Spatially continuous identification of beta diversity hotspots using species distribution models

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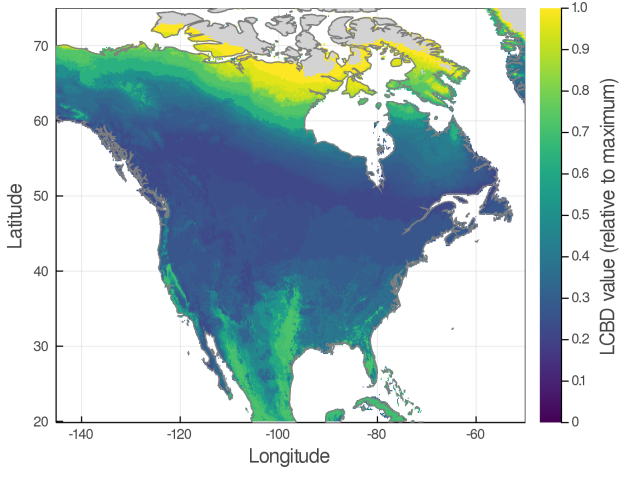
Suggestion

Bring together 2 elements:

1. Identification of beta diversity hotspots
2. Species distribution modelling (SDM) on continuous scales



While we're at it...

Beta diversity

- Community composition, not turnover

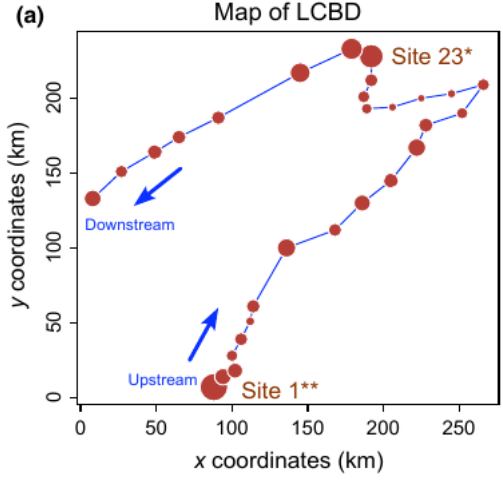
> *"Variation in species composition among sites within a geographical region of interest" (Legendre et al. 2005)*

Local contribution to beta diversity (LCBD)

- Highlights exceptional species compositions

> *"Comparative indicators of the ecological uniqueness of sites in terms of community composition" (Legendre & De Caceres, 2013)*

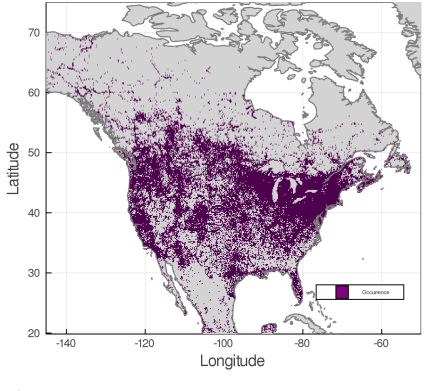
Why continuous scales?

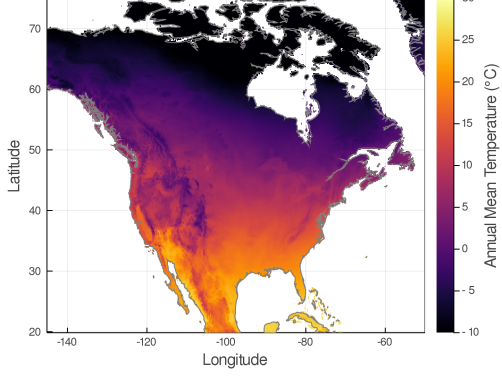


Original LCBD example (Legendre & De Caceres, 2013)

Why continuous scales?

- Online data on extended scales is increasingly accessible
- Potential for novel ecological insights





Relevance

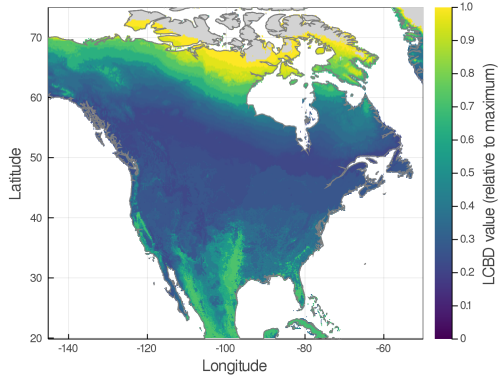
Novel ecological insights

- Tool for poorly sampled regions, or with sparse sampling
- Identification of conservation targets

Combination with IPCC climate change scenarios

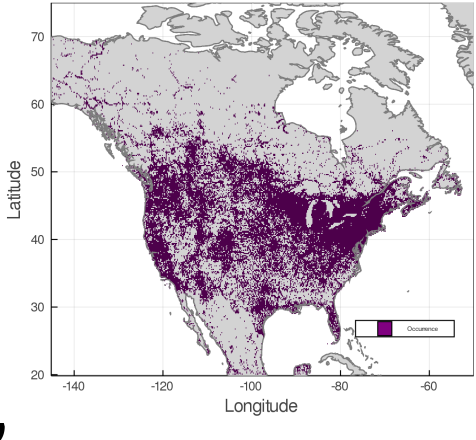
- Model beta diversity changes
- Identify sites with significant changes

⇒ Insight-oriented approach, exploratory analyses



Occurrence data

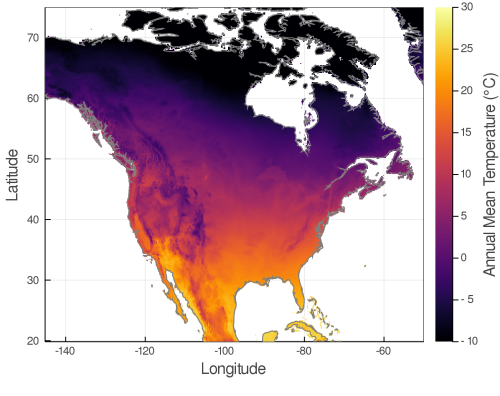
- Data from the eBird Basic Dataset
- All species of Warblers (*Parulidae* family) in North America

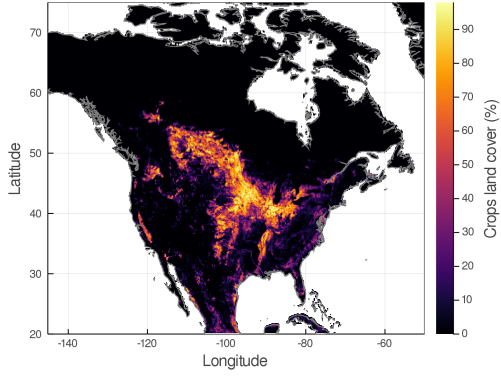


eBird

Environmental data

- 2 climates variables : mean annual temperature, mean annual precipitation
- 10 land cover variables : bare, crops, grass, moss, shrub, snow, tree, urban, permanent water, seasonal water

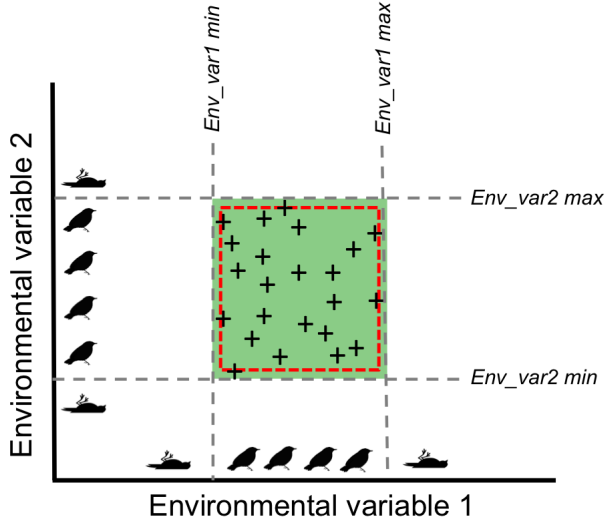




WorldClim - Global Climate Data
Free climate data for ecological modeling and GIS

Copernicus
Europe's eyes on Earth

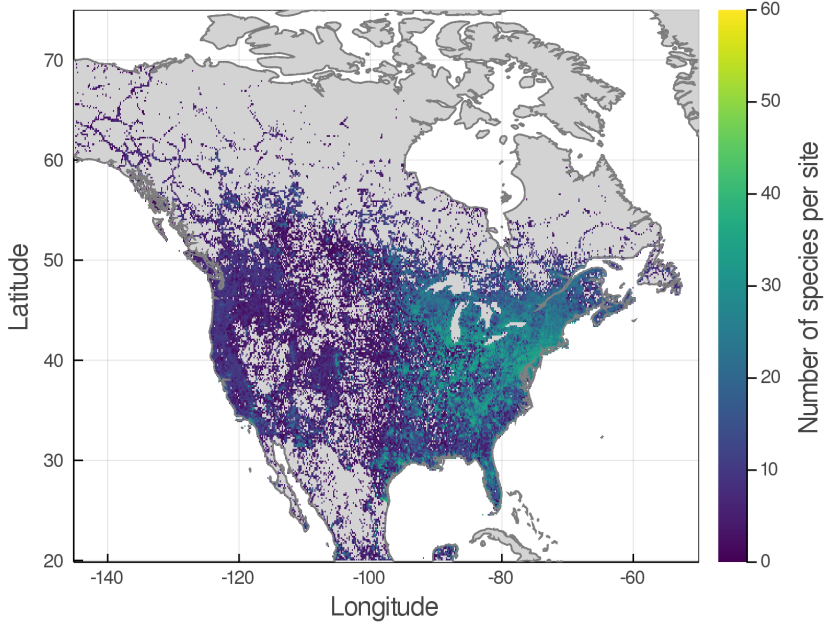
Methods - BIOCLIM model



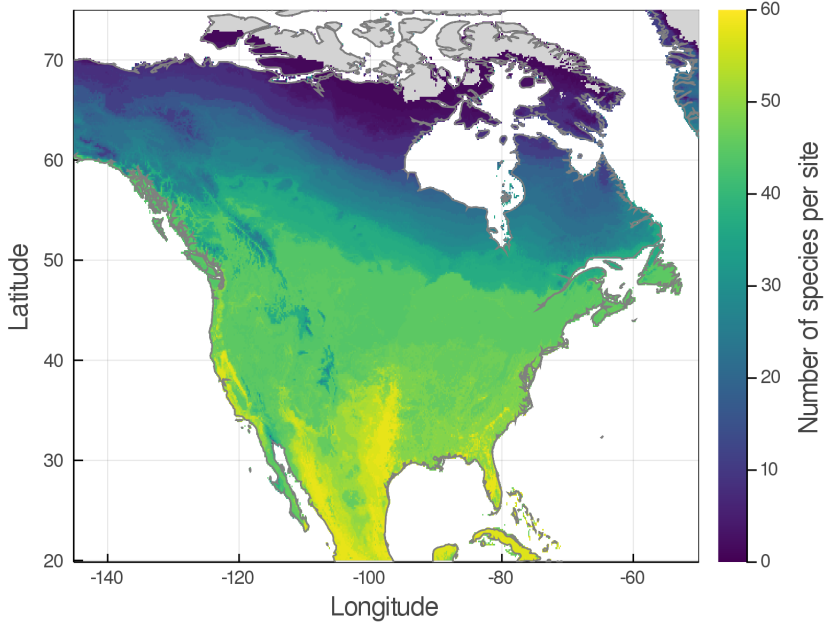
Climate envelope in the BIOCLIM model[1]

[1] https://support.bccvl.org.au/support/solutions/articles/6000083201-bioclim

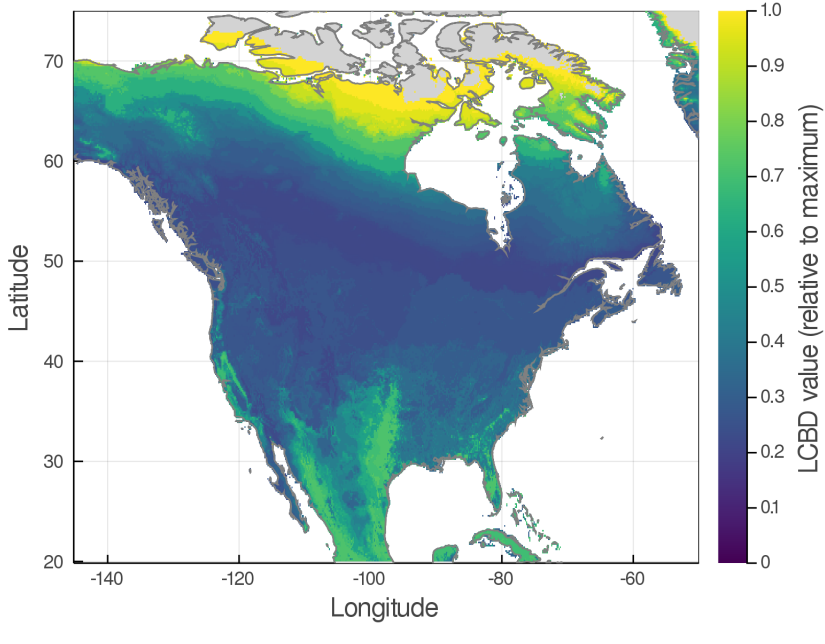
Species richness - Raw data



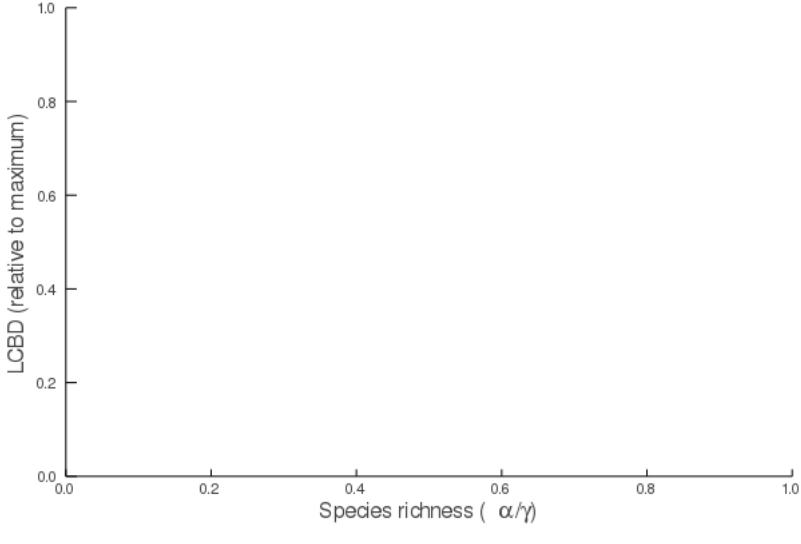
Species richness - SDM results



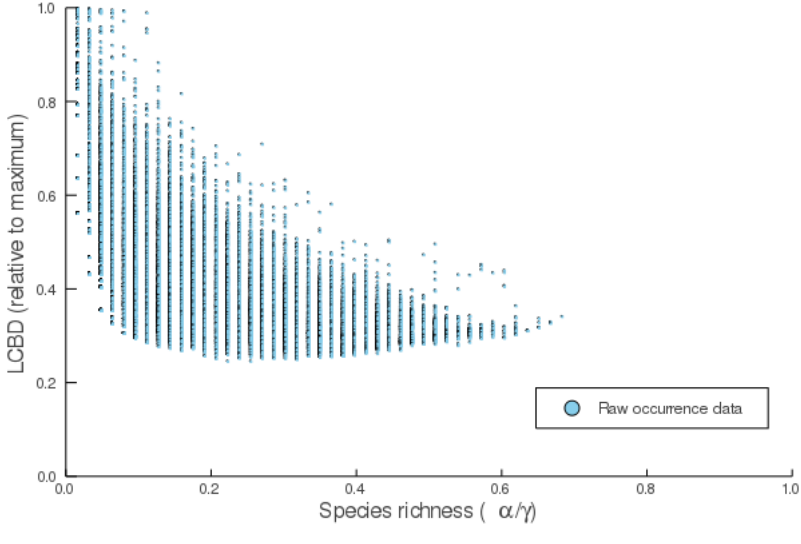
LCBD values - SDM results



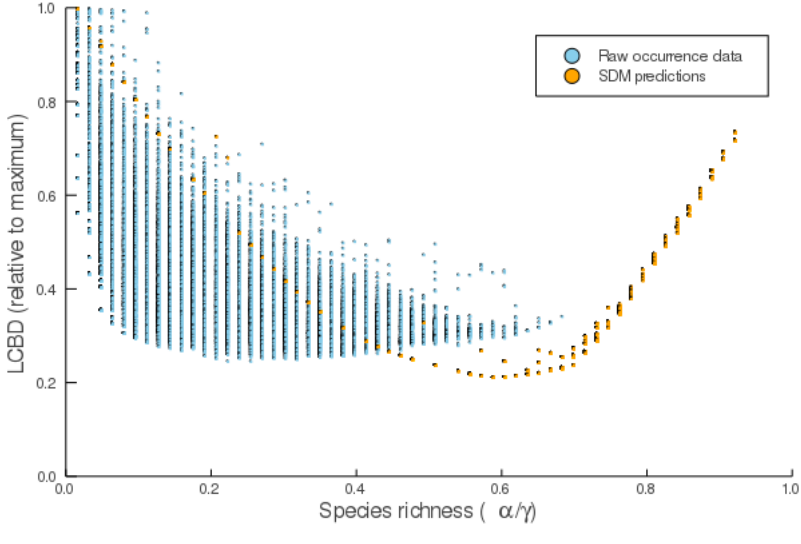
LCBD-richness relationship



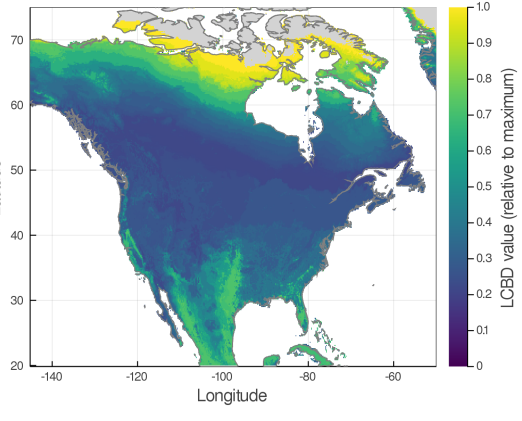
LCBD-richness relationship

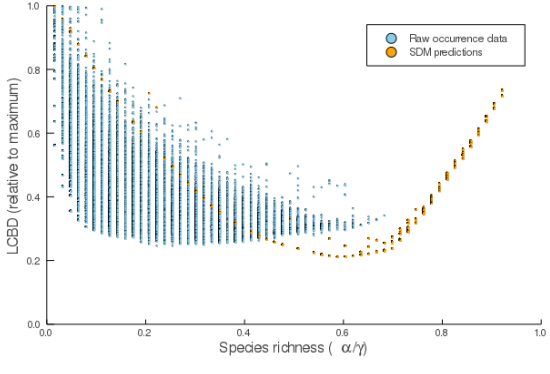


LCBD-richness relationship



Spatially continuous identification of beta-diversity hotspots using species distribution modelling





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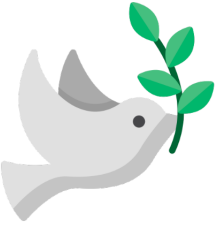
Icon credits

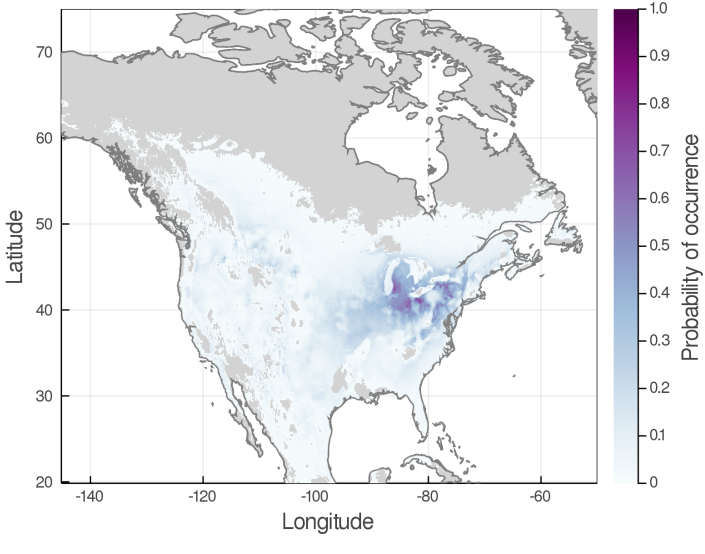
Created by Matt Steele
from Noun Project



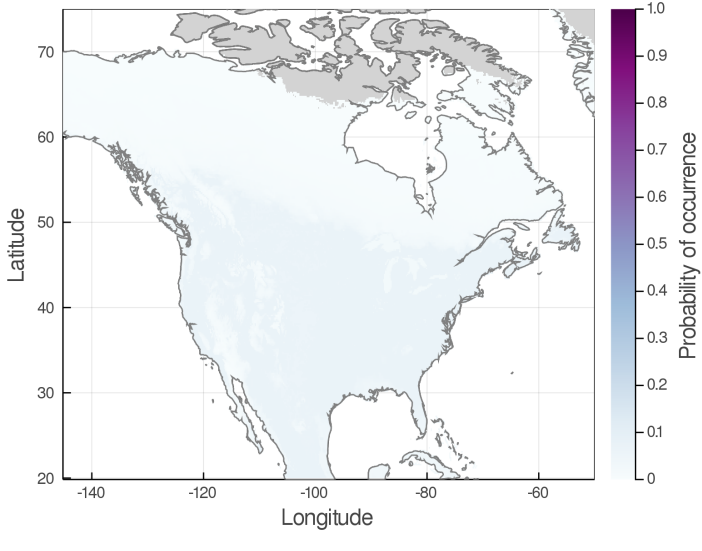
"Icon made by Pixel perfect from www.flaticon.com"

Appendix

Single species example - SDM with threshold



Single species example - SDM without threshold



LCBD - Raw data (with Hellinger transformation)

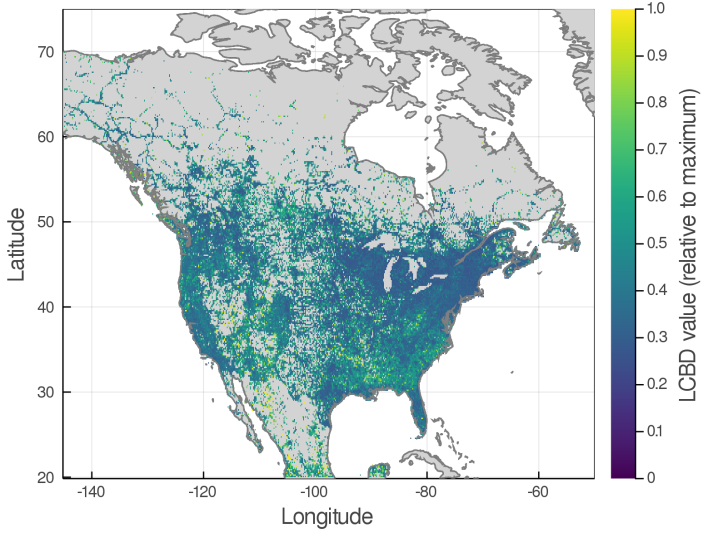


Figure 1: LCBD values relative to maximum value based on the raw data after Hellinger transformation