



SOUTHERN AFRICAN MOUNTAIN ECOSYSTEMS INDICATORS FOR CHANGES IN BIODIVERSITY



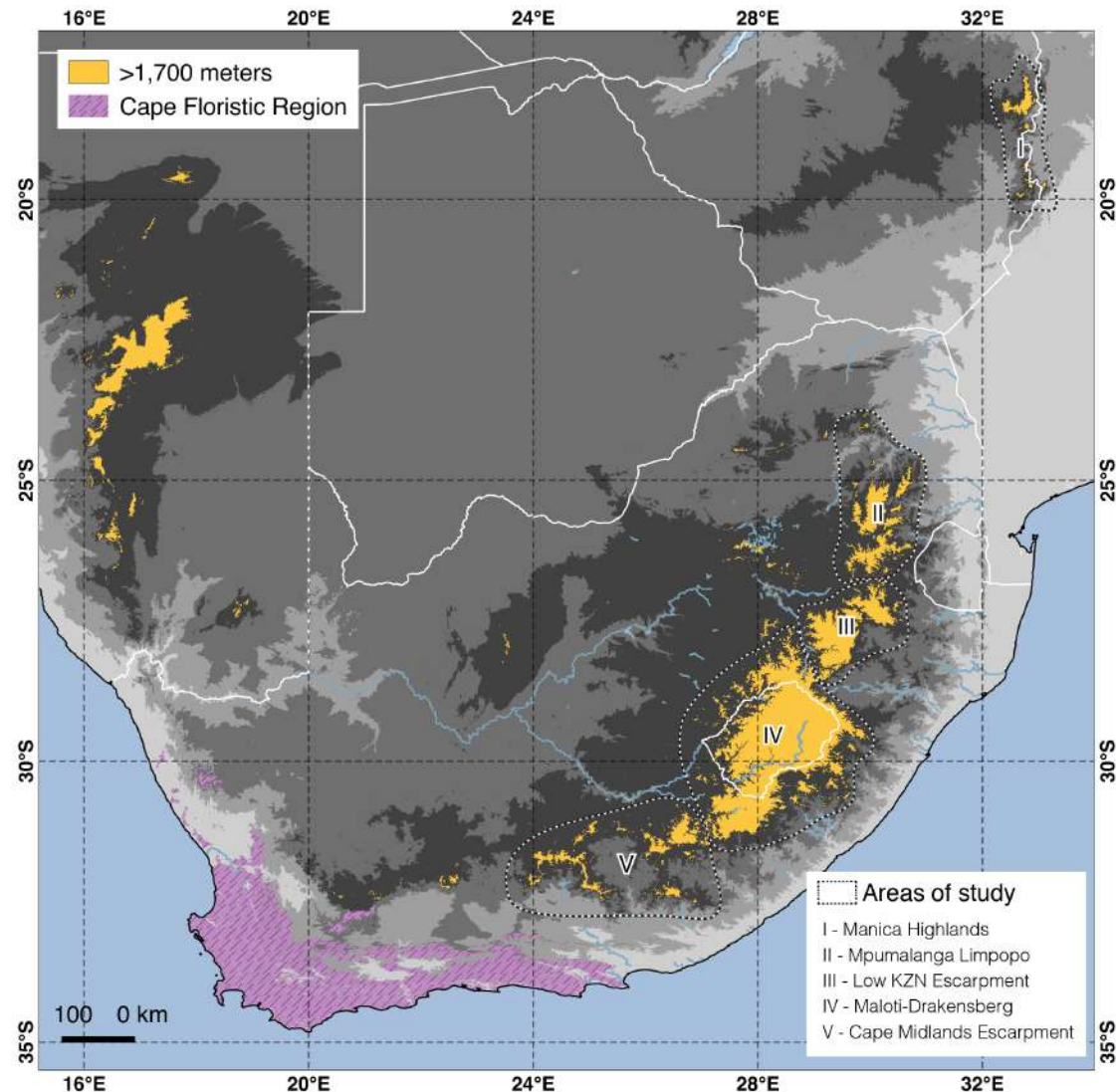
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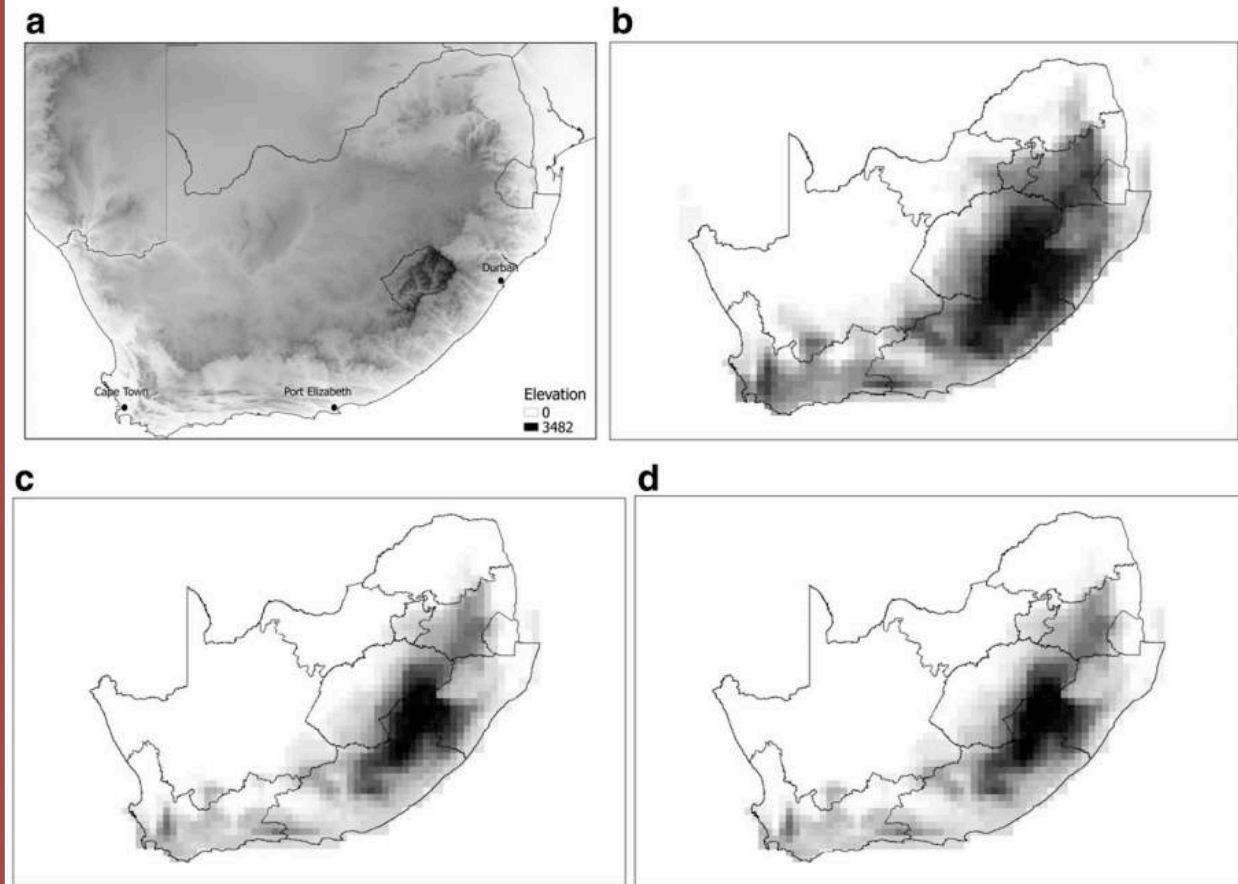
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SOUTHERN AFRICAN MOUNTAIN ECOSYSTEMS

- South Africa, Lesotho, Zimbabwe, Angola and Mozambique.
- Dominated by grasslands.
- Distinct biotic composition than the rest of the Afrotropics:
 - Endemism levels comparable to the Cape Floristic Region.



- Mountains are especially endangered by climate change, since species in these environments present narrow niches.
- Species in these environments are predicted to undergo retraction towards higher elevations in the near future (Bentley *et al.* 2019).



A is a map showing the locations of the occurrence points used. The other maps show predicted species richness patterns for the 46 modelled species for **b** current climate (1971–2005), **c** future climate (2040–2080) with full dispersal and **d** future climate with no dispersal. For the species richness maps, black shaded regions denote high richness, with lighter grey to white denoting lower richness.

- Underrepresented in literature when compared to Northern Hemisphere mountains.
- Many misconceptions and biased views (e.g. “where are the trees?”, the role of fire).
- Gap in biodiversity and ecological knowledge.



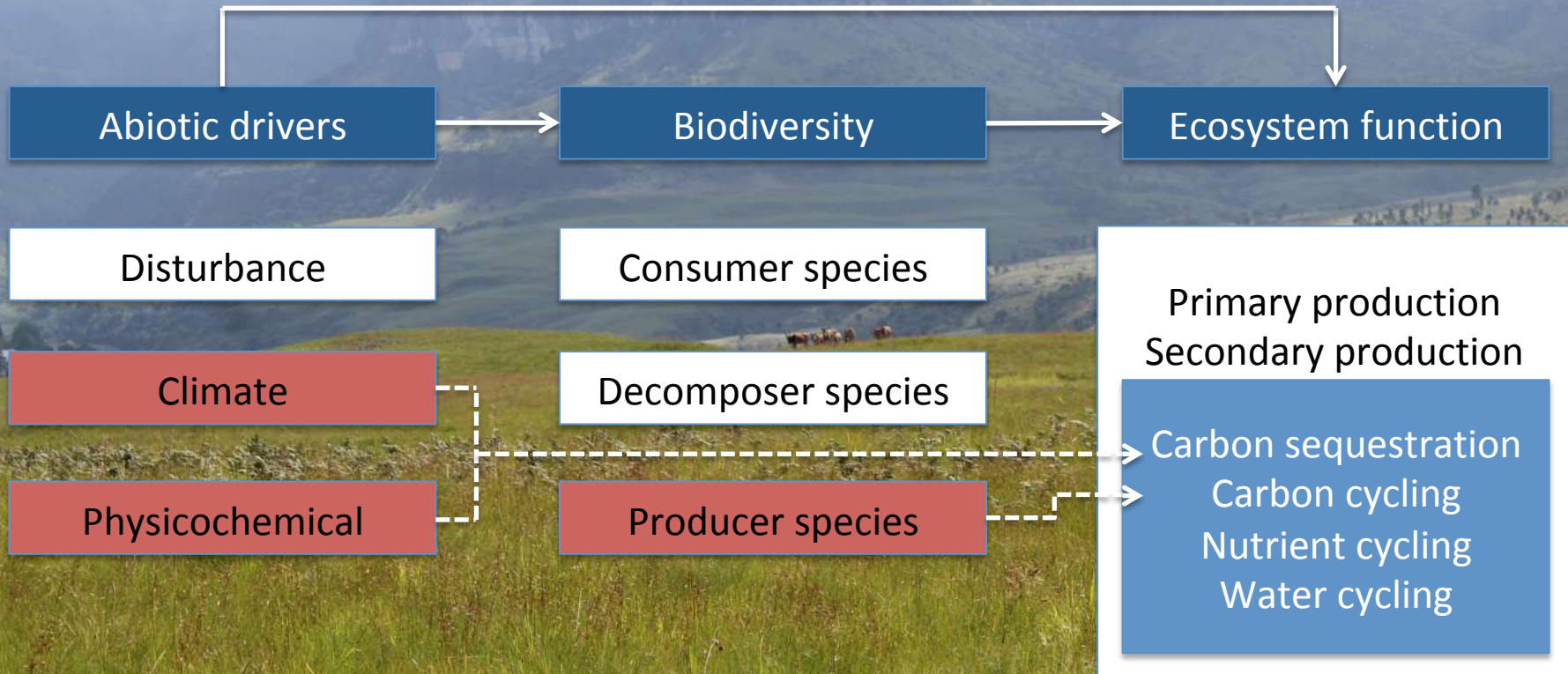
Dolph Kohnstamm - Picture of tree line above St. Moritz, Switzerland



João Vidal - Amphitheater, South Africa

A framework for testing the biodiversity-ecosystem function. Biodiversity and abiotic drivers determine function individually and in concert (blue boxes).

Source: Midgley (2012)





João Vidal - Amfiteatro, South Africa.

Extremely high water production value.

Long-term resilience should be very high priority for research, policy and practice.



João Vidal – Free State, South Africa.

Increasing presence of **invasive trees** along river banks is a threat to the natural water cycle on grasslands: **different ecophysiological pressure** and **erosion**.

OBJECTIVES



João Vidal - Amphitheater, South Africa.

- Objective: develop local approaches to address important ecological questions (e.g. **measure the impacts of climate change and human caused biodiversity erosion**) which is suitable for African mountains;
- Our case in point: the endemic-rich Maloti-Drakensberg.

METHODS

- Methods able to include both **immediate anthropogenic change** and **background subtle change**.



João Vidal – around Harrismith, Free State, South Africa.

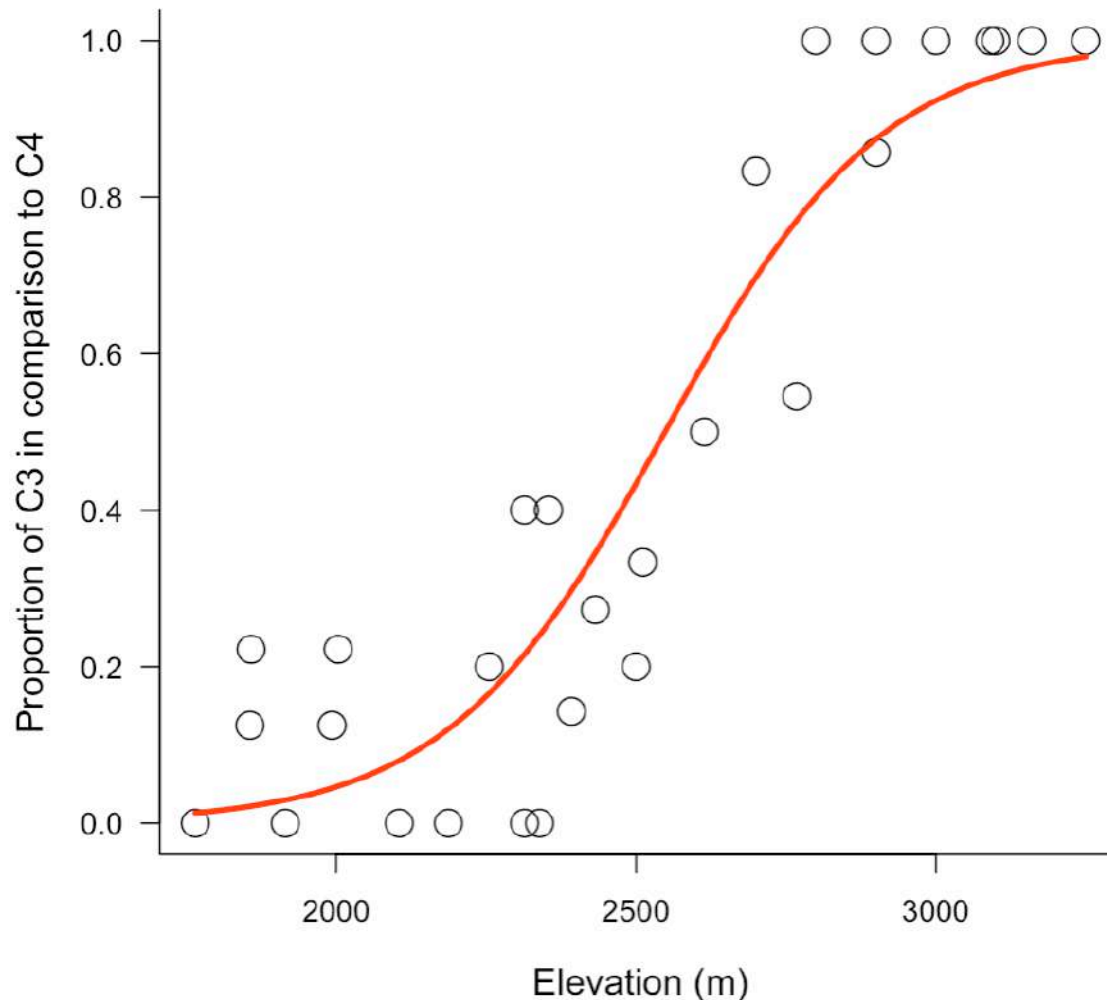
Potential indicators:

- Biodiversity erosion
- Species composition shifts
- Functional community changes
- Woody species expansion
- Colonization by non-native species



João Vidal – Amphitheater, South Africa.

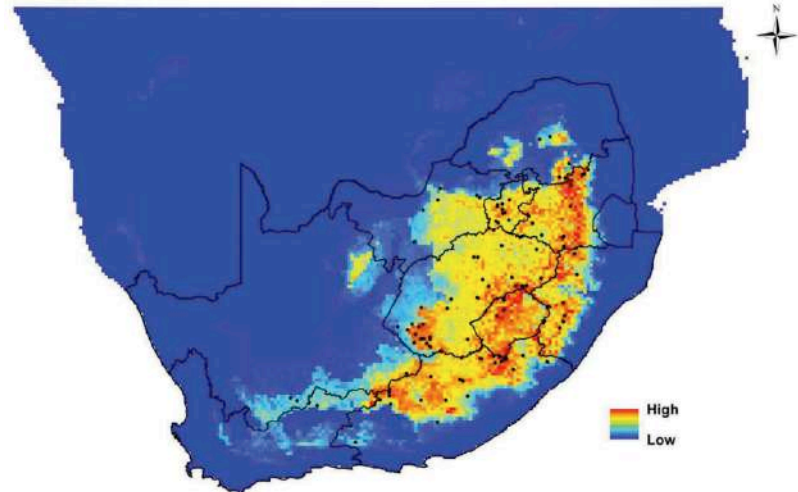
PRELIMINARY RESULTS



- Initial results show a clear **increase on C3/C4 proportion along the elevation gradient;**
- This pattern can be used as a reference for monitoring **long-term functional groups turnover** not only in the Drakensberg, but in the entire Afromontane.

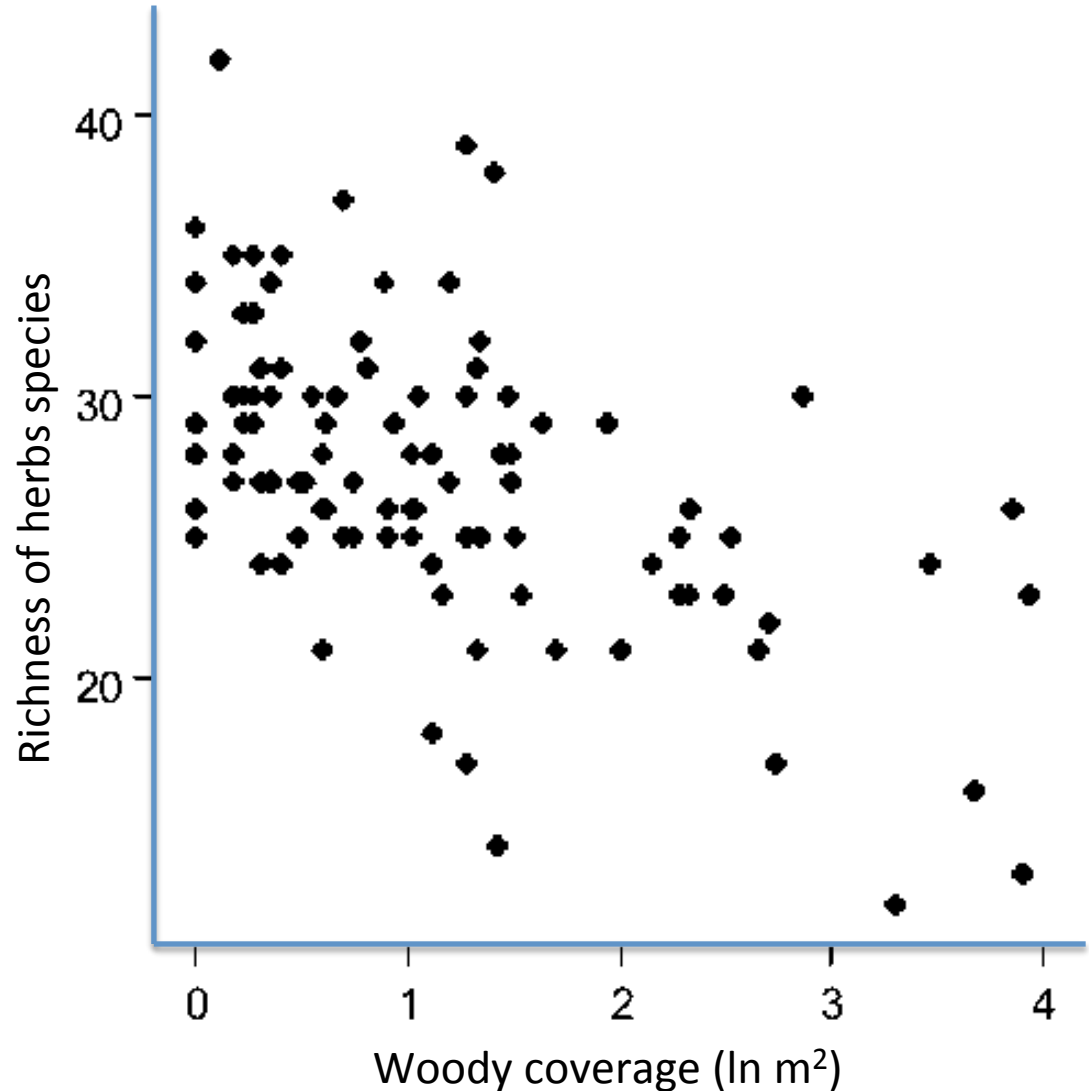
PRELIMINARY RESULTS

- Other functional groups also show promising indicative potential.
- Cushion plant species: *Euphorbia clavarioides* (Momborg 2018).
- Distribution in mountain regions, but strongly influenced by temperature and precipitation.



PRELIMINARY RESULTS

- Initial results on **woody coverage** in Haenertsburg grasslands show a **negative correlation** with **richness of herbs species**;
- This demonstrates the potential of using woody coverage as a **proxy for biodiversity erosion**.



CONCLUSION

- These results reinforce what we've already seen in southern Africa mountain grasslands:
- Degraded areas have a remarked increase in the presence of trees, many of them invasive/aliens.
- No tree cover is found in **preserved landscapes**.



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João Vidal - AmphiTheater, South Africa.

Thank you!