
bioscape.io
BIOSCAPE
Biodiversity Survey of the Cape
NRF
National Research Foundation
SAEON
South African Environmental Observation Network
University at Buffalo
UNIVERSITY OF CALIFORNIA
MERCED
JPL
Jet Propulsion Laboratory
California Institute of Technology
NASA
UNESCO
UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD

BioSCape is a team effort!

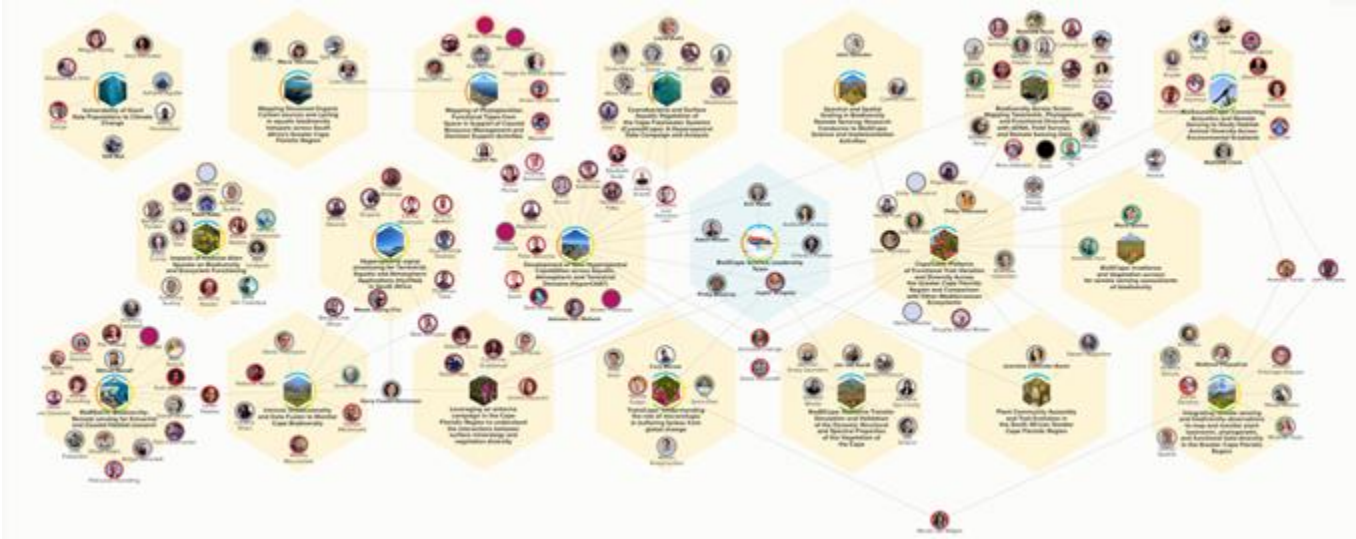
Adam Wilson
Co-PI & Terrestrial Lead

Erin Hestir
Co-PI & Aquatic Lead

Jasper Slingsby
Co-PI & South Africa Lead

Anabelle Cardoso
Research Scientist & Team Manager

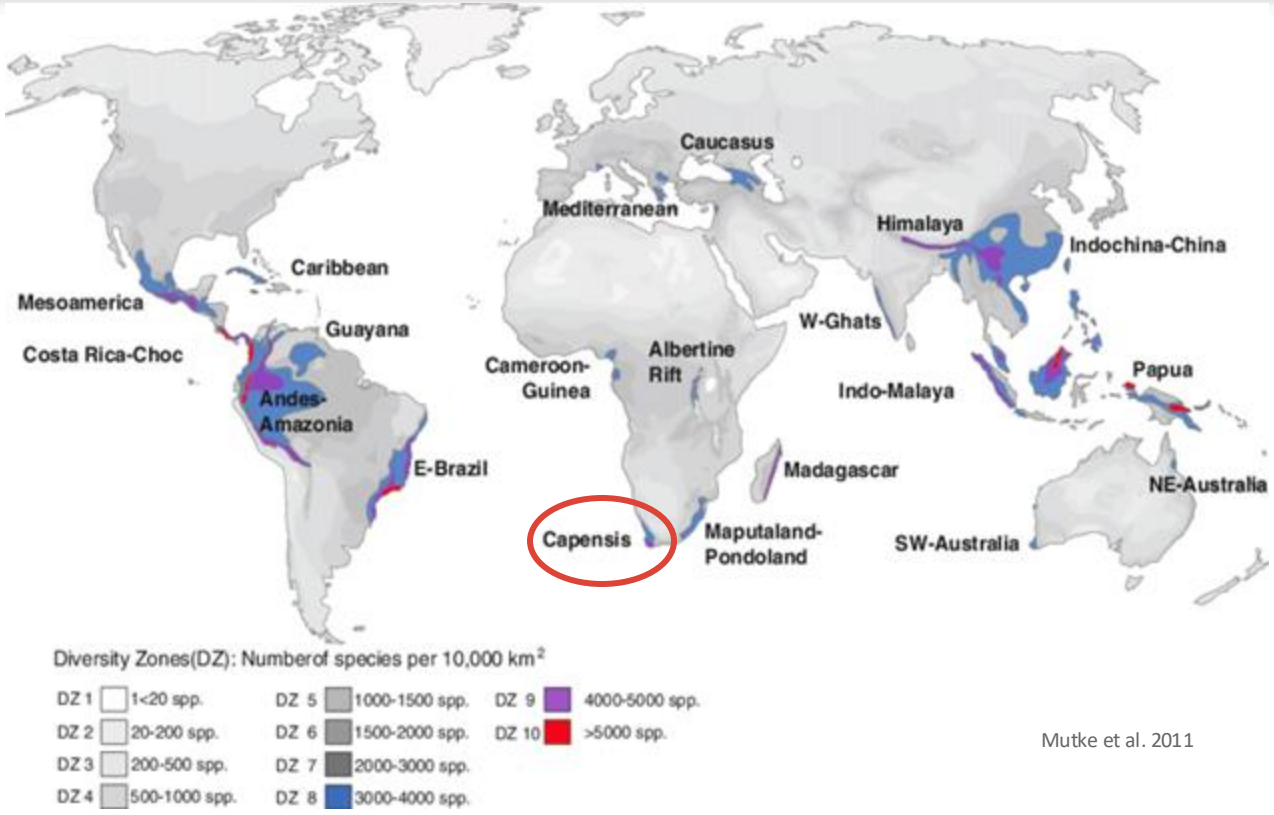
Phil Brodrick
Data PI



And ~150 others across 19 sub-projects

50:50 US:SA

BioSCape - NASA's first biodiversity-focused field campaign



Mutke et al. 2011

Greater Cape Floristic Region

Exceptionally high terrestrial & aquatic biodiversity

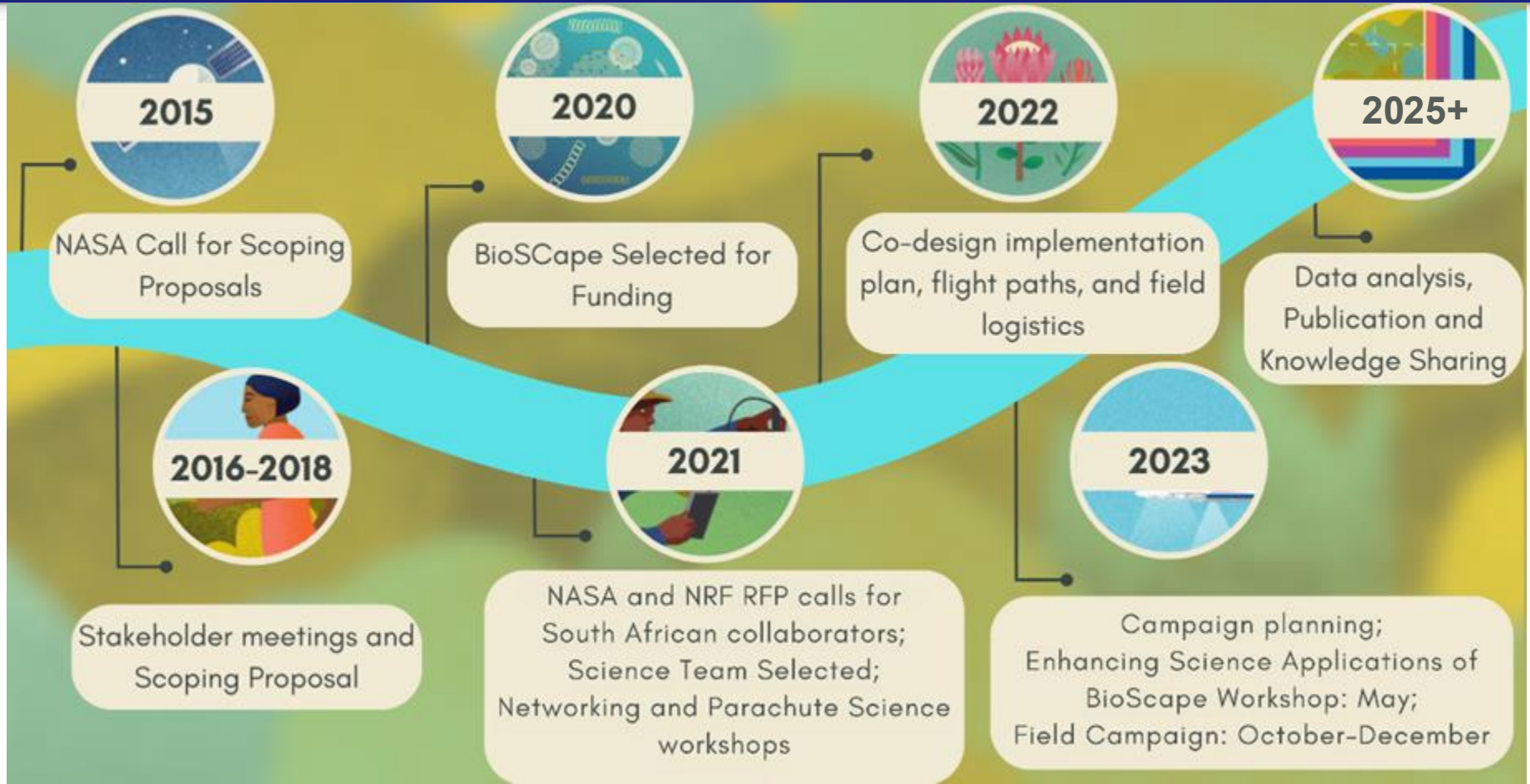
2 Terrestrial biodiversity hotspots

8 Terrestrial Biomes
- >12,000 plant species!
- ~20% Africa's plants in ~1% of area
- 78% endemic

6 Marine Biomes
- 3rd highest marine endemism

Unique freshwater systems

Timeline


2015
NASA Call for Scoping Proposals
2016-2018
Stakeholder meetings and Scoping Proposal
2020
BioSCape Selected for Funding
2021
NASA and NRF RFP calls for South African collaborators; Science Team Selected; Networking and Parachute Science workshops
2022
Co-design implementation plan, flight paths, and field logistics
2023
Campaign planning; Enhancing Science Applications of BioScape Workshop: May; Field Campaign: October-December
2025+
Data analysis, Publication and Knowledge Sharing

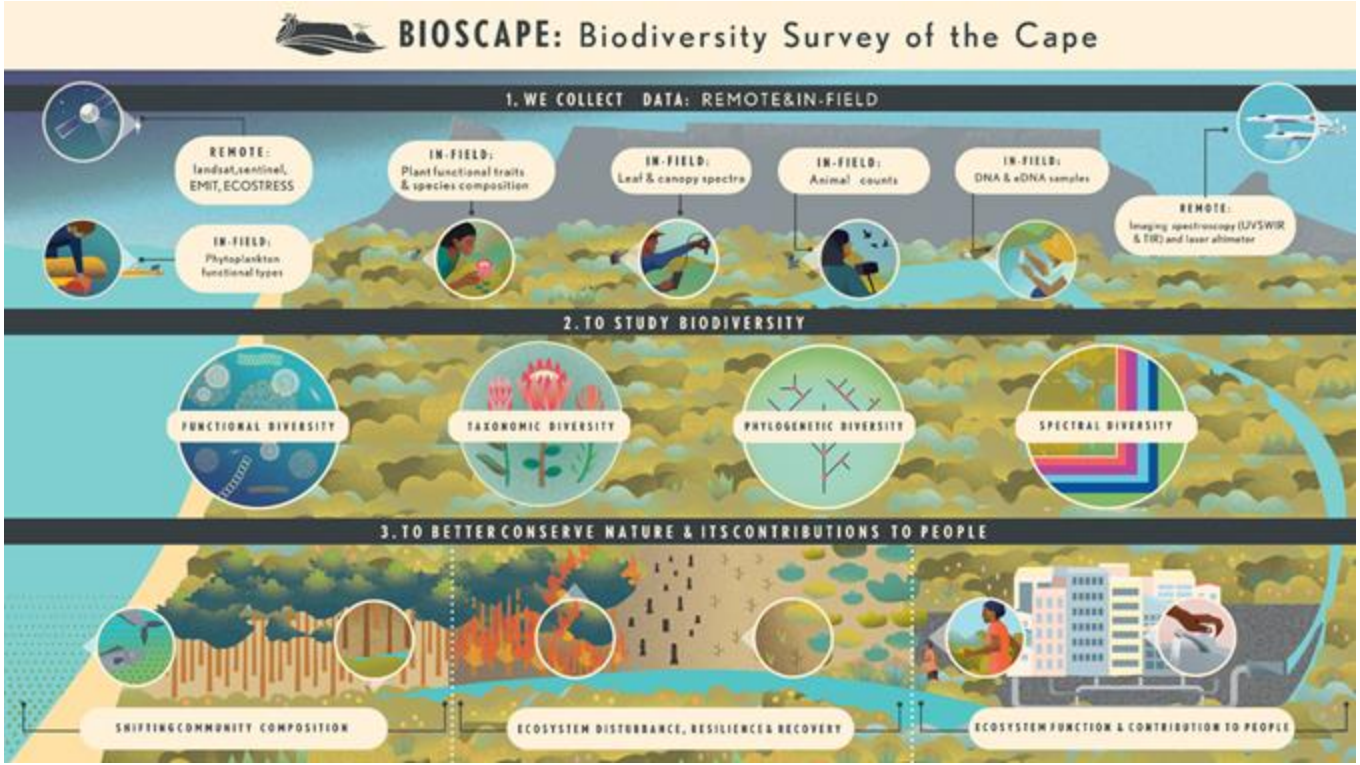
Research Objectives

Decadal Survey Question E-1:

What are the structure, function, and biodiversity of Earth's ecosystems, and how and why are they changing in time and space?

Three major research themes:

1
Distribution and abundance of biodiversity
2
Role of biodiversity in ecosystem functions?
3
Feedbacks between global change, biodiversity change, and ecosystem services?



Use-inspired science: Conservation Applications















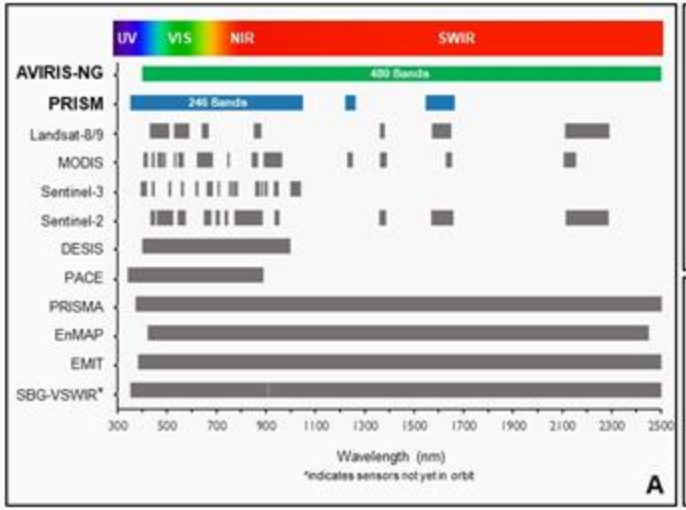

BioSCape - NASA's first biodiversity-focused field campaign

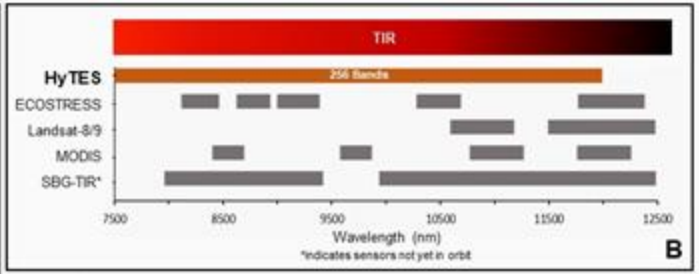
3 Imaging Spectrometers

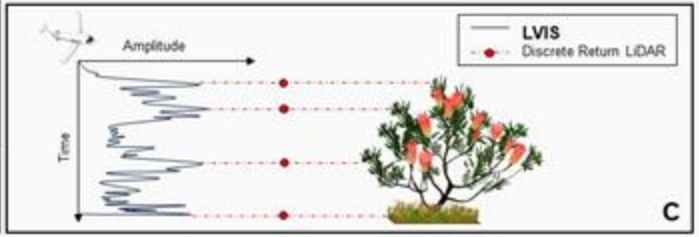
2 LiDAR

Many Satellite Overpasses

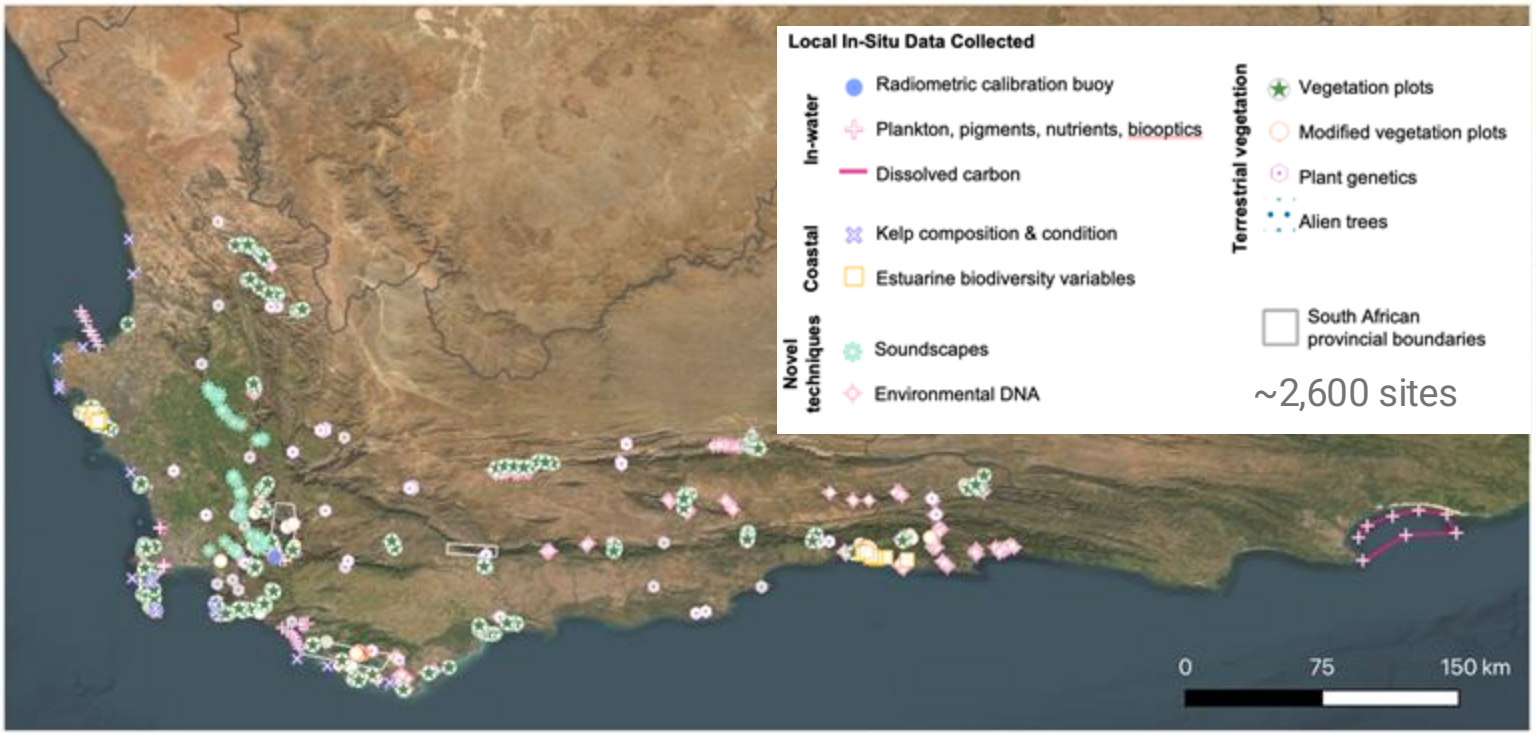
Diverse Field Data







BioSCape - Field Data



BioSCape is the largest Open Access imaging spectroscopy and structural high-resolution mapping endeavour in Africa

(and the Southern hemisphere?)

bioscape.io/data

Research co-development with local end users and capacity building

bioscape.io/engage

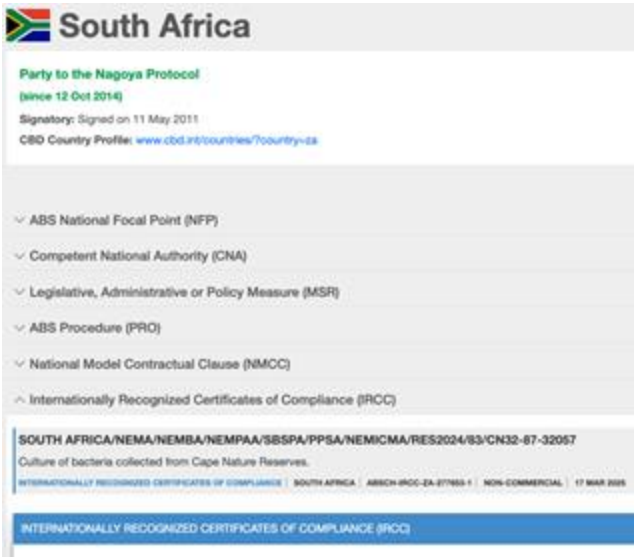
Convention of Biological Diversity - Nagoya Protocol on Access and Benefit-sharing

BioSCape projects successfully obtained an Internationally Recognized Certificate of Compliance (IRCC) under the Nagoya Protocol.

- Ensures ethical and legal research practices
- Promotes fair and equitable sharing of benefits
- Enhances trust and collaboration with international partners

Strengthens BioSCape's commitment to biodiversity research, conservation, and compliance with global standards.

Parties to the Nagoya Protocol



Science Oscars of South Africa - 2025 Finalist

Finalist

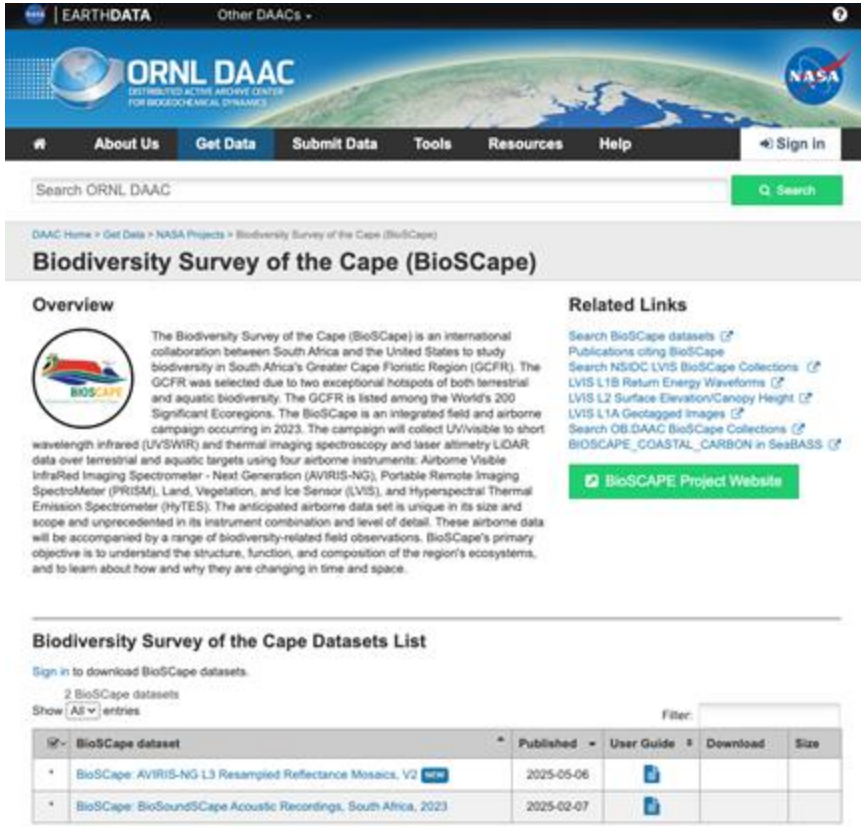
Recognising and celebrating an outstanding contribution to science, engineering, technology (SET) and innovation in South Africa

BioSCape: The Biodiversity Survey of the Cape

Jasper Slingsby, South African Lead and Senior Lecturer

Data for Research Award
for advancing the availability, management and re-use of research data
(by an individual or a team)

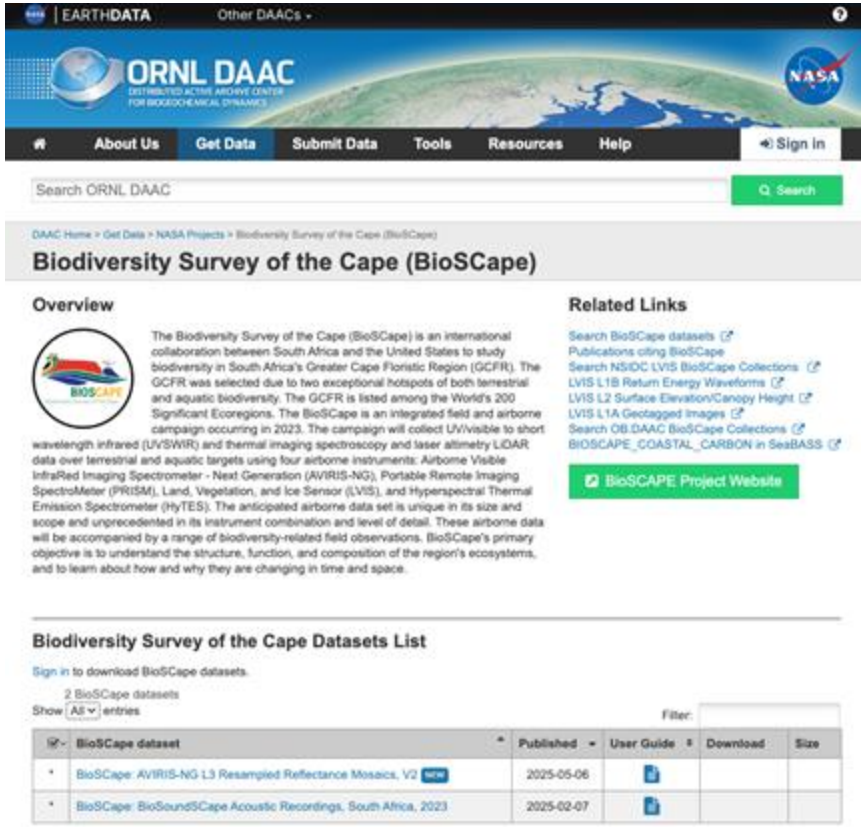
All BioSCape Data will be Publicly Archived and Accessible

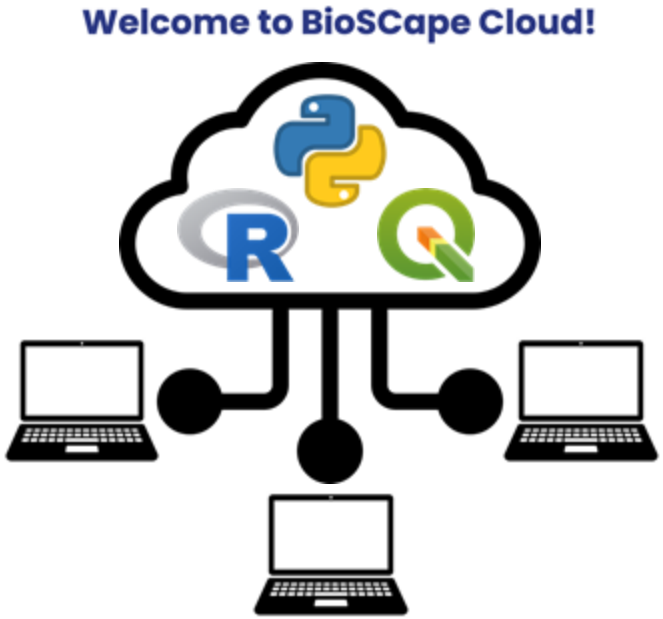


Reasons to submit your data to ORNL

- Backup before your hard drive dies
- Enable reproducible workflows
- Get a DOI and increase citations
- Looks good in your annual report
- YOU ARE REQUIRED TO!

All BioSCape Data will be Publicly Archived and Accessible





Contact info@bioscape.io for access

aws $36k

Learn more about BioSCape

npj | biodiversity

Perspective

https://doi.org/10.1038/s44185-024-00071-5

The biodiversity survey of the Cape (BioSCape), integrating remote sensing with biodiversity science

Check for updates

Anabelle W. Cardoso[1,2], Erin L. Hestir[3] ✉, Jasper A. Slingsby[2,4,5], Cherie J. Forbes[1,2], Glenn R. Moncrieff[6], Woody Turner[7], Andrew L. Skowno[2,8], Jacob Nesslage[9], Philip G. Brodrick[9], Keith D. Gaddis[7] & Adam M. Wilson[1]

nature reviews biodiversity

Volume 1 | January 2025 | 2–4 | 2

https://doi.org/10.1038/s44358-024-00007-8

BioSCape combines local knowledge and remote-sensing technology for inclusive biodiversity science

Anabelle W. Cardoso & The BioSCape Consortium

Check for updates

The Biodiversity Survey of the Cape (BioSCape) in South Africa's Greater Cape Floristic Region aims to test the limits and potential of remote sensing for biodiversity applications. Integrating field biodiversity measurements and local knowledge with advanced remote sensing, BioSCape brings us closer to measuring key biodiversity variables globally from space.

sustainable human development while surviving the threat of climate change. Fortunately, the region has a long history of data-informed conservation and provides learning opportunities that can inform management of similar regions worldwide[2].

Integrated data to measure biodiversity

During BioSCape, airborne imaging spectroscopy (also known as hyperspectral remote sensing) and LiDAR data were acquired over terrestrial, freshwater and marine study areas. Imaging spectroscopy measures reflected and emitted solar radiation at high spectral resolution, which enables the retrieval of biodiversity information such

bioscape.io/products

Submit to the BioSCape Special Collection

JGR Biogeosciences

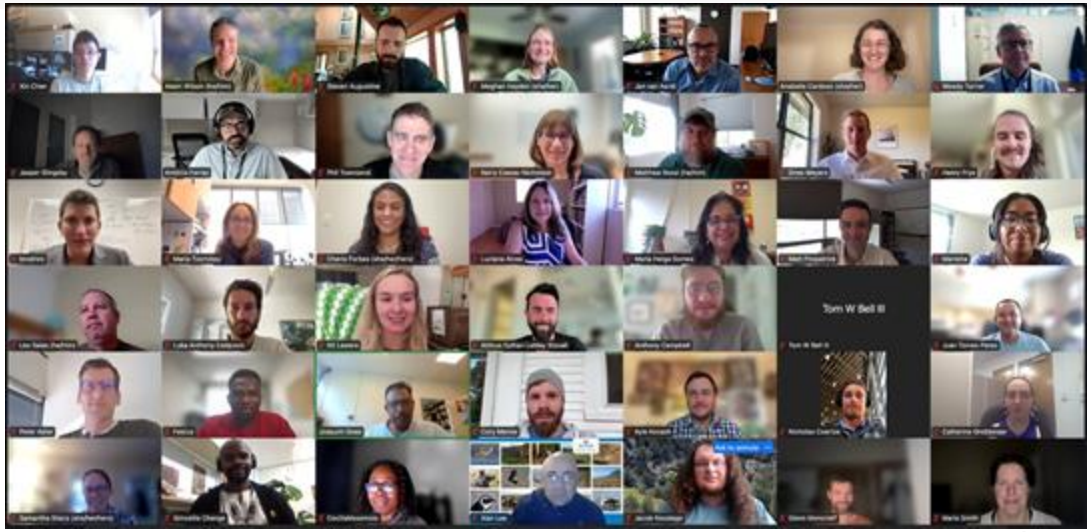
Call for Papers

BioSCape: The Biodiversity Survey of the Cape

Submission deadline: Sunday, 30 November 2025

The Biodiversity Survey of the Cape (BioSCape) is a collaborative international project to advance biodiversity mapping and monitoring through remote sensing. BioSCape is one of the most extensive high-resolution Open Access imaging spectroscopy and structural mapping initiatives in the Southern Hemisphere. The airborne campaign, conducted in October and November 2023, covered ~45,000 km² using five instruments, including three imaging spectrometers (spanning ultraviolet to thermal infrared) and both full-waveform and discrete-return lidar. This unique dataset was collected alongside extensive terrestrial and aquatic field data to address research questions on biodiversity structure, composition, and function in response to global change. The BioSCape target domain, the Greater Cape Floristic Region of South Africa, is home to two of the world's richest plant biodiversity hotspots and a regional peak in marine biodiversity and endemism where the cold Benguela and the warm Agulhas Ocean currents meet. This astonishingly high biodiversity and endemism turns over across steep environmental, climatic, and anthropogenic gradients and spans an extensive range of terrestrial and aquatic ecosystem types encountered worldwide. The project's themes span mapping plant functional traits, communities of plants and animals, invasive species, kelp forests, and phytoplankton functional types. Innovative methods also explore links between eDNA, autonomous sound recordings, and landscape diversity metrics from imaging spectroscopy. This Special Collection invites submissions utilizing BioSCape data to enhance understanding of biodiversity in this unique and complex region.

Virtual Science Team Meeting (June 10-11)



2024 Science Team Meeting Photo

10 & 11 June
7-8.30am PT / 10-11.30am ET / 4-5.30pm SA

Email info@bioscape.io if you would like to join!

Full science team to share updates and foster collaboration and maximise the future impact of BioSCape by maintaining open communication across the team members from both the US and South Africa.

BioSCape Sessions Today

9:00AM **Project Talks: BioSCape 1 (10 min talk + 2 min Q&A)**

Biodiversity Survey of the Cape (BioSCape)
Adam Wilson/State University of New York at Buffalo

RadSCape: radiative transfer simulation and validation of the dynamic structural and spectral properties of the vegetation of the Cape
Jan van Aardt/Rochester Institute of Technology

Spectral and spatial scaling in biodiversity remote sensing: research conducive to BioSCape science and implementation activities
Henry Frye/University of Wisconsin, Madison

Cyanobacteria and surface aquatic vegetation of the Cape freshwater systems (CyanoSCape): a hyperspectral data campaign and analysis
Liane Guild/NASA Ames Research Center

BioREaCH: biodiversity-remote sensing for estuarine and coastal habitat research
Atticus Stovall/NASA Goddard Space Flight Center

10:35AM **Project Talks: BioSCape 2 (10 min talk + 2 min Q&A)**

Cape Traits: patterns of functional trait variation and diversity across the Greater Cape Floristic Region and comparison with other Mediterranean ecosystems
Henry Frye/University of Wisconsin, Madison

Impacts of invasive alien species on biodiversity and ecosystem functioning
Meghan Hayden/Utah State University

BioSCape – Mapping of phytoplankton functional types from space in support of coastal resource management and decision support activities
Jinghui Wu/Columbia University

Intrinsic dimensionality and data fusion to monitor Cape biodiversity
Kerry Cawse-Nicholson/NASA Jet Propulsion Laboratory

Biodiversity across scales: mapping taxonomic, phylogenetic, and functional diversity with eDNA, field surveys, and remote sensing data
Matthew Rossi/University of Colorado, Boulder

1:50 PM **Project Talks: BioSCape 3 (10 min talk + 2 min Q&A)**

BioSoundSCape: Connecting acoustics and remote sensing to study habitat-animal diversity across environmental gradients
Matthew Clark/Sonoma State University

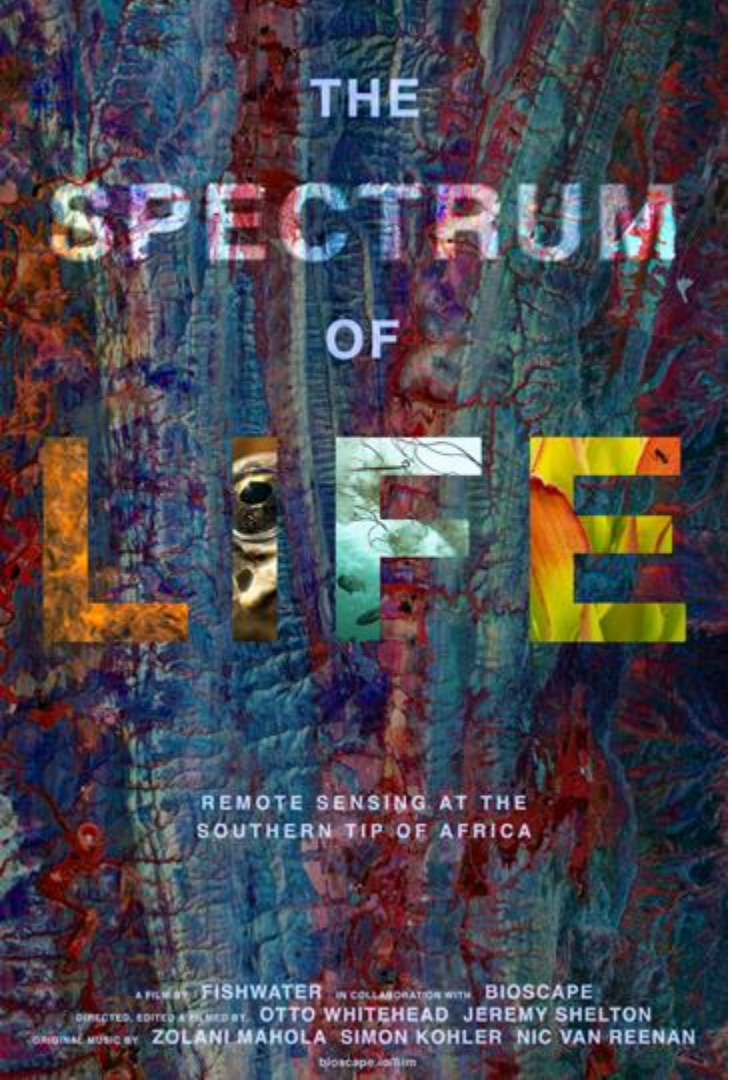
TraitsCape: understanding the role of microrefugia in buffering fynbos from global change
Cory Merow/University of Connecticut, Storrs

Integrating remote sensing and biodiversity observations to map and monitor plant taxonomic, phylogenetic, and functional beta-diversity in the Greater Cape Floristic Region
Xin Chen/University of Maryland Center for Environmental Science-Appalachian Lab, Frostburg

BioSCape multi-sensor data integration
Philip Brodrick/NASA Jet Propulsion Laboratory

6:05PM ***Optional* BioSCape Film: The Spectrum of Life**

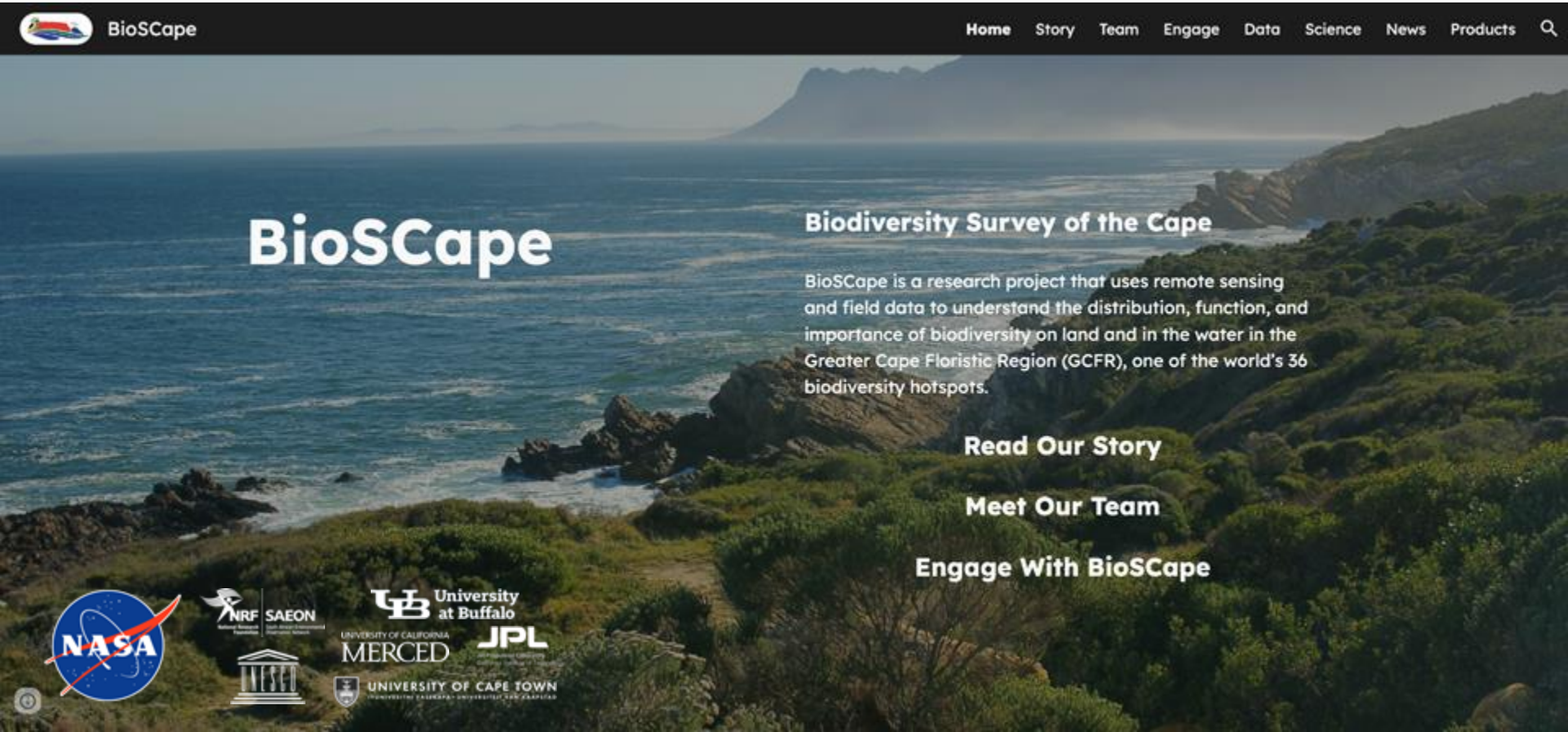
(runs for approximately 36 minutes)



BioSCape Film Screening

6:05PM ***Optional*** **BioSCape Film: The Spectrum of Life**
(runs for approximately 36 minutes)

Visit bioscape.io Email: info@bioscape.io

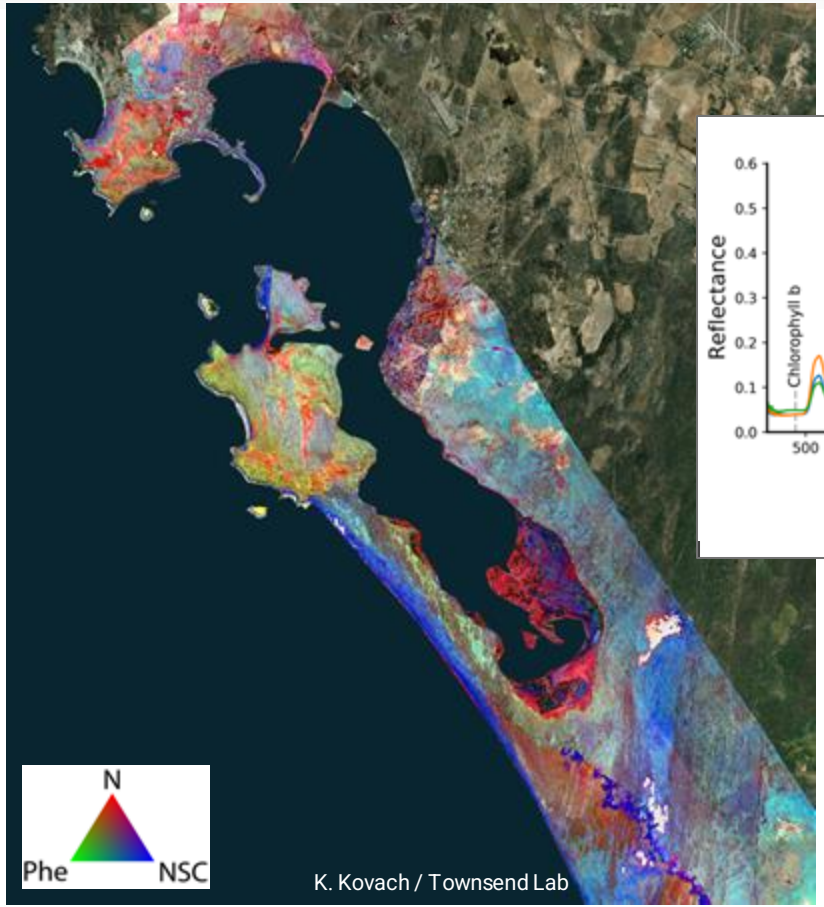


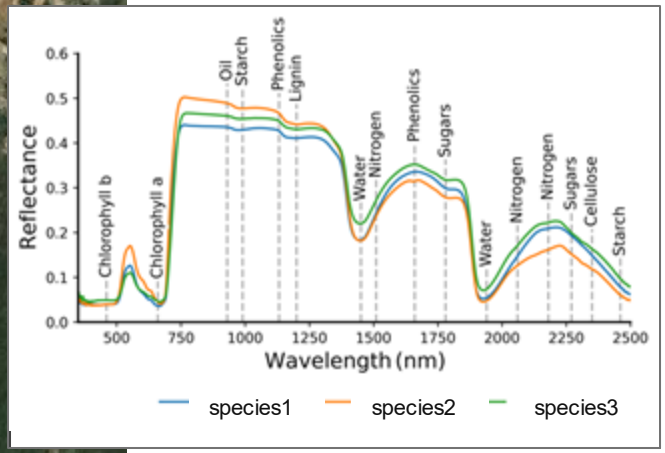
BioSCape - Advancing remote sensing of biodiversity

480 + 246 = 726 spectral bands across the UV, VIS, NIR, and SWIR range.

BioSCape - Advancing remote sensing of biodiversity

Imaging spectroscopy gives you subtle signatures that facilitate mapping functional traits.

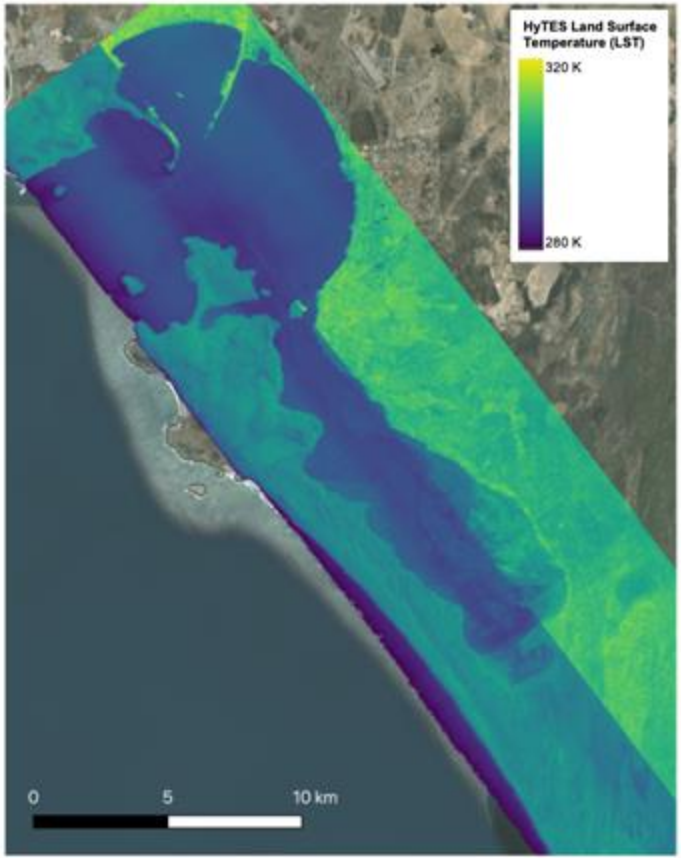




A.Chlus

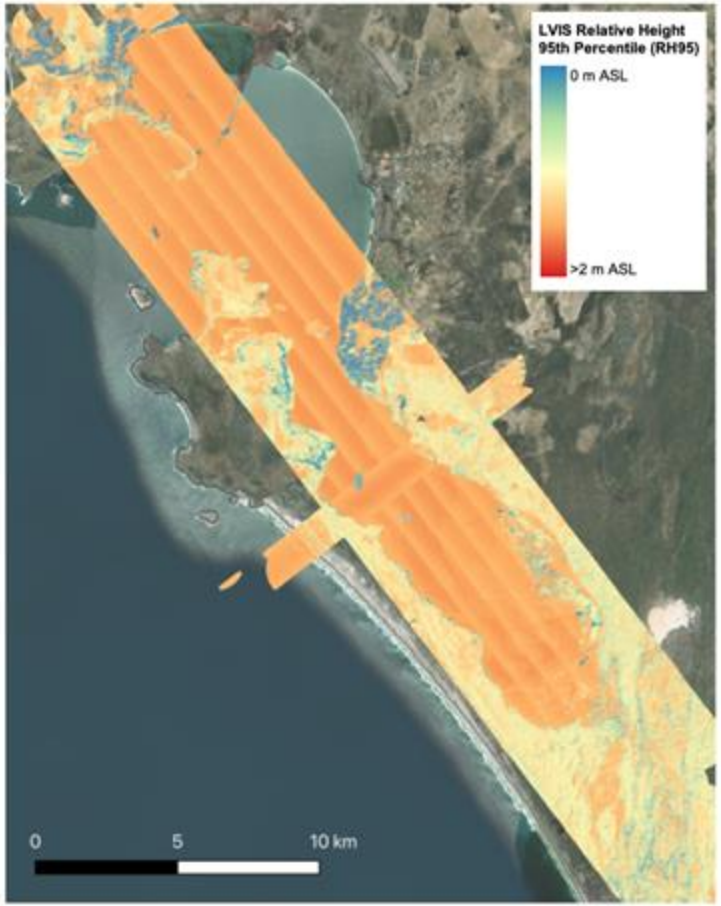
BioSCape - Advancing remote sensing of biodiversity

256 spectral bands in the TIR range to map land surface temperature and emissivity over land and water.



BioSCape - Advancing remote sensing of biodiversity

With full waveform and discrete return airborne LiDAR, you can really start to untangle ecosystems to map both structure and function.



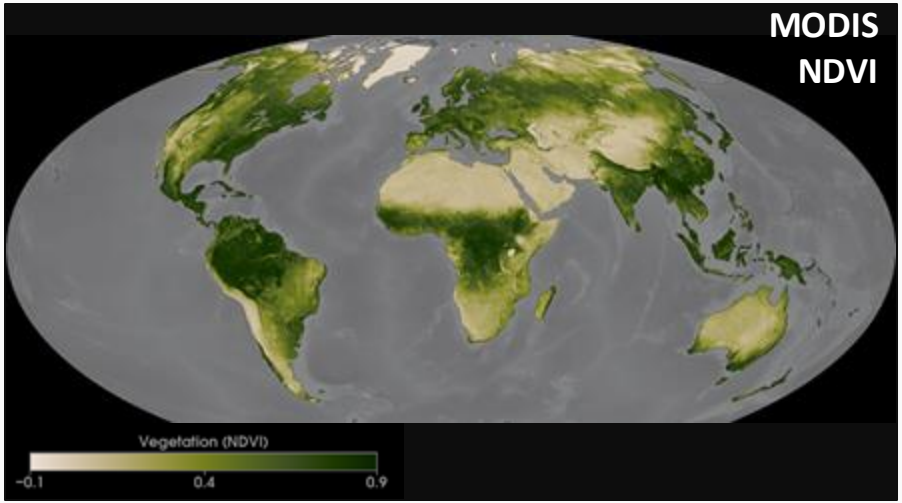
NRF National Research Foundation | SAEON South African Environmental Observation Network

BioSCape - Field Data

When airborne and field data are coupled, the potential of remote sensing for biodiversity applications is unleashed!

Globally consistent, locally accurate biodiversity data are severely lacking

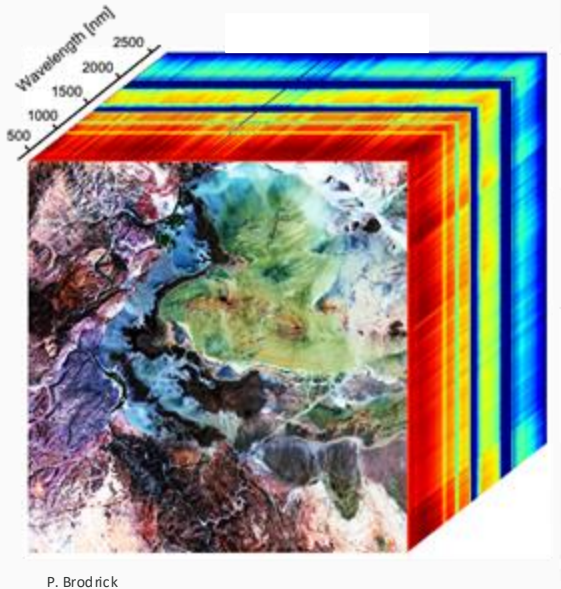
- Field biodiversity data is labour and time intensive to collect
- Not feasible to do everywhere all the time



- Traditional remote sensing has not been advanced enough to fill field gaps.
- One-size-fits-all approach inappropriate
  - Biodiversity is complex

New Remote Sensing Technology = New Opportunities

Imaging Spectroscopy (UV - VIS - SWIR - TIR)



P. Brodrick

EMIT Spectral Image Cube near Cape Town, South Africa

LiDAR

GEDI / GSFC

Full waveform LiDAR measuring forest 3D structure, as collected by GEDI and LVIS

Many global targets, goals, and reports focus on conserving biodiversity

To do this, we need to measure and monitor biodiversity globally