The Spatial Patterns of Nanjenshan Lowland Rain Forests

南仁山低地雨林之物種分佈類型

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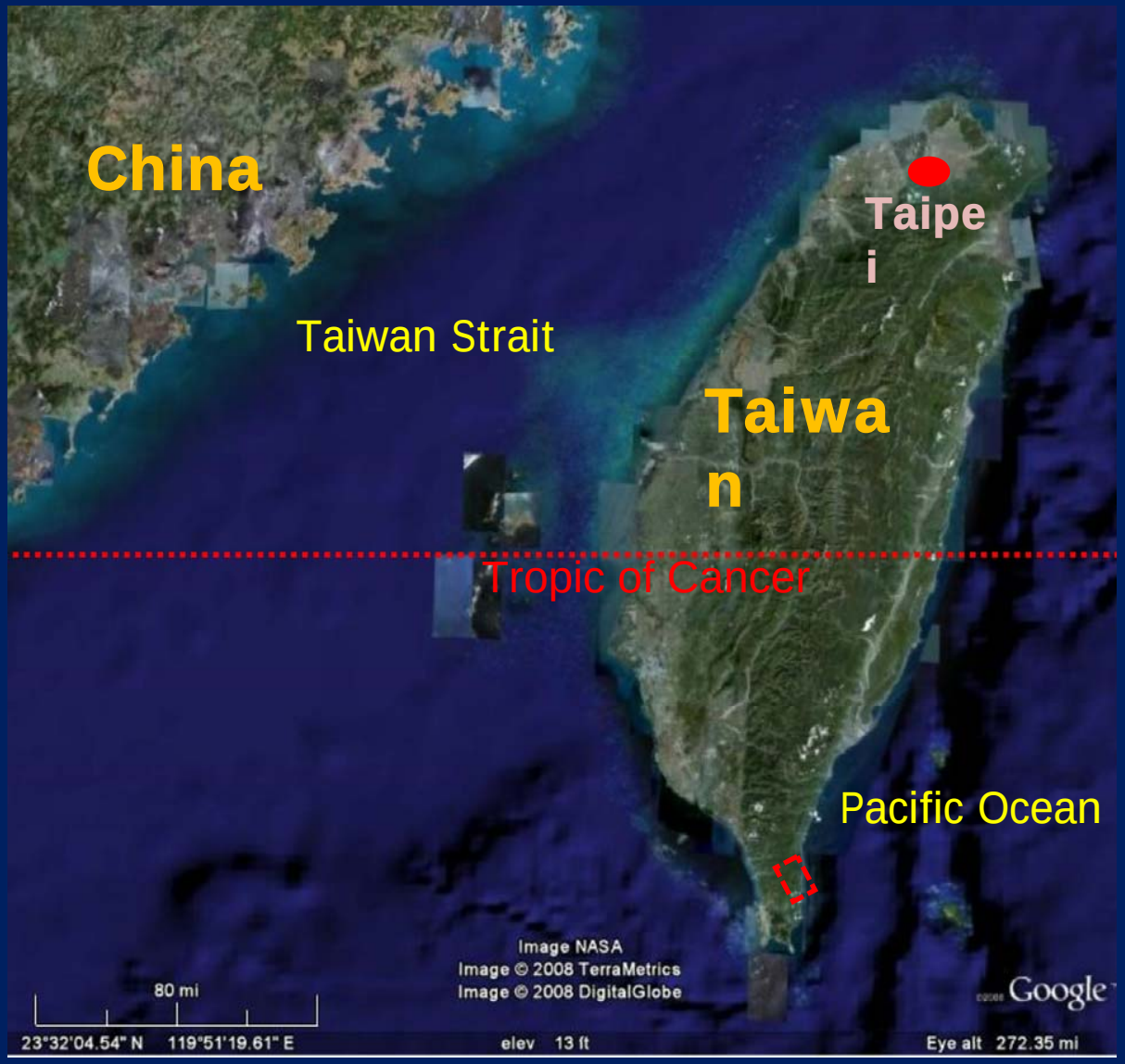
Introduction

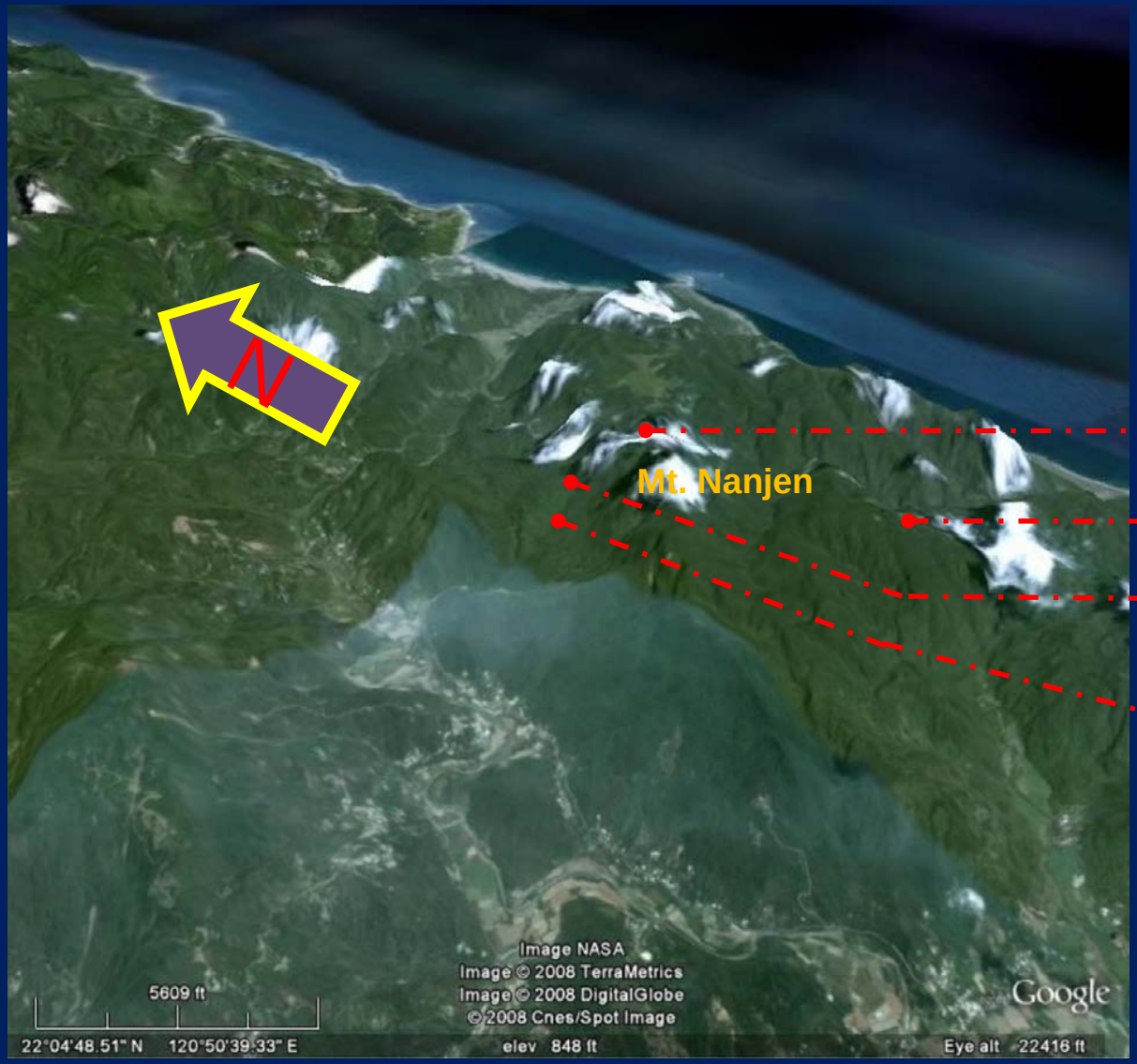
- Studies on spatial patterns
  - To generate better understanding of plant communities. (Dale, 1999)
  - To access the stand history, population dynamics, competition. (Haase, 1995)
  - Imply the factors regulate species existence and species diversity in the tropics . (Condit et al., 2000)

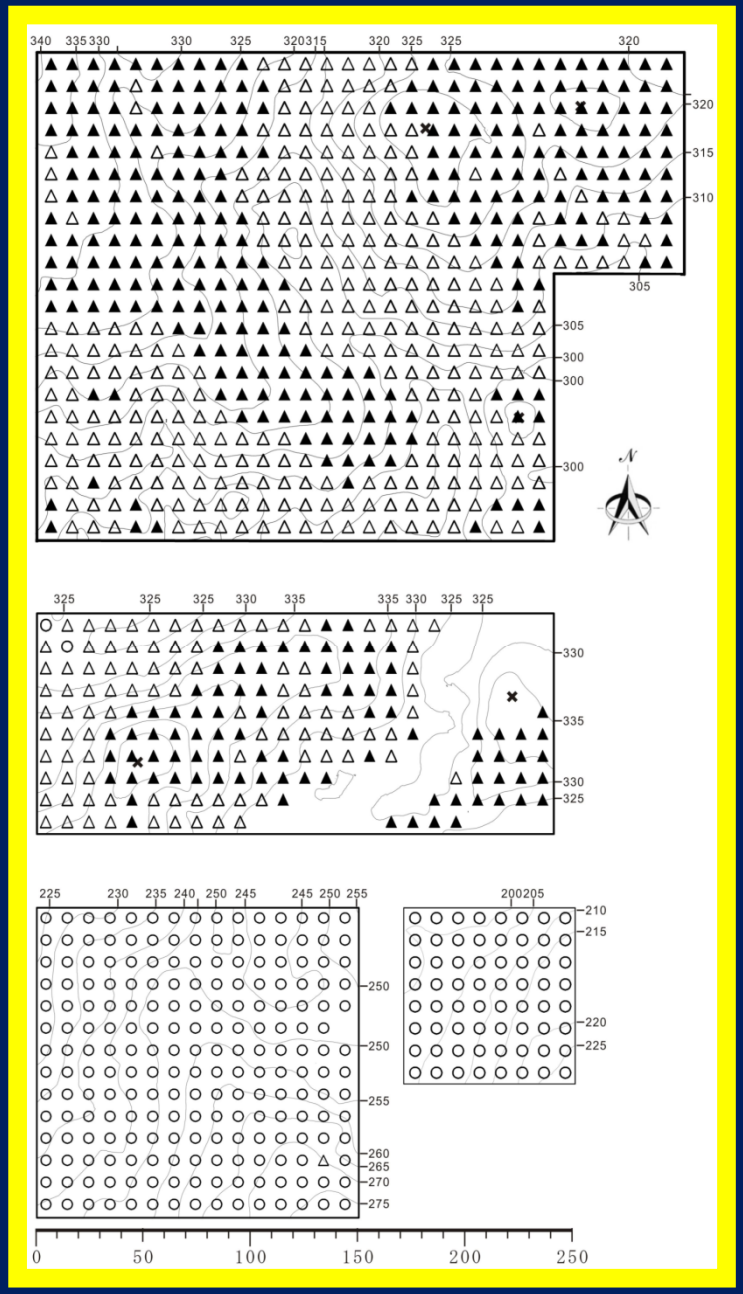
- Spatial patterns can arise from
  - Environment heterogeneity
  - Disturbance
  - Intra- and inter-specific competition
  - Life history strategies
- Lead to a regular or less aggregated distribution
  - Competition for resources (e.g., Boyden et al. 2005)
  - Density dependent mortality (e.g. Moeur 1993)
  - Self-thinning (Volkov 2005)
    - Janzen-Connell hypothesis
    - Chesson–Warner hypothesis

- The main goal of our study was to understand
  - What are the spatial patterns of these four plots
  - What are the spatial patterns in different size classes


China
Taipei
Taiwan Strait
Taiwan
Tropic of Cancer
Pacific Ocean
Image NASA
Image © 2008 TerraMetrics
Image © 2008 DigitalGlobe
80 mi
23°32'04.54" N 119°51'19.61" E
elev 13 ft
Eye alt 272.35 mi
Google

Study site


N
Mt. Nanjen
Nanjen Lake plot
Lanjenchi plot
Nanjenshan plot I
Nanjenshan plot II
Image NASA
Image © 2008 TerraMetrics
Image © 2008 DigitalGlobe
©2008 Cnes/Spot Image
Google
5609 ft
22°04'48.51" N 120°50'39.33" E
elev 848 ft
Eye alt 22416 ft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275
0 50 100 150 200 250

Plot	Plot size (ha)	Year for Fully censused	Altitude (m)	Average temperature (℃)	Mean annual precipitation (mm)
Lanjenchi	5.88	1989-1991 1996-1997 1998-1999 2005-2006	284-341 (57)	22.7	3986
Nanjen Lake	2.21	1998	324-358 (34)	22.5	2809
Nanjenshan plot I	2.10	1993-1994 2000 2008	224-275 (51)	22.7	3252
Nanjenshan plot II	0.64	2000 2008	196-229 (33)		

Methods

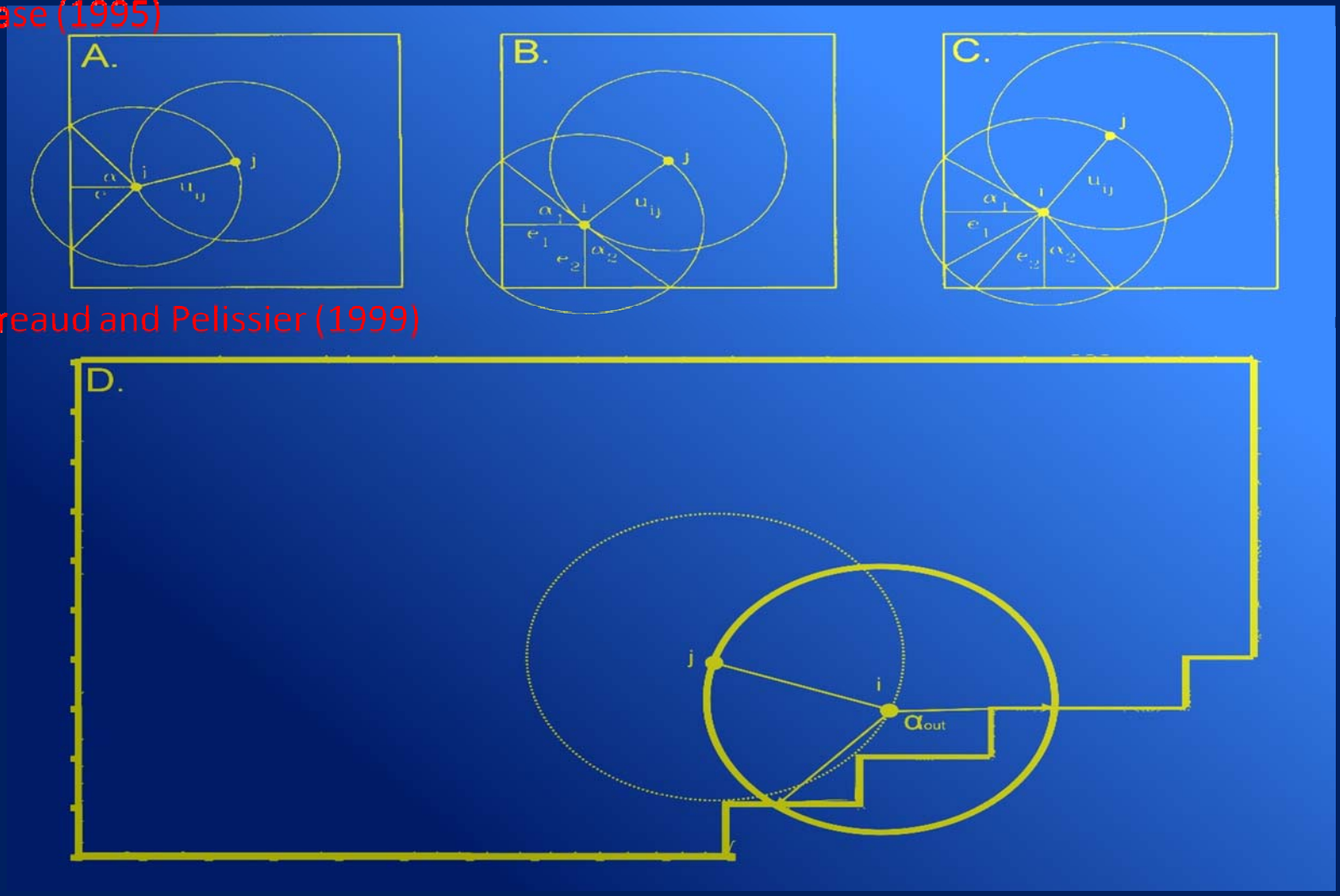
- Ripley's *K-f*unction

$$\hat{K}(d) = \frac{A}{n^2} \sum_{i=1}^{n} \sum_{j=1}^{n} w_{ij} I_d(i,j)$$

- Edge correction
  - Haase (1995)
  - Goreaud and Pelissier (1999)
- Monte-Carlo simulation
  - 600 times
  - 95 % confidence interval (2-tailed)

Edge correcting

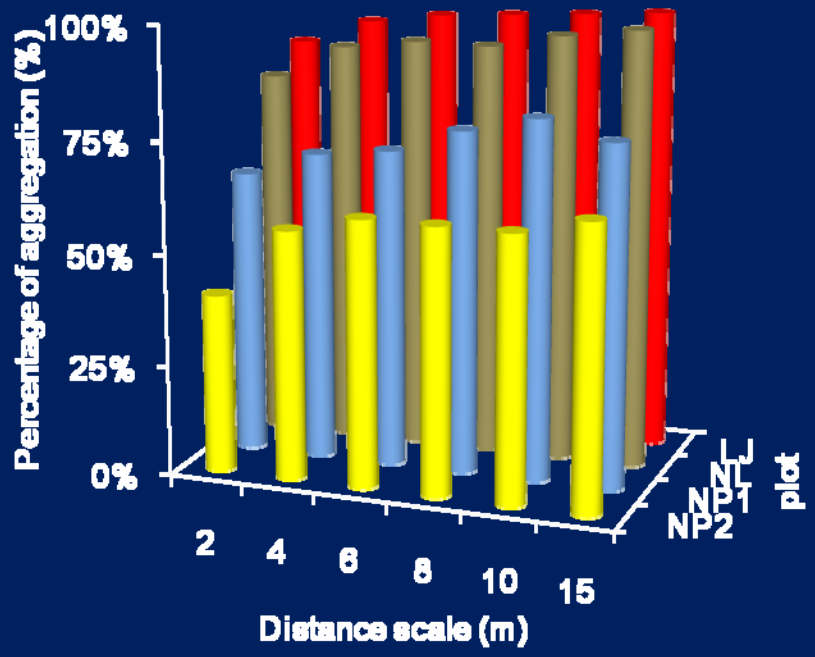
Haase (1995)



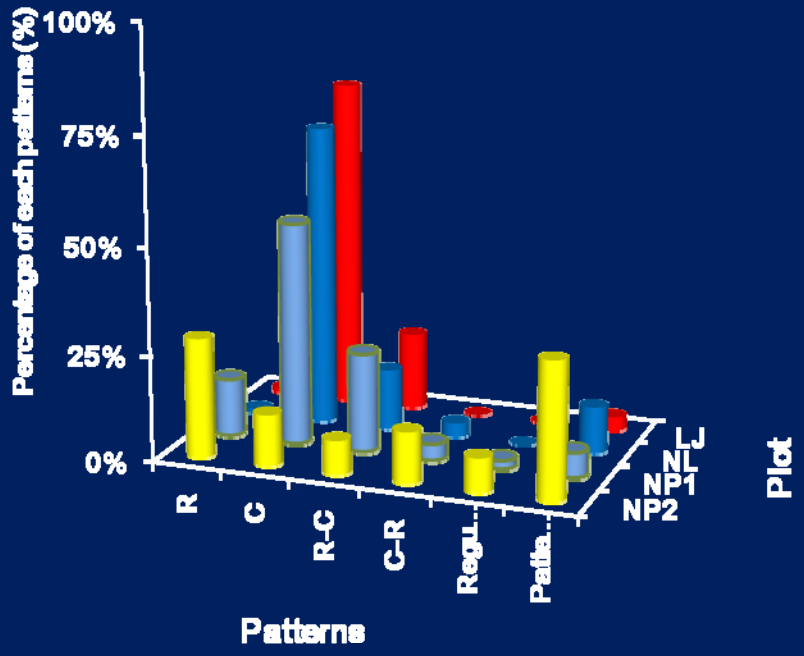
Goreaud and Pelissier (1999)

Result – **All individuals**

- Each distance scale

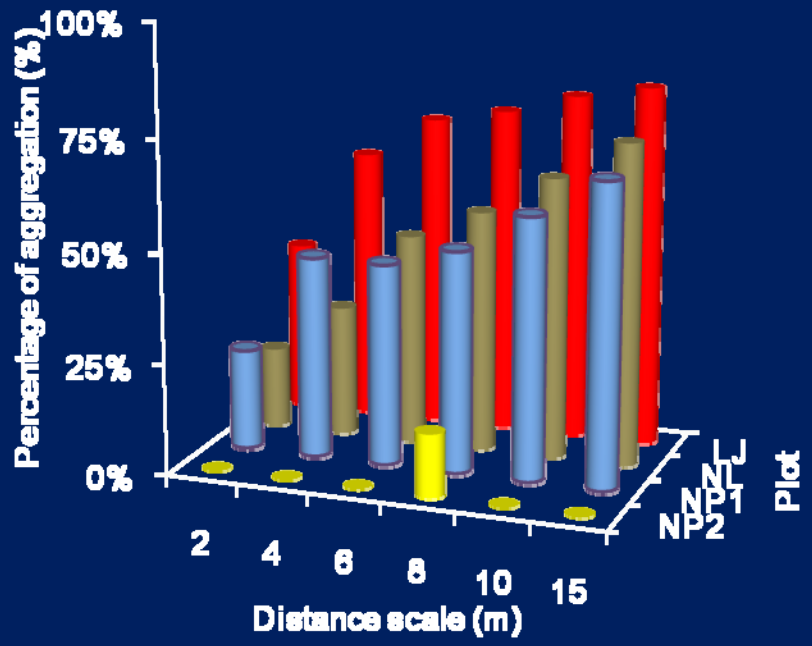


- All distance scales

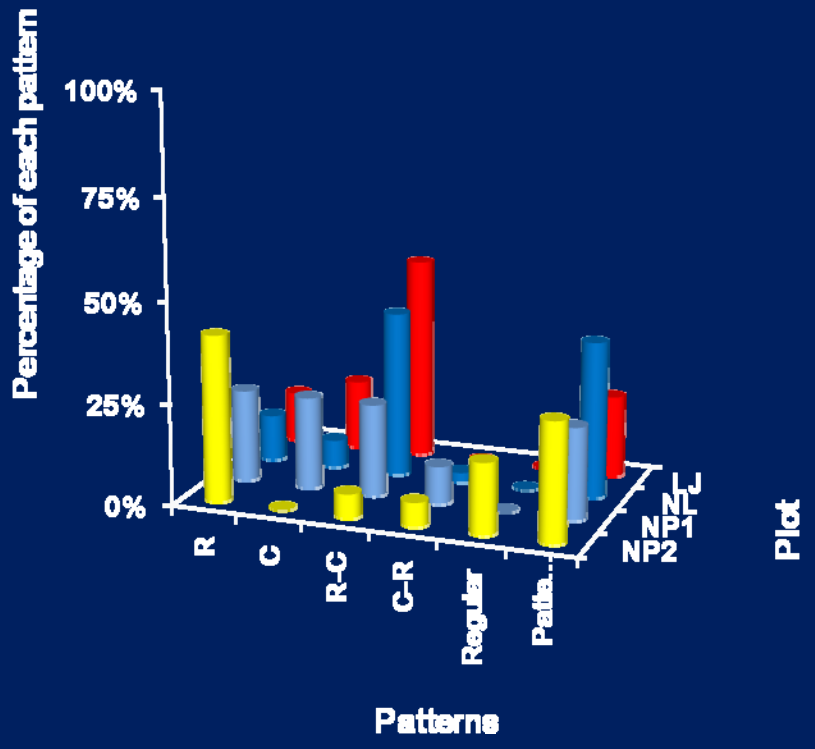


Result – **Large tree**

- Each distance scale

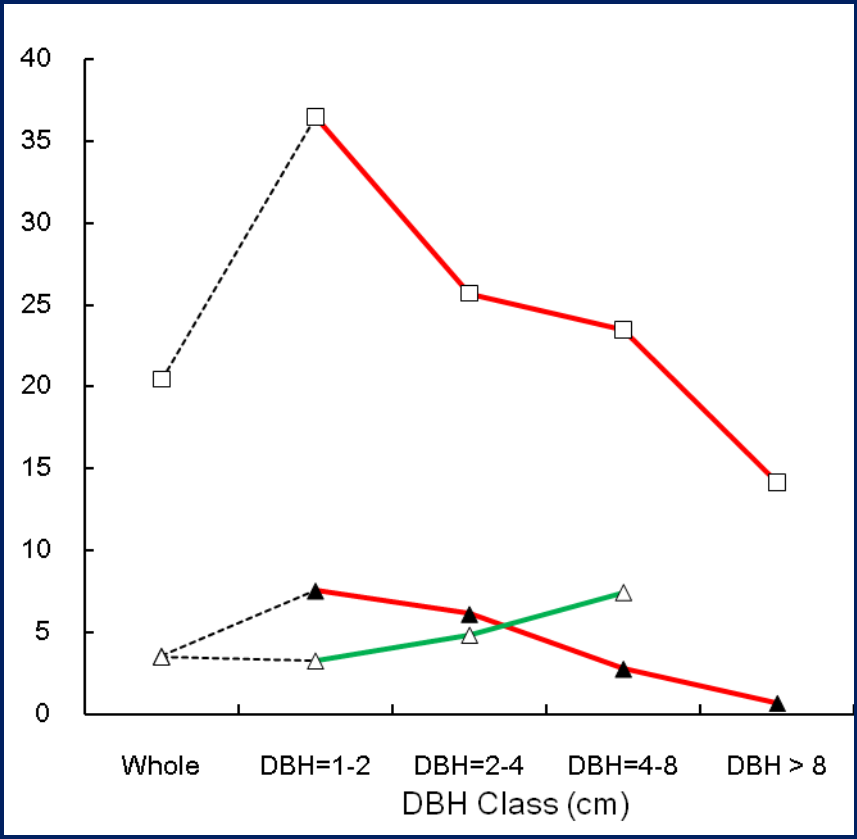


- All distance scales

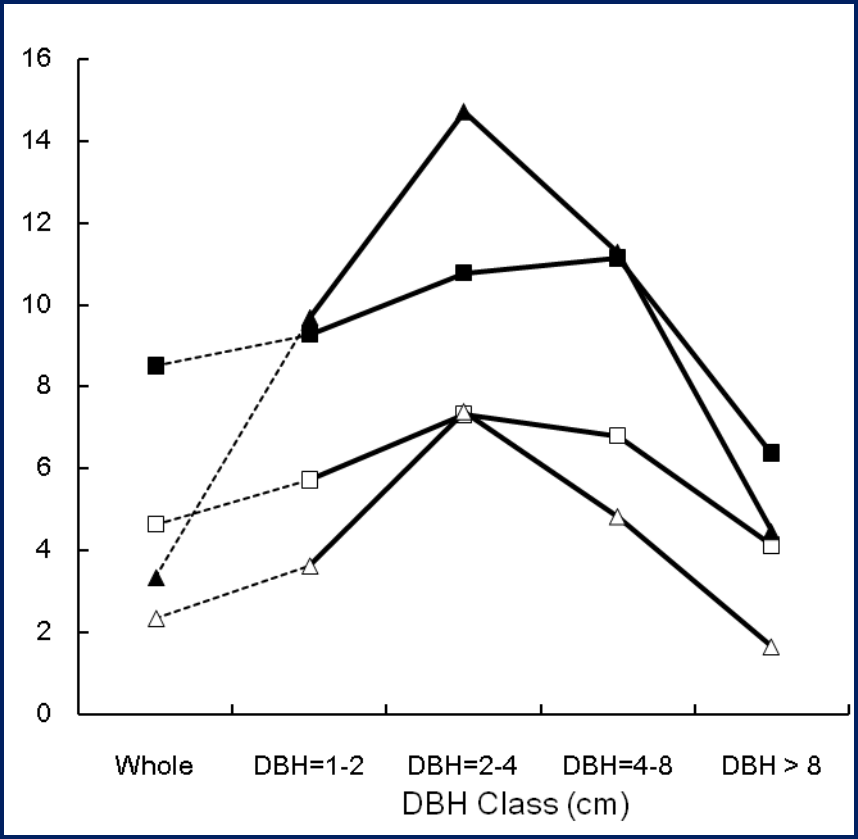


Result – **Different size classes**

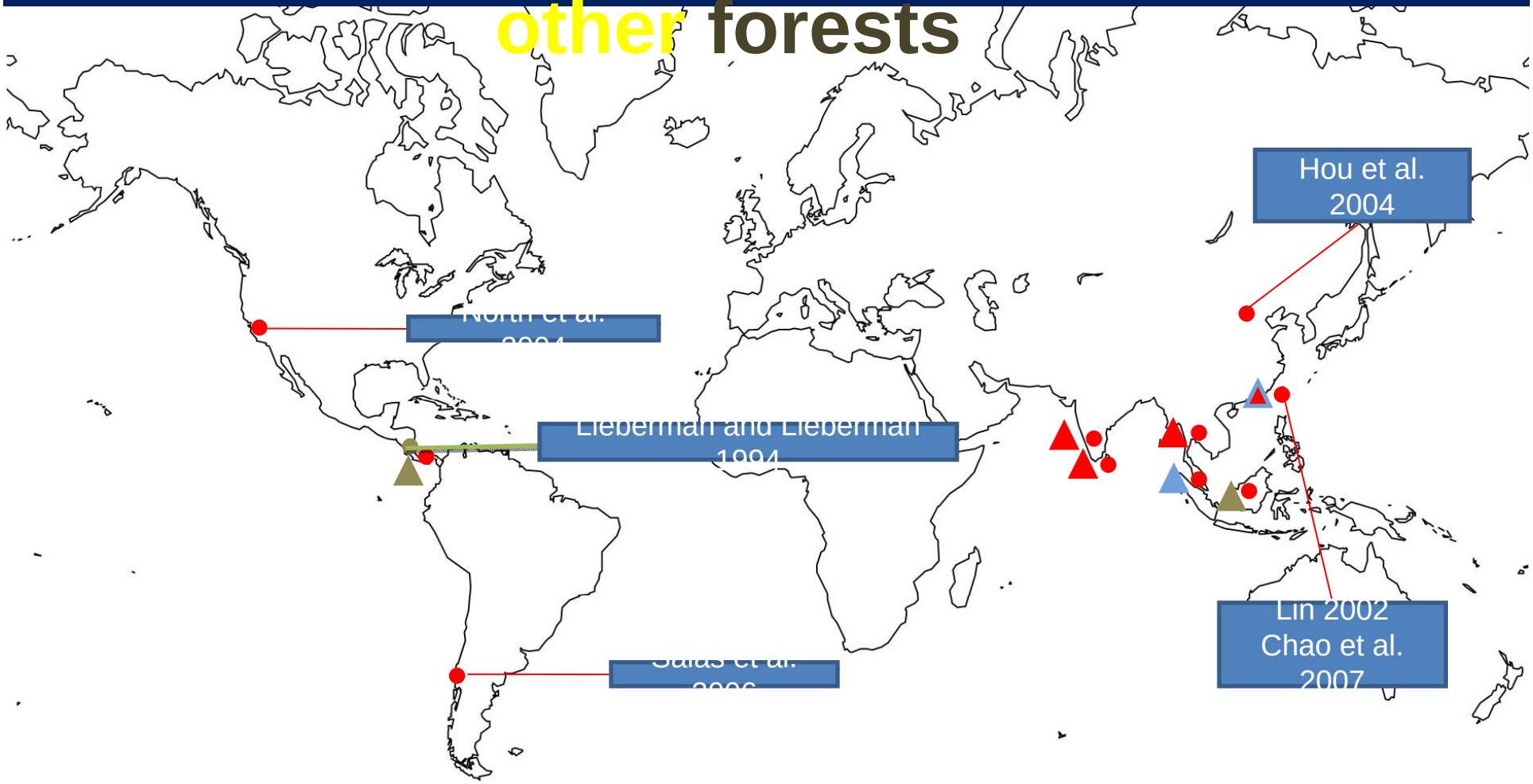
Decreasing and increasing patterns



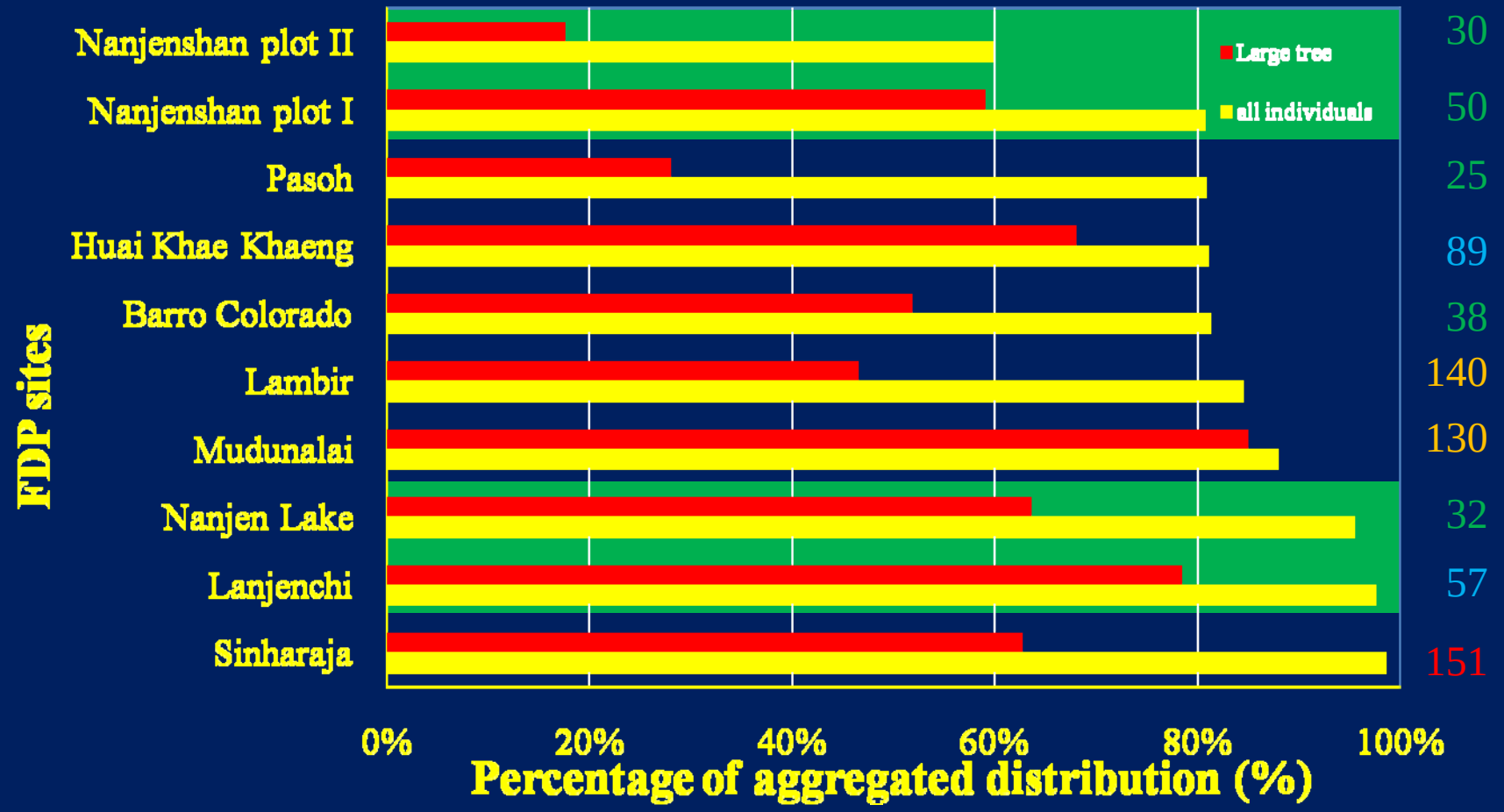
- Convex pattern



Discussion-spatial patterns in other forests



Discussion - Compare the results of spatial patterns with tropical forests

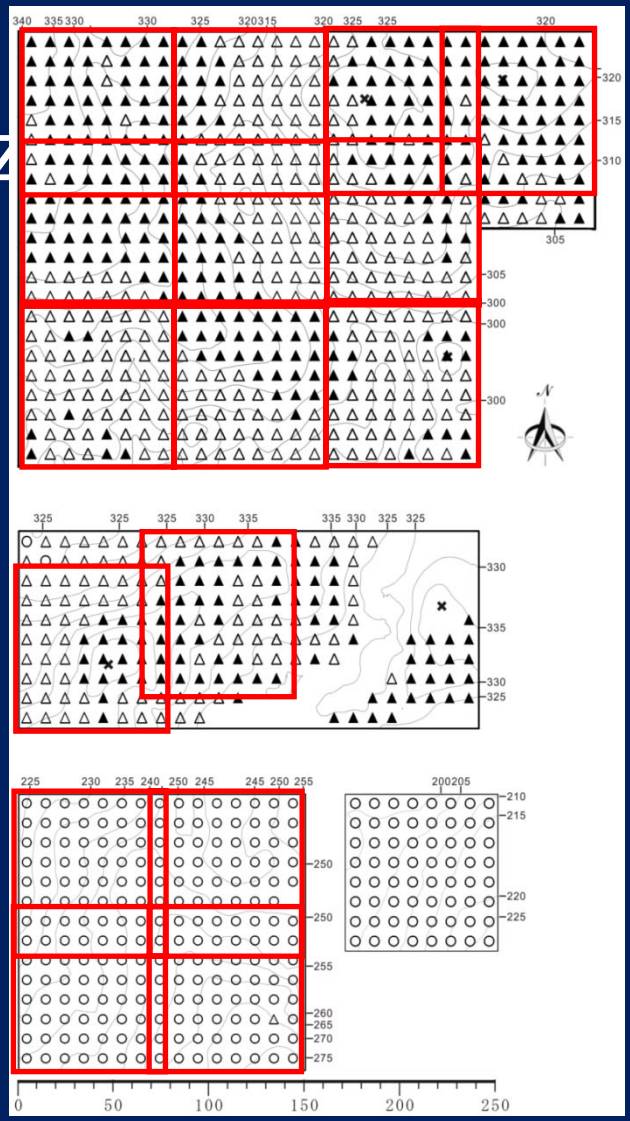


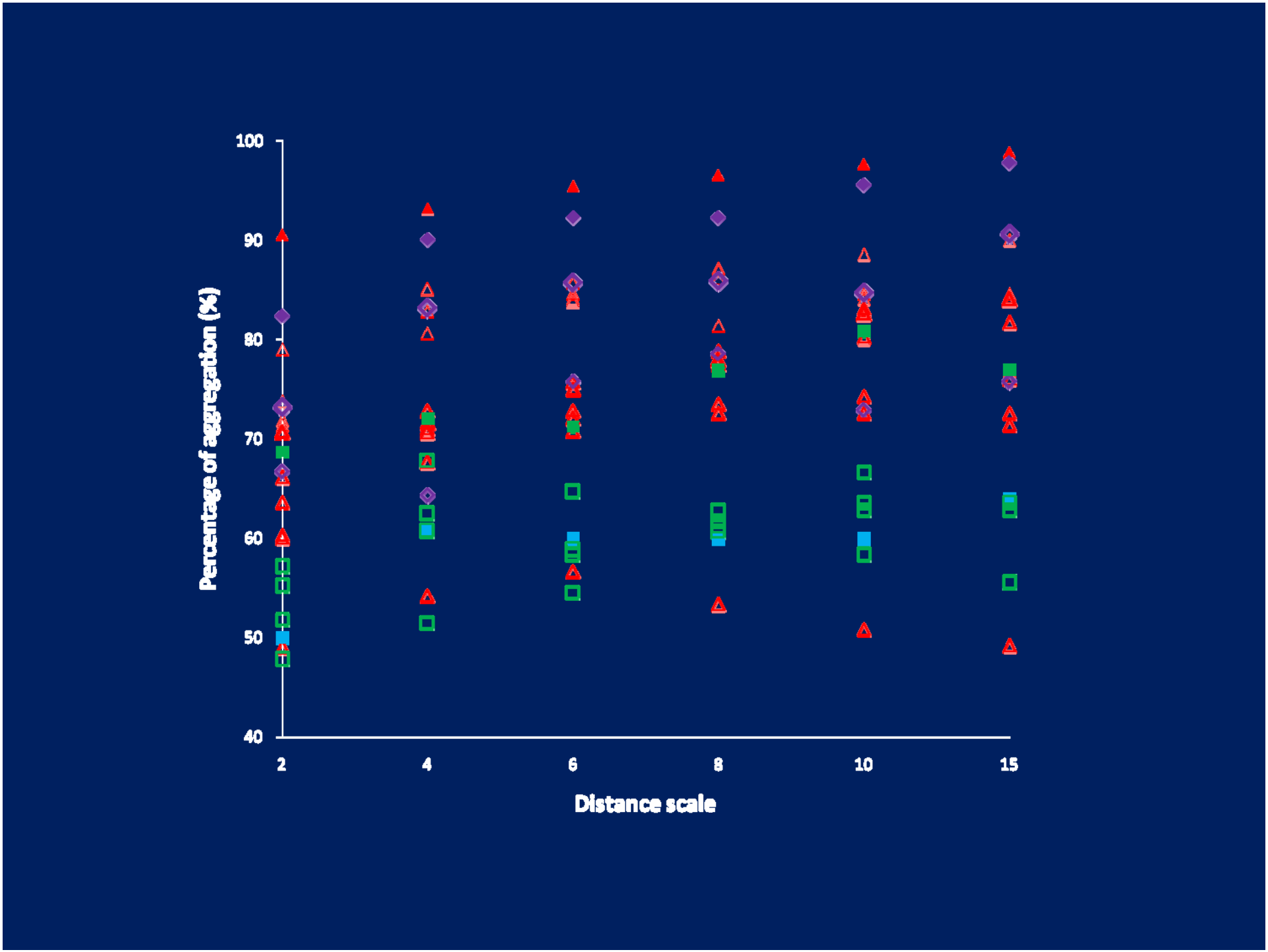
Discussion – **patterns of different size classes**

- Lanjenchi & Nanjen Lake plots
  - Decreasing, convex
  - Increasing pattern was just a few
- Nanjenshan plots I & II
  - Not specific

Question

- Spatial pattern vs. plot siz




Percentage of aggregation (%)
100
90
80
70
60
50
40
2
4
6
8
10
15
Distance scale


Thank
you !