

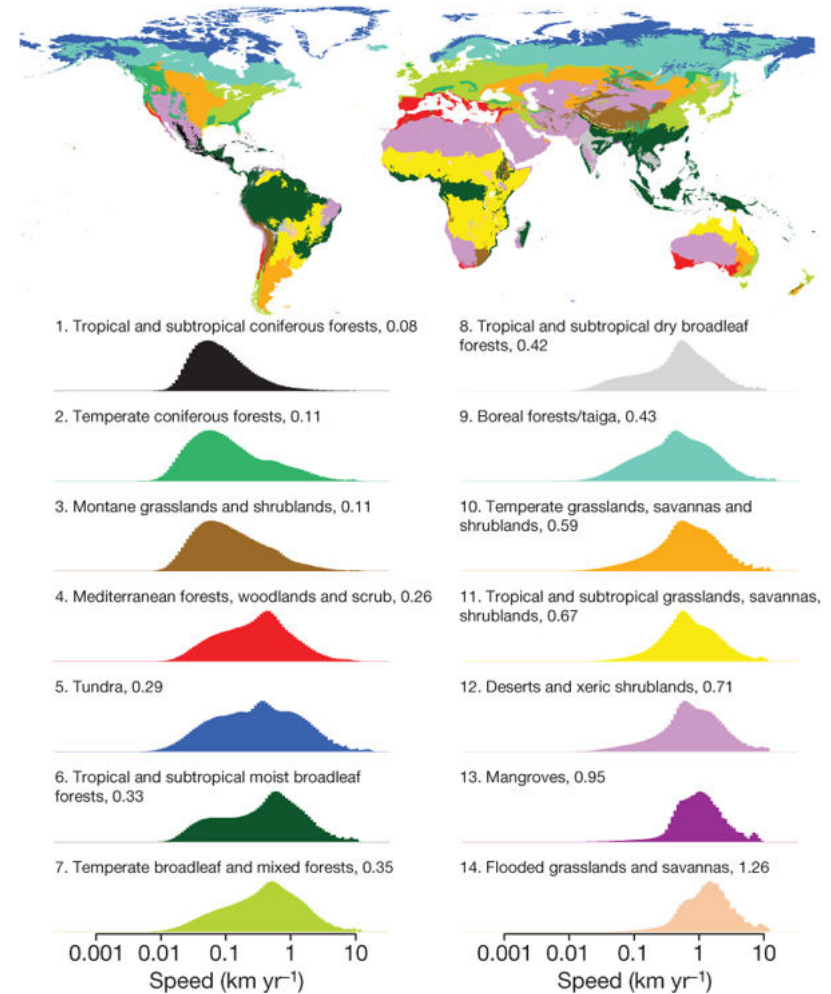
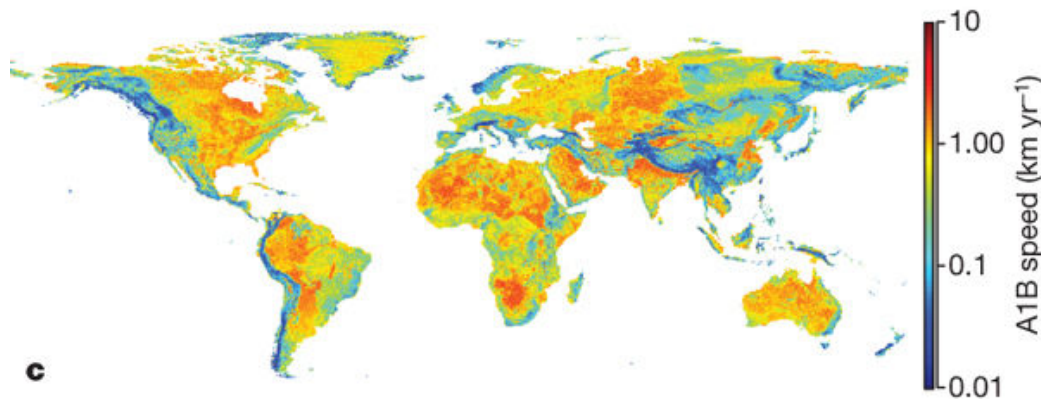
Novel Approaches to Predicting Plant Species' Movement under Climate Change

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Plant Species Survival of Climate Change

- **Global average speed of 0.42 km/yr**
- **0.11 - 1.46 km/yr depending on biome**



Integro-Difference Equations (IDEs)

$$u_{t+1}(x) = \int_{-\infty}^{\infty} [K(x-y, y) \circ B(y, u_t(y))] u_t(y) dy$$

Individuals at x

Dispersal

Demography

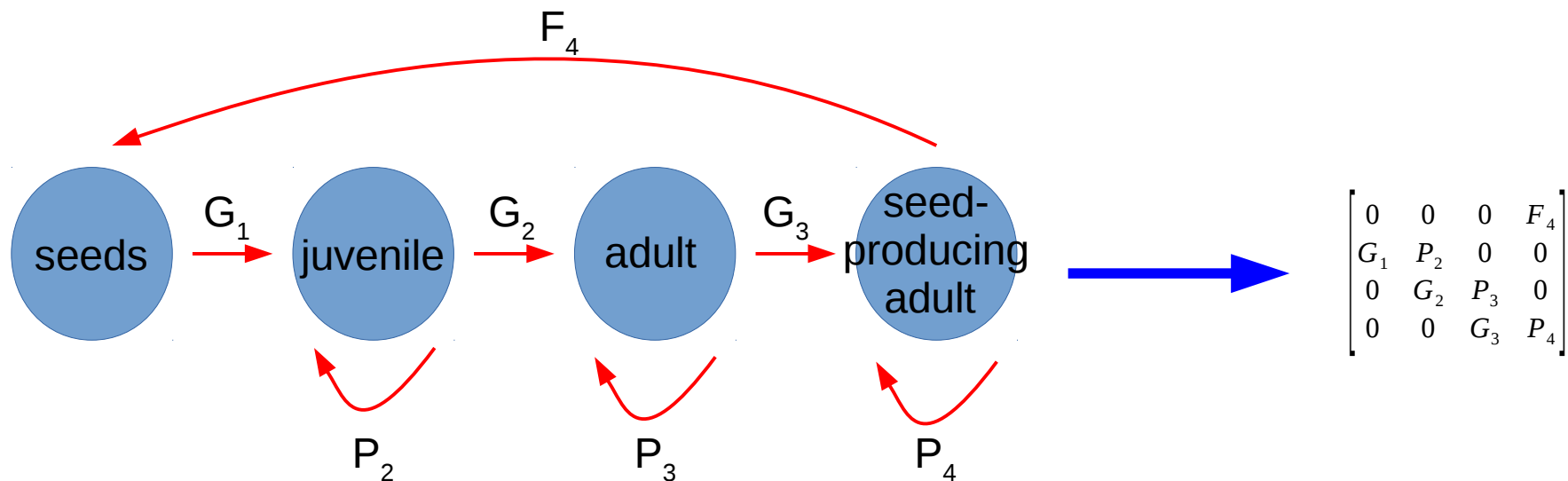
Individuals at y

- **Can be solved for C - maximum wavespeed of invasion**
- **Incorporates both dispersal distances and demographic trends**



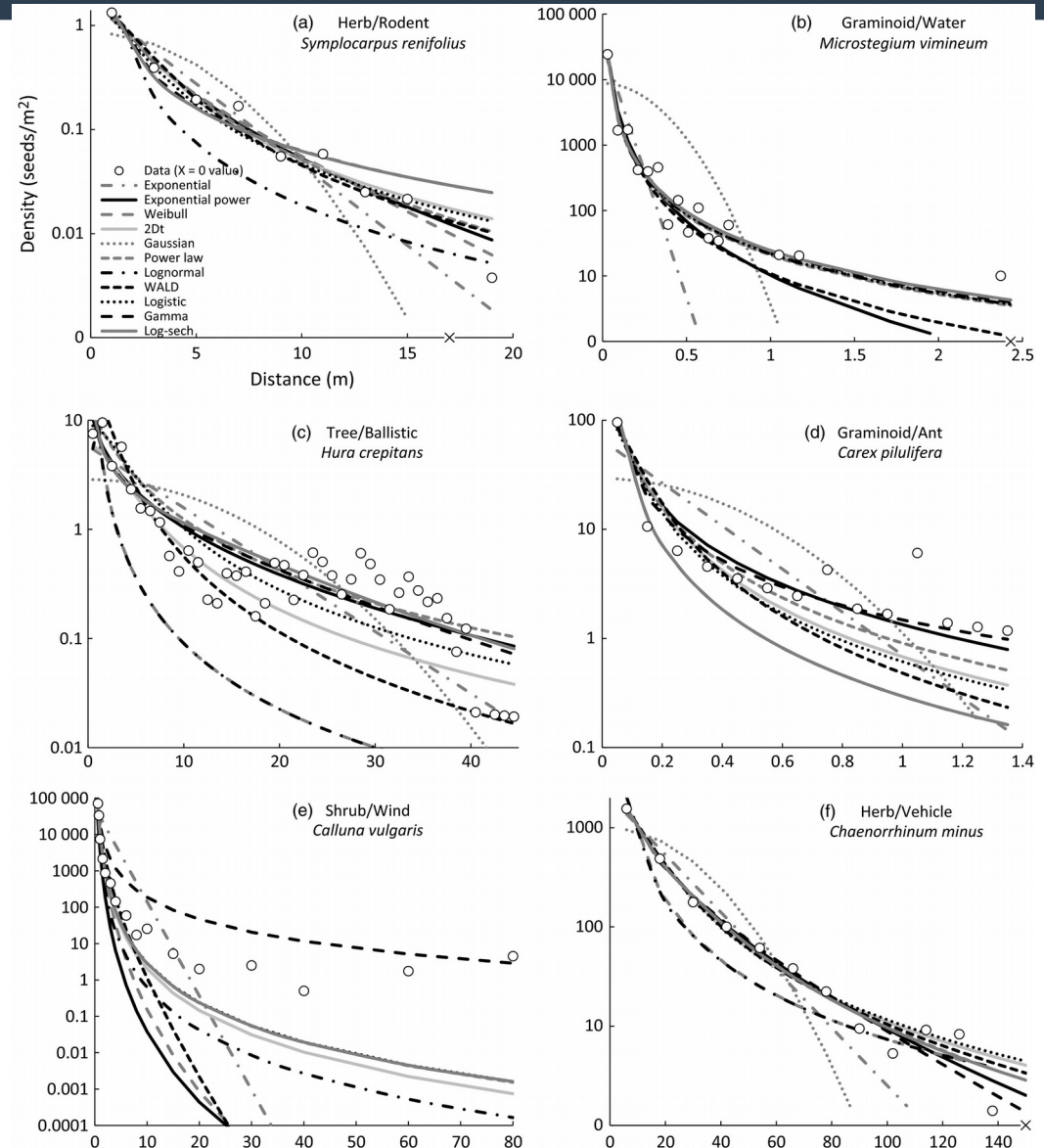
Demographic Models

- **Compadre database**
- **Matrix models for various growth forms and species**



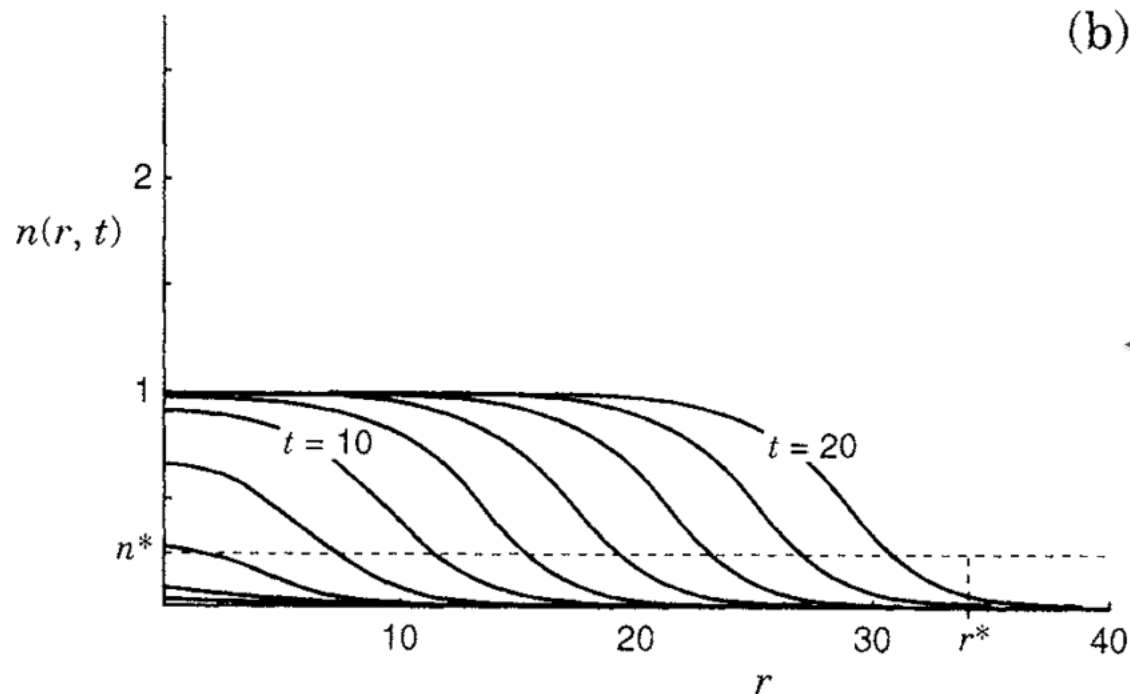
Dispersal Kernels

- Estimated from field data
- Variety of species and dispersal regimes



Calculating C

- Calculated from reproductive rate and maximum dispersal



Lack of Overlap

- **Lack of species which have both dispersal and demographic models**
- **Requires the use of “virtual species”**

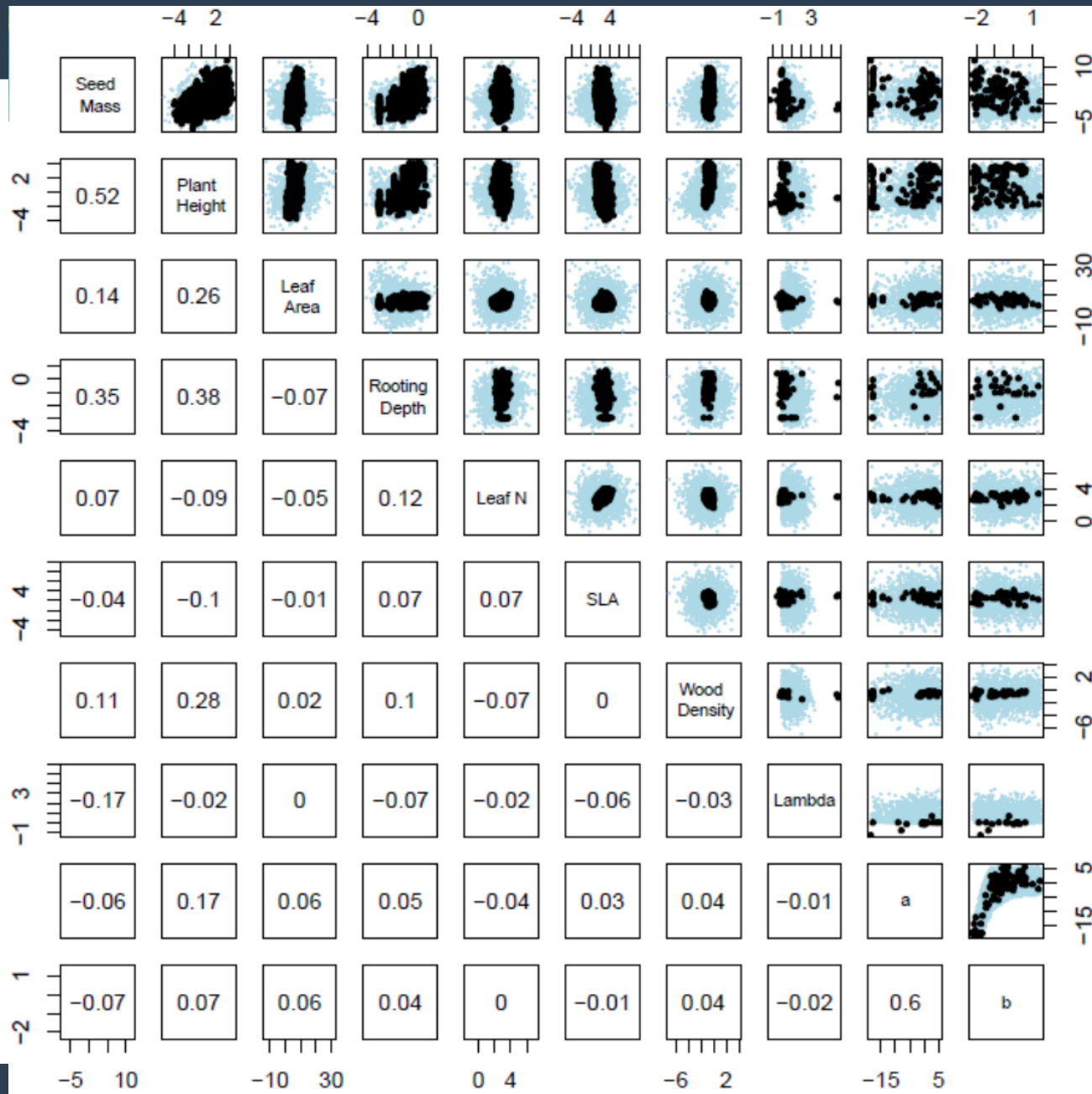


Virtual Species

- **Multivariate Gaussian mixed model of trait/parameter correlations**
 - Realistic combinations of traits
- **Dispersal characteristics used for potential wave speed based on real species**
- **Based on 784 COMPADRE species with trait, growth form and dispersal data**



Trait Combinations



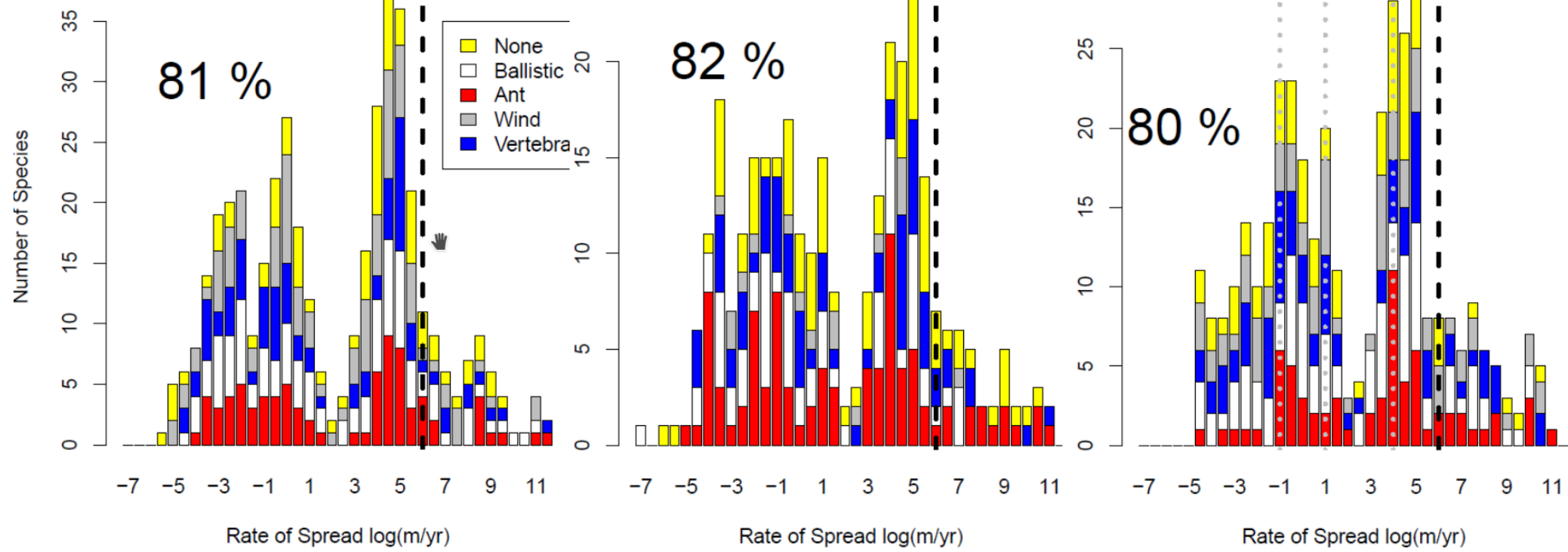
Preliminary Results

Global Mean (0.42 km/yr)

Trees

Shrubs

Herbs



Future Work

- **Refine virtual species outputs with additional data**
- **Divide trait data and virtual species by biome**

