



GLACIER NATIONAL PARK GLORIA SITES IN A REGIONAL CONTEXT



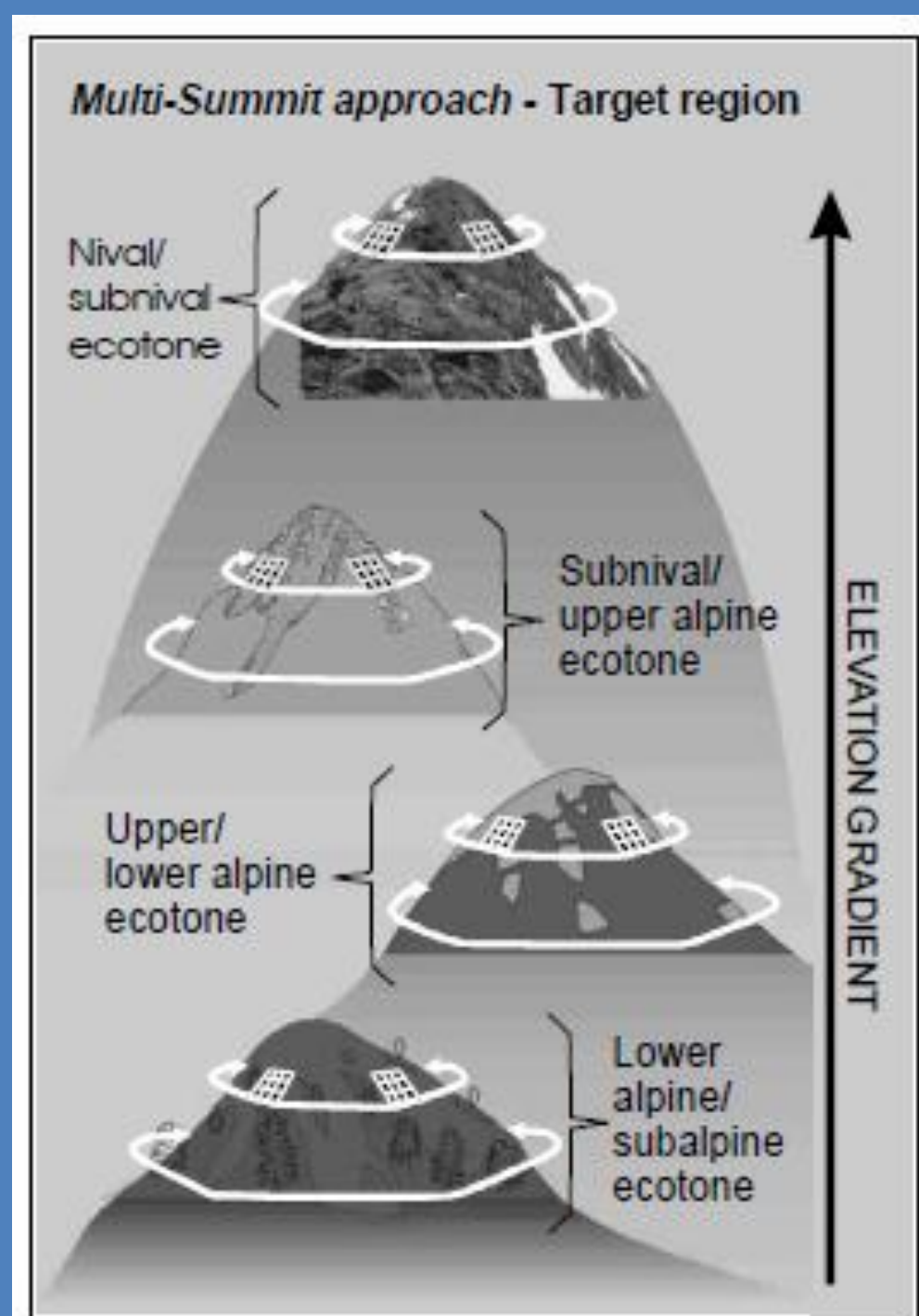
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The GLORIA Project

Global Observation Research Initiative in Alpine Environments



- >100 sites worldwide
- Plants surveyed every 5 years
- Each site has 4 summits, each surveyed in 4 cardinal directions

Initial results show change in diversity, identity in Europe; e.g.:

Erschbamer et al. 2011

Pauli et al. 2012



GLORIA in Glacier NP

Est. 2003/4

Resampled 2009



Summit	Elevation
Dancing Lady Mtn.	2245
Bison Mtn.	2387
Pitamakan Peak	2493
Seward Mtn	2717

Overall importance of variable terrain emphasized

Holzer & Fagre 2004

Millar & Fagre 2007

Regional Alpine Data



Given variable methods, regional vegetation data is taken to represent what *could* exist spatially across West

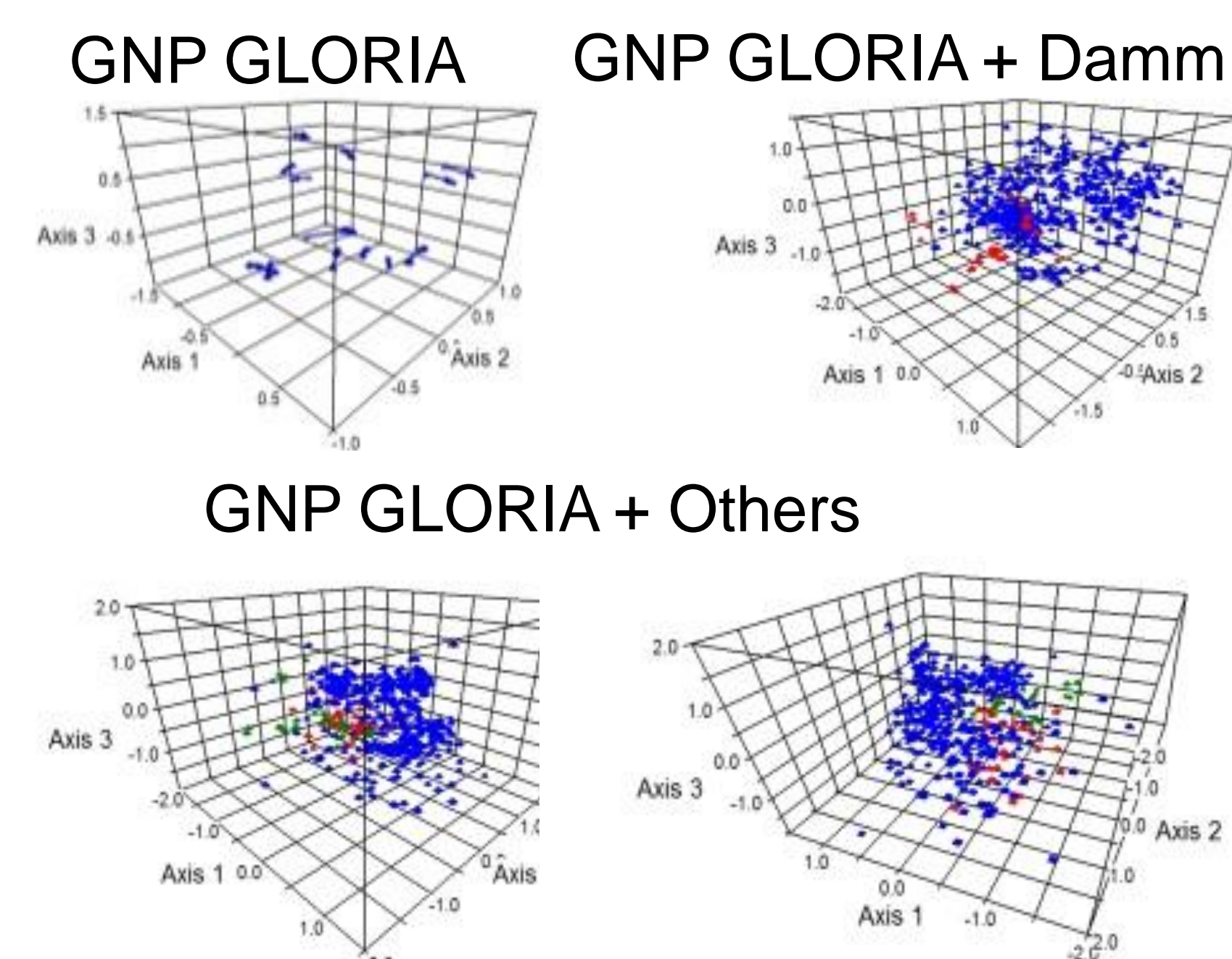
Question & Results

How distinct are GLORIA summit sites and what is their context in relation to local and regional alpine vegetation?

Sorenson's Dissimilarity for Pairs

14 GLORIA resamples	0.329
91 GLORIA all possible	0.855
137,550 GNP possible	0.915
84,666 West-wide possible	0.966

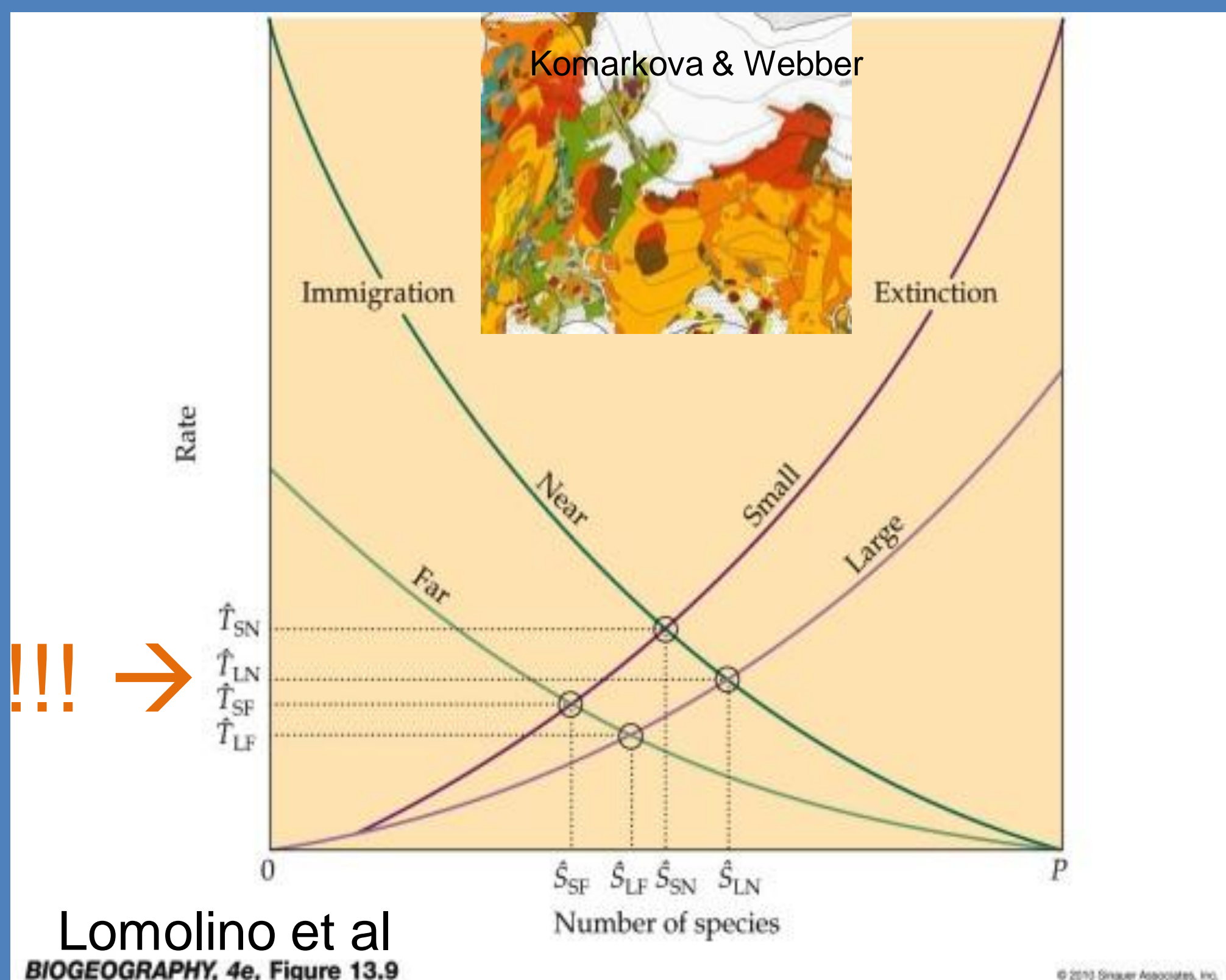
NMDS ordinations



Conclusions

Change (in similarity) seems significant, but is a small proportion of the range. Yet sites are clearly specialized: GLORIA sites are on the edge of the ordination volume - indicating niche control and slow background rates of change (depending on our belief in taxonomy). Thus GLORIA should be a good indicator, but will miss other potentially significant types of change in alpine vegetation.

The GLORIA Problem



Lomolino et al
BIOGEOGRAPHY, 4e, Figure 13.9

Turnover happens independent of climate change!

Background rate depends on isolation. From what? Depends on niche vs neutral model;

e.g.: Malanson et al 2011, Rose & Malanson 2012