Historical biogeography methods

1. Estimate a dated phylogeny

2. Put the geographic ranges at the tips

3. Assume some process(es)

4. Conduct inference

Summary of previous lectures:

Different authorities have different assumptions about what processes matter!

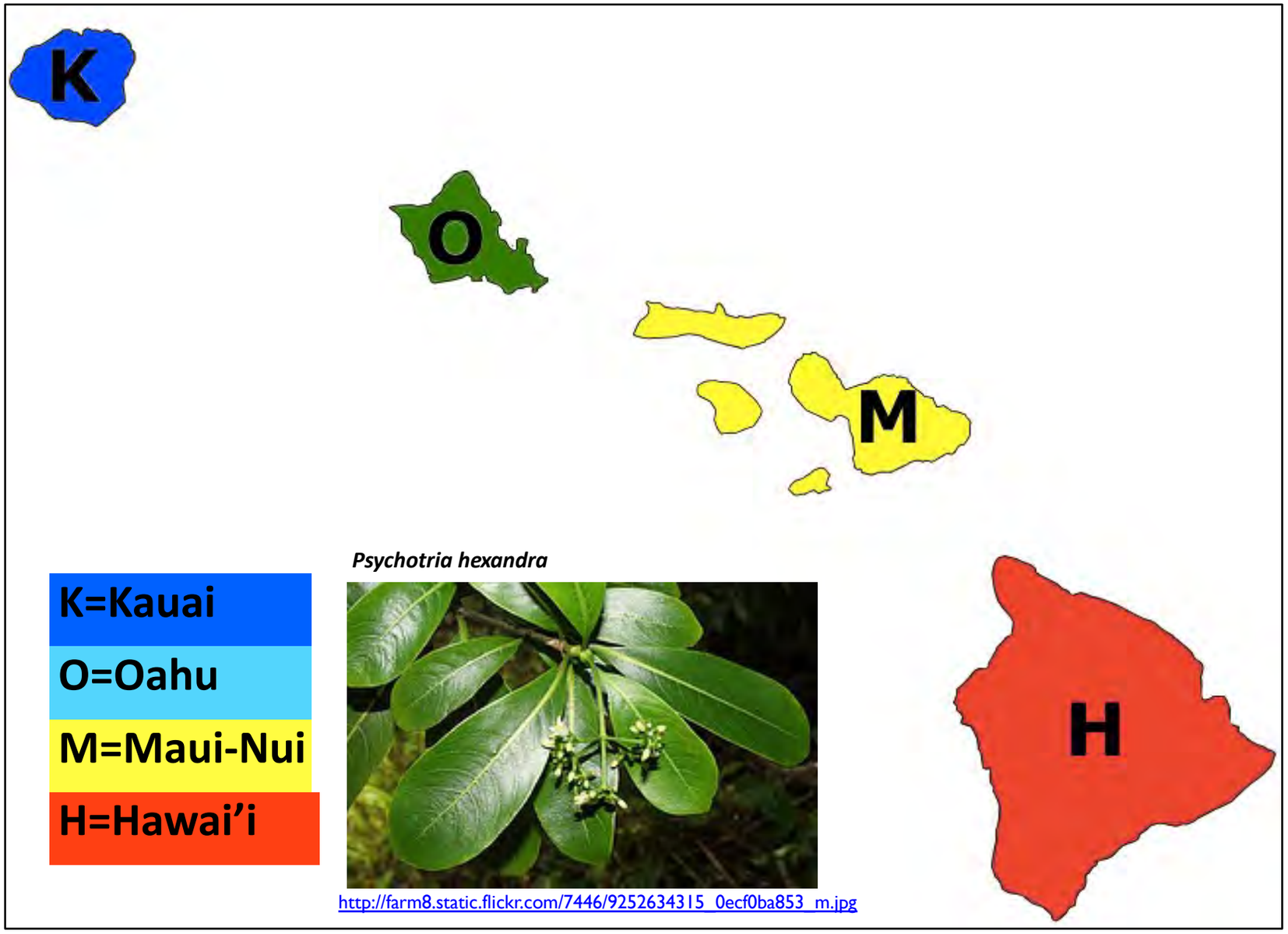
Your inferences will depend on your assumptions

Vicariance: deterministic vision where geology determines ranges

Dispersal: "unpredictable" "chance events"

Me: "Unpredictable" doesn't mean intractable – we can address using probabilistic models

Results of different biogeography models on same dataset:



K=Kauai

O=Oahu

M=Maui-Nui

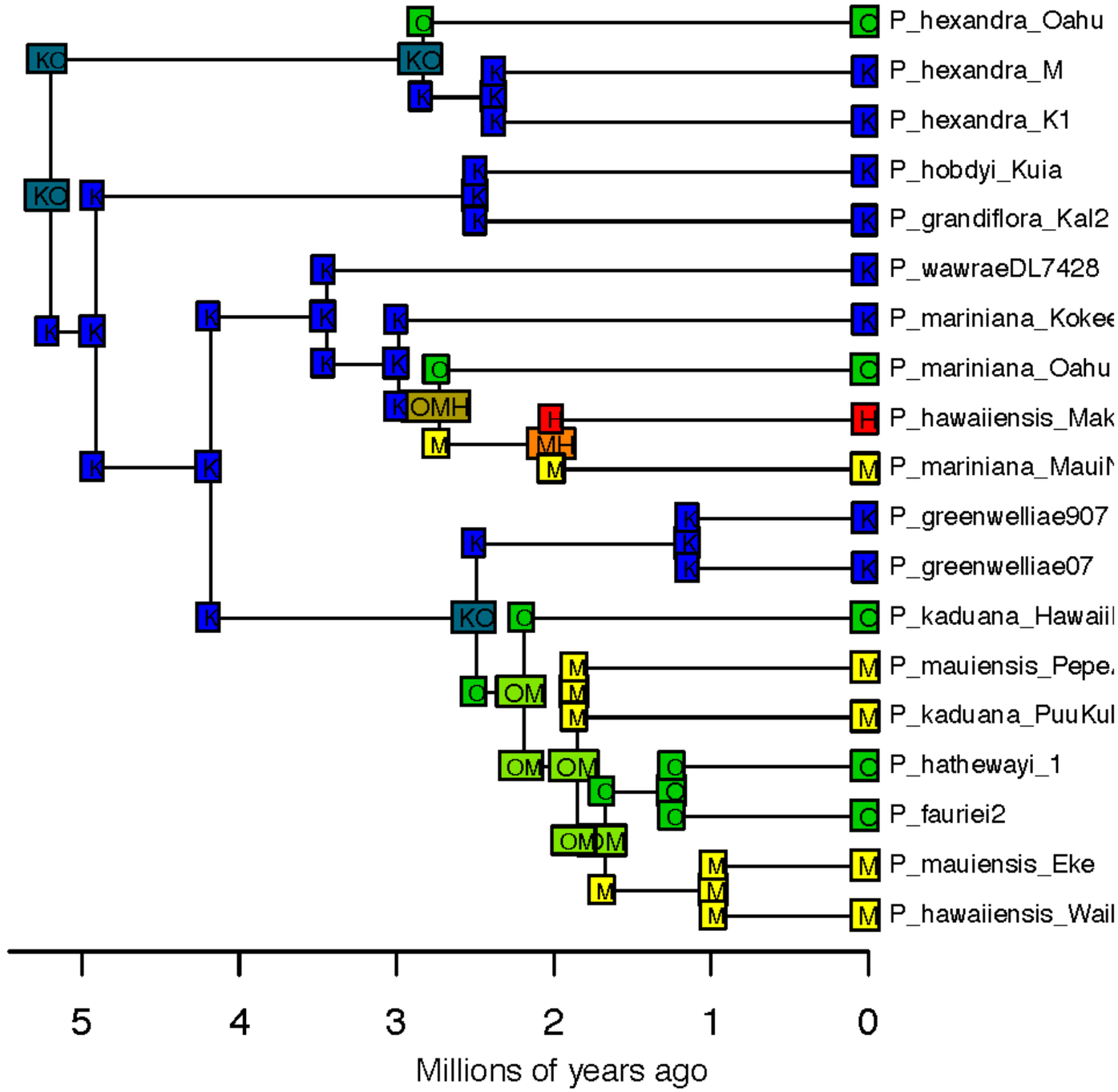
H=Hawai'i

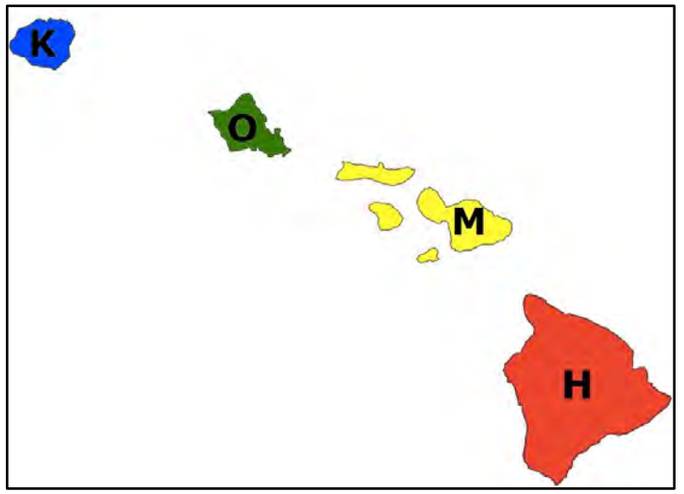
Psychotria hexandra

http://farm8.static.flickr.com/7446/9252634315_0ecf0ba853_m.jpg

Example of biogeographic history: *Psychotria*

Model: DEC





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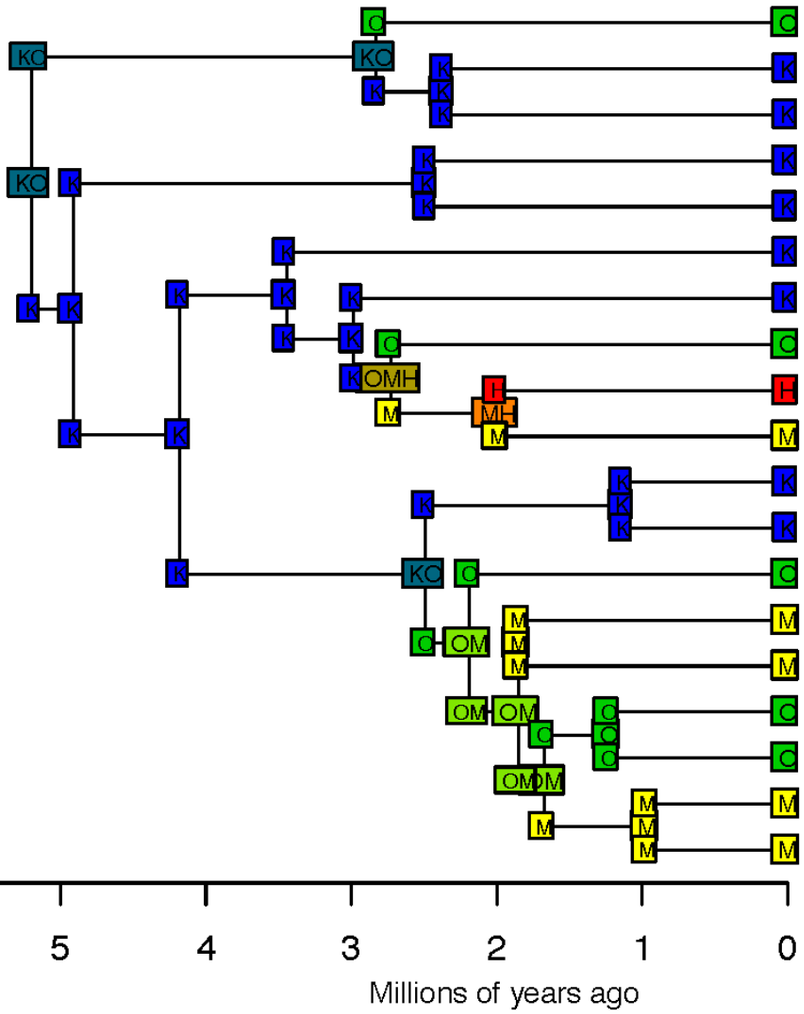
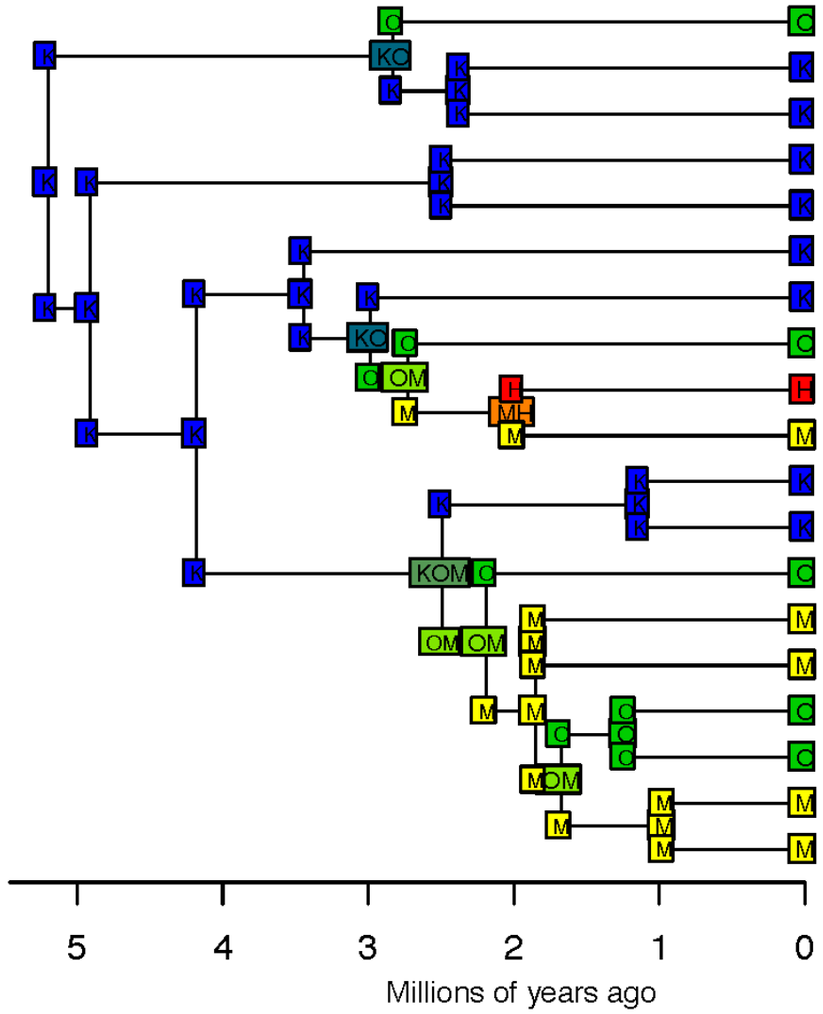
Comparison: 3 models

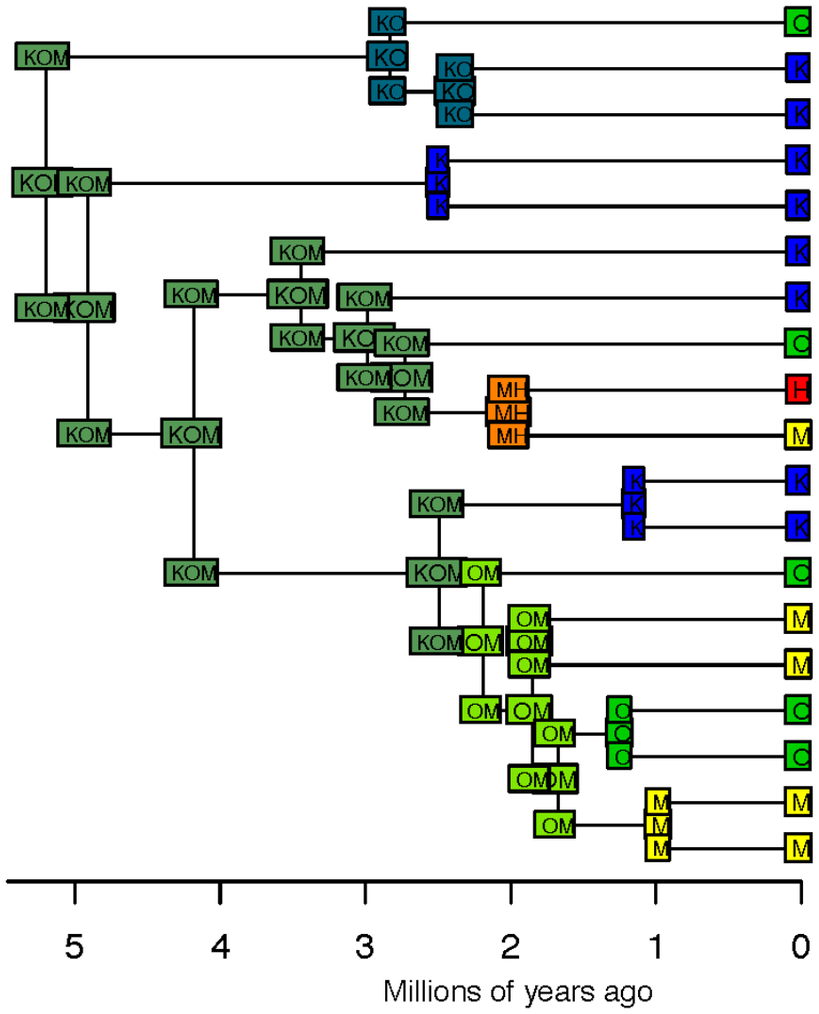
Model: DEC



Model: DIVA



Model: BayArea



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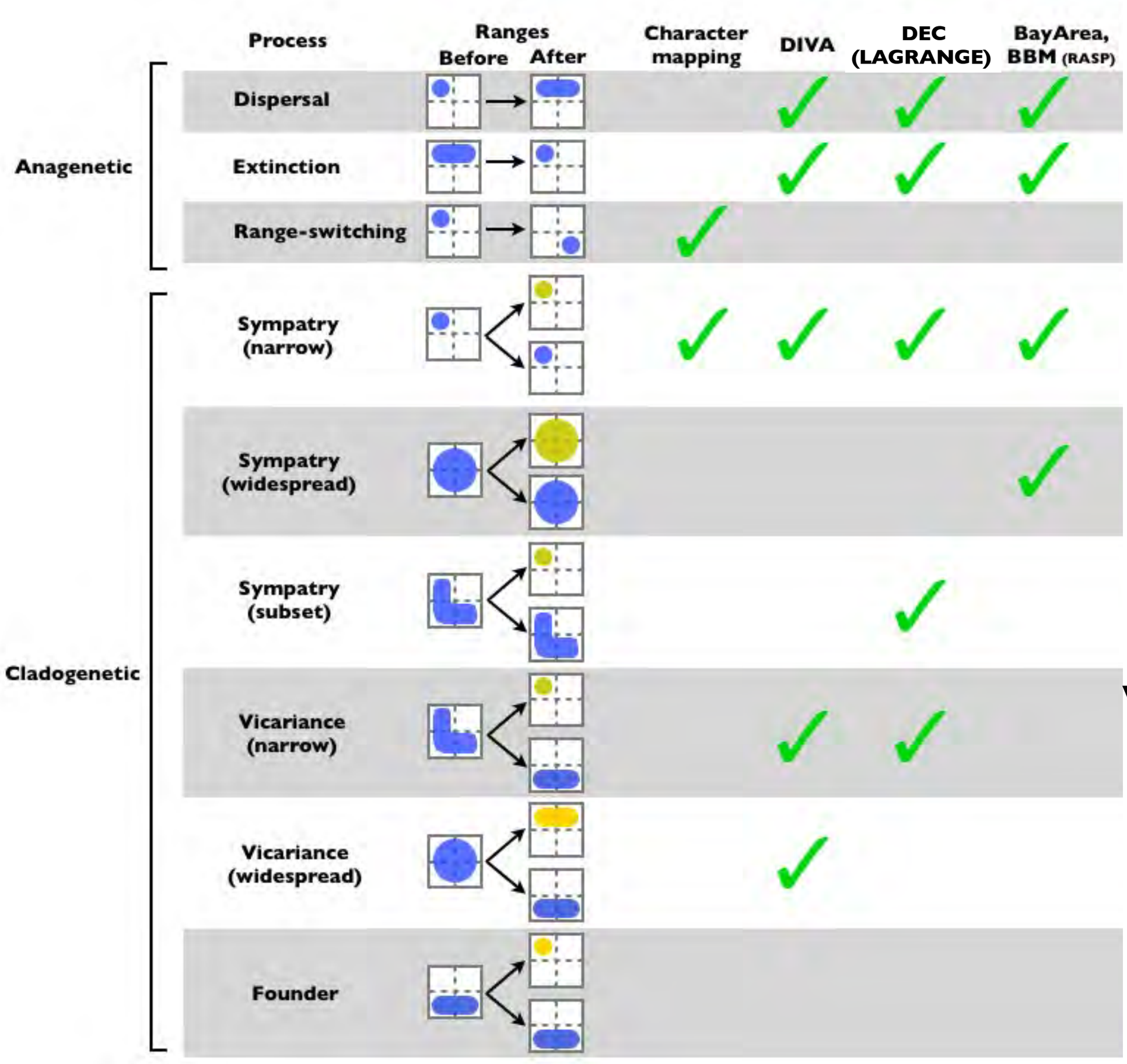
I think we should use <u>statistical model choice</u> in biogeography

Comparison of two models:

1. model without founder-event speciation

2. model with founder-event speciation

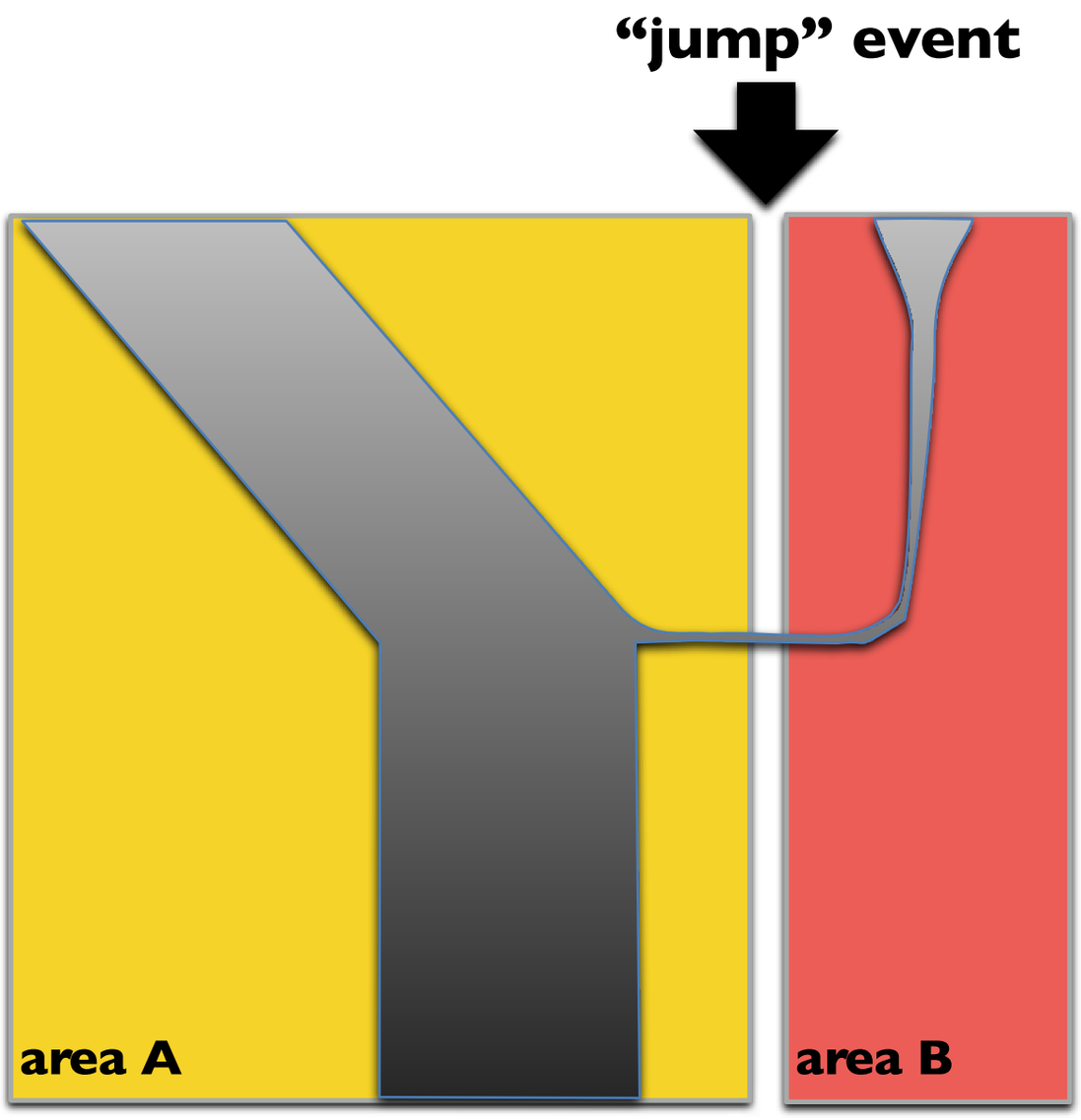


Which model should we use?

What about founder-event speciation?

Figure 1, Matzke 2013, *Frontiers of Biogeography*

Founder-event speciation



- In founder-event speciation, a rare dispersal event "instantaneously" establishes a geographically isolated new lineage with one or a few individuals

- Widely discussed in population genetics, speciation literature, island biogeography

- However, ignored in traditional historical biogeography computer models

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