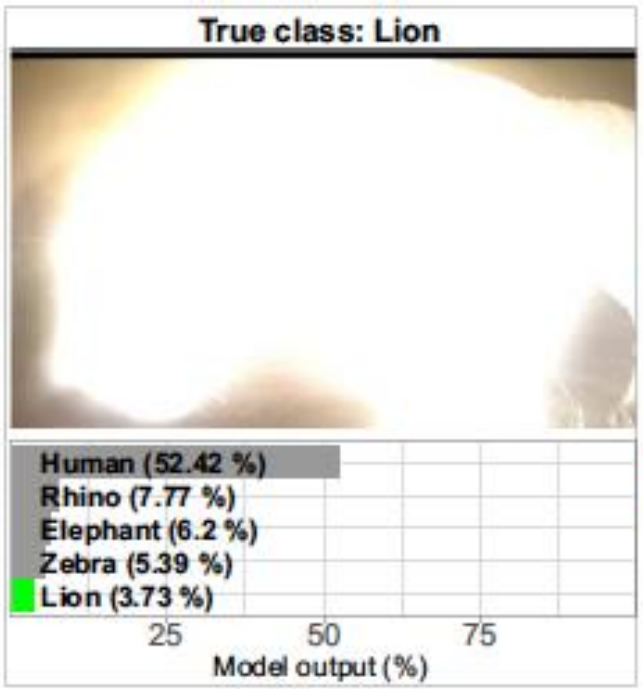
Identifying animal species in camera trap images using deep learning and citizen science

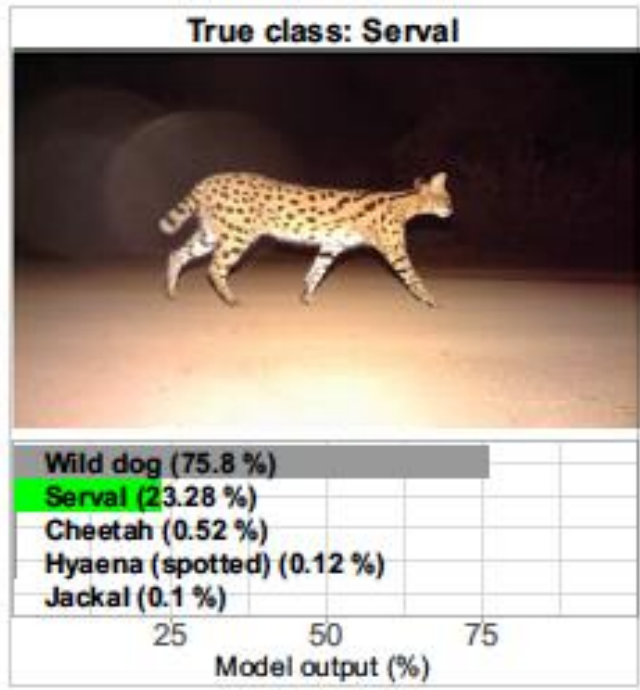
Marco Willi[1] | Ross T. Pitman[2,3] | Anabelle W. Cardoso[4] | Christina Locke[5] | Alexandra Swanson[6] | Amy Boyer[7] | Marten Veldthuis[6] | Lucy Fortson[1]











Willi et al. 2019 Methods in Ecology and Evolution

Outstanding questions/applications for ecology

- Can CNNs be extended to directly identify ecological patterns, rather than only biophysical components that ecologists can then link together as patterns?
- How can unsupervised CNNs facilitate the identification of ecologically relevant patterns and processes without predefined classes?
- How can CNN architectures be modified to incorporate temporal data to encapsulate both spatial and phenological context?
- How best can multiple scales and/or resolutions of remotely sensed data be integrated to match the scale of different biophysical components?
- How can AI be used to make ecological predictions rather than only identify components or images and describe patterns?