Cascading paleoclimate interactions affect origination rates of marine genera

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5th IMERP

20th April 2021

About me

PhD Student

Tersane

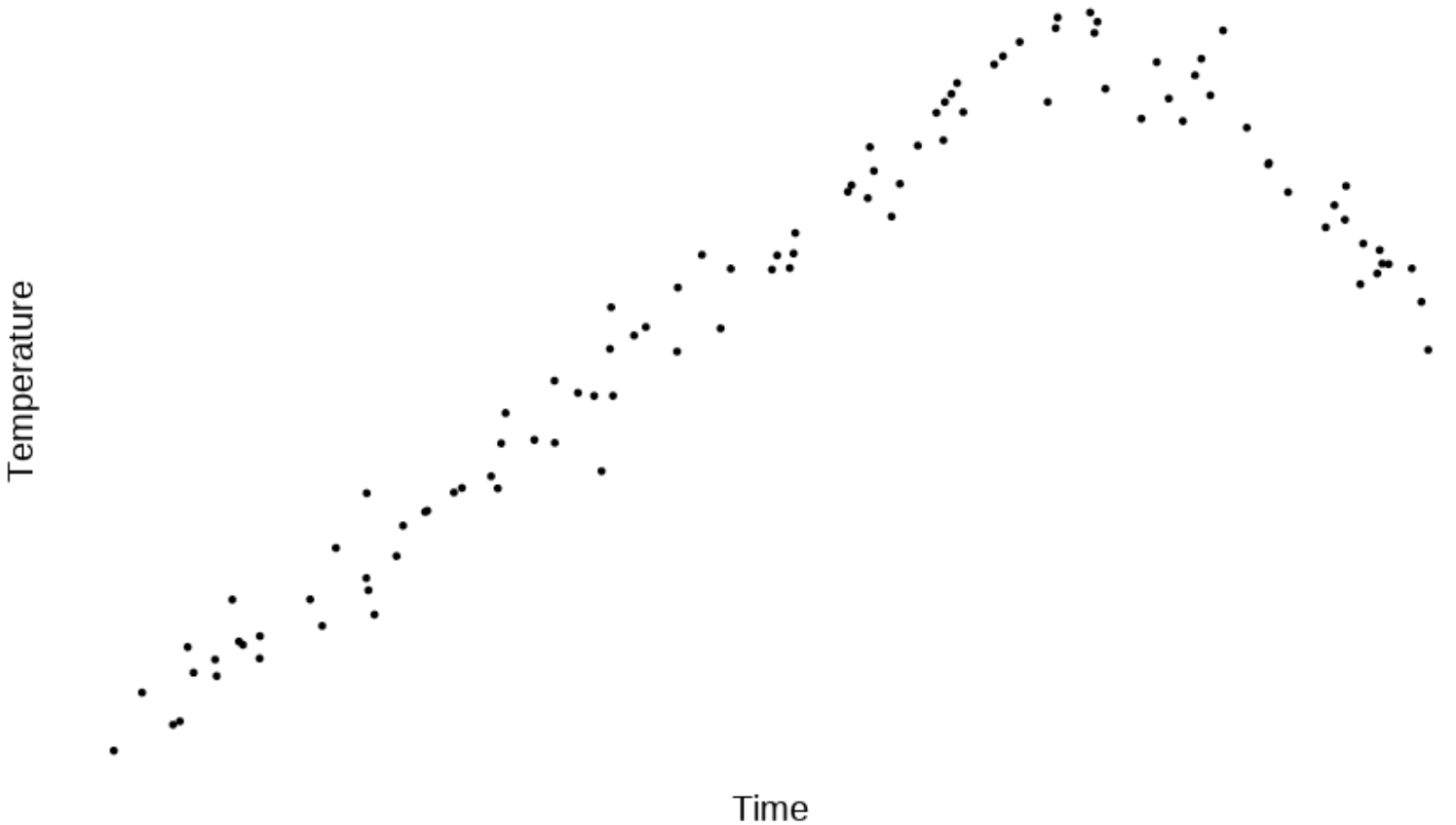
Conservation Palaeobiology

Environmental Data Science

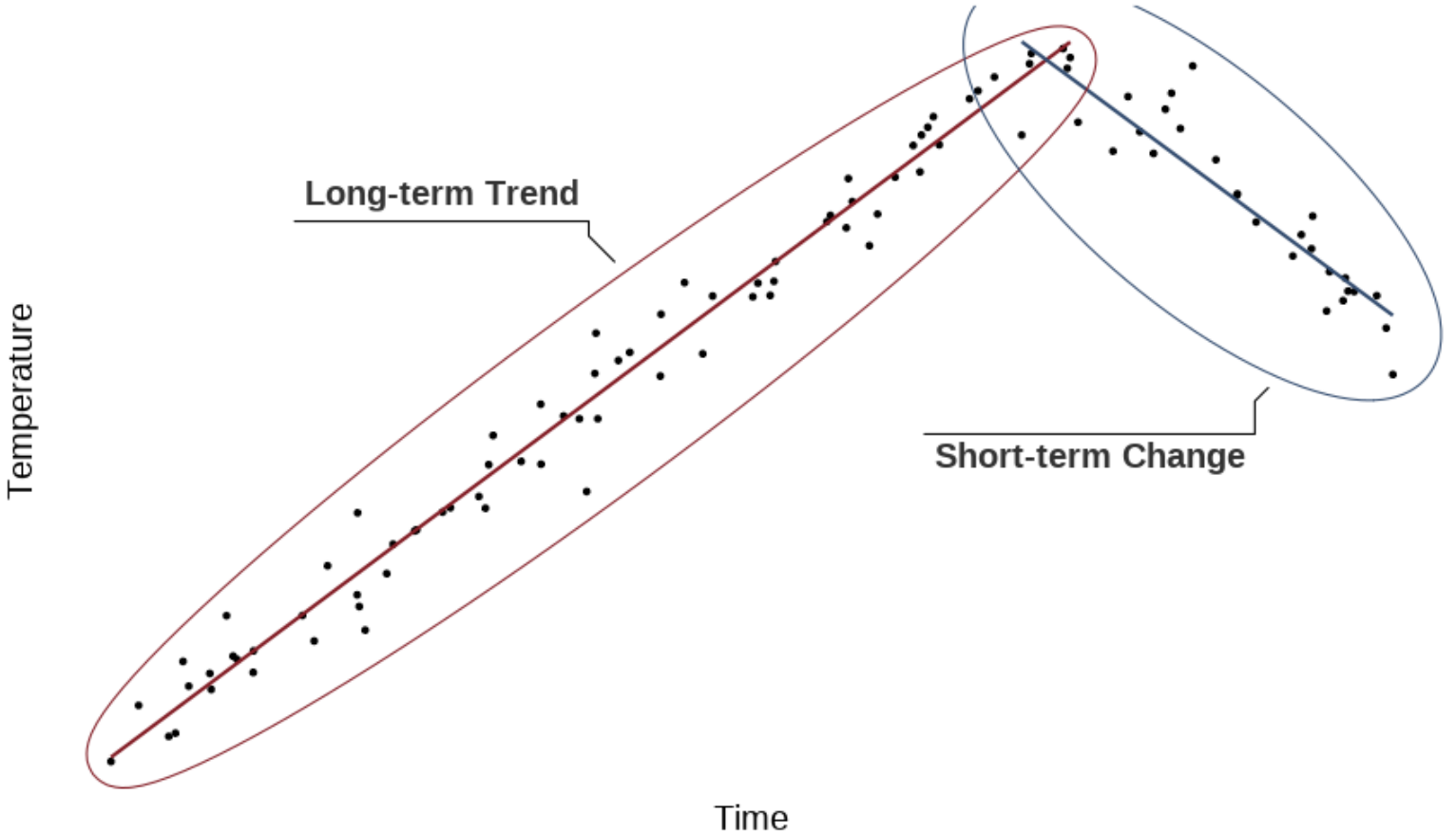
Complex interactions of life and climate

Palaeoclimate Interactions

Paleoclimate Interaction



Paleoclimate Interaction



Background

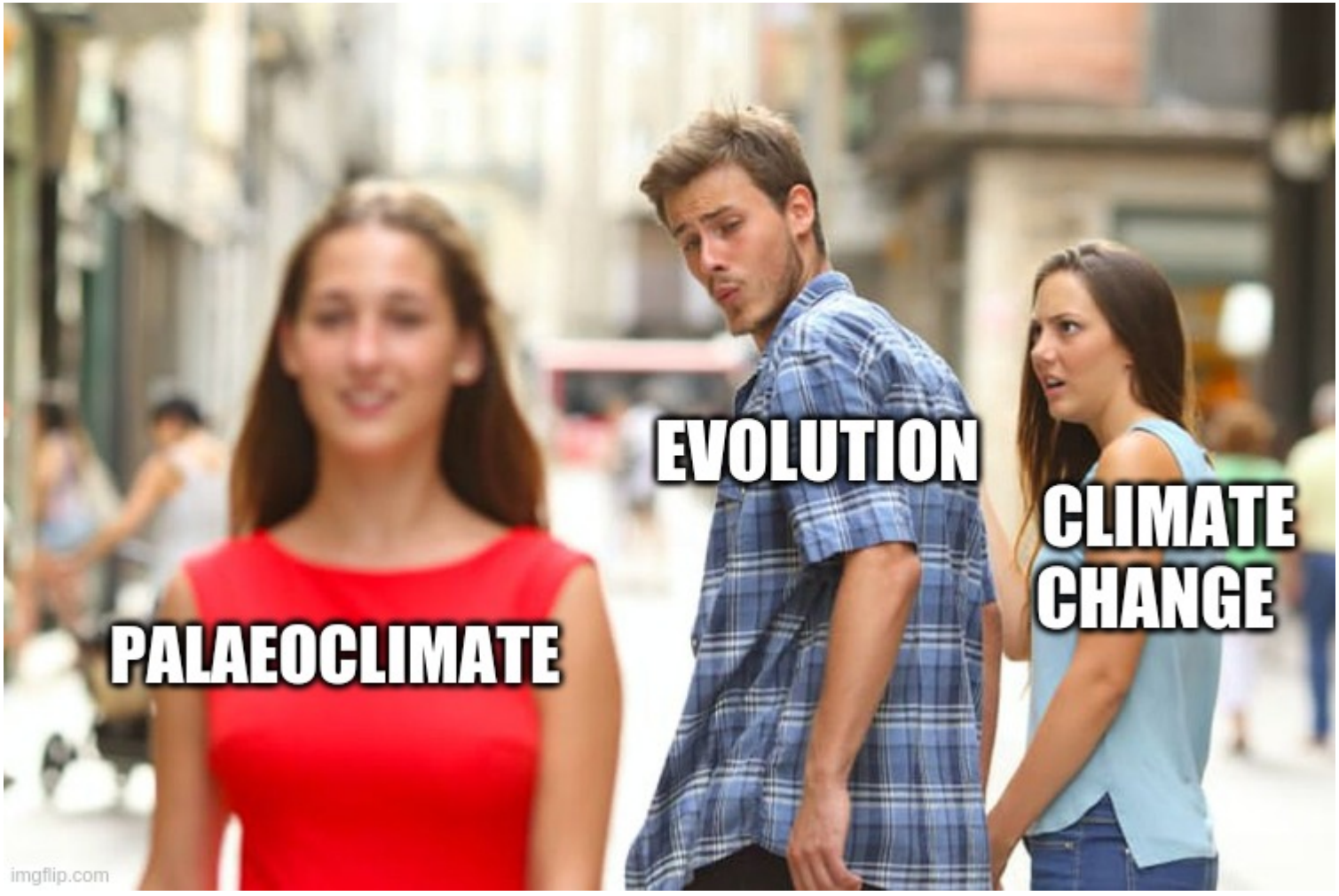
Various ecological concepts state that climatic context matters for evolutionary dynamics

- niche conservatism[1]
- migration lags[2]
- cascading effects[3]

[1] Wiens & Graham 2005, Hopkins et al. 2014

[2] Svenning & Skov 2004, Normand et al. 2011

[3] Beaugrand 2015, Lord et al. 2017


EVOLUTION
CLIMATE CHANGE
PALAEOCLIMATE
imgflip.com

Recent work

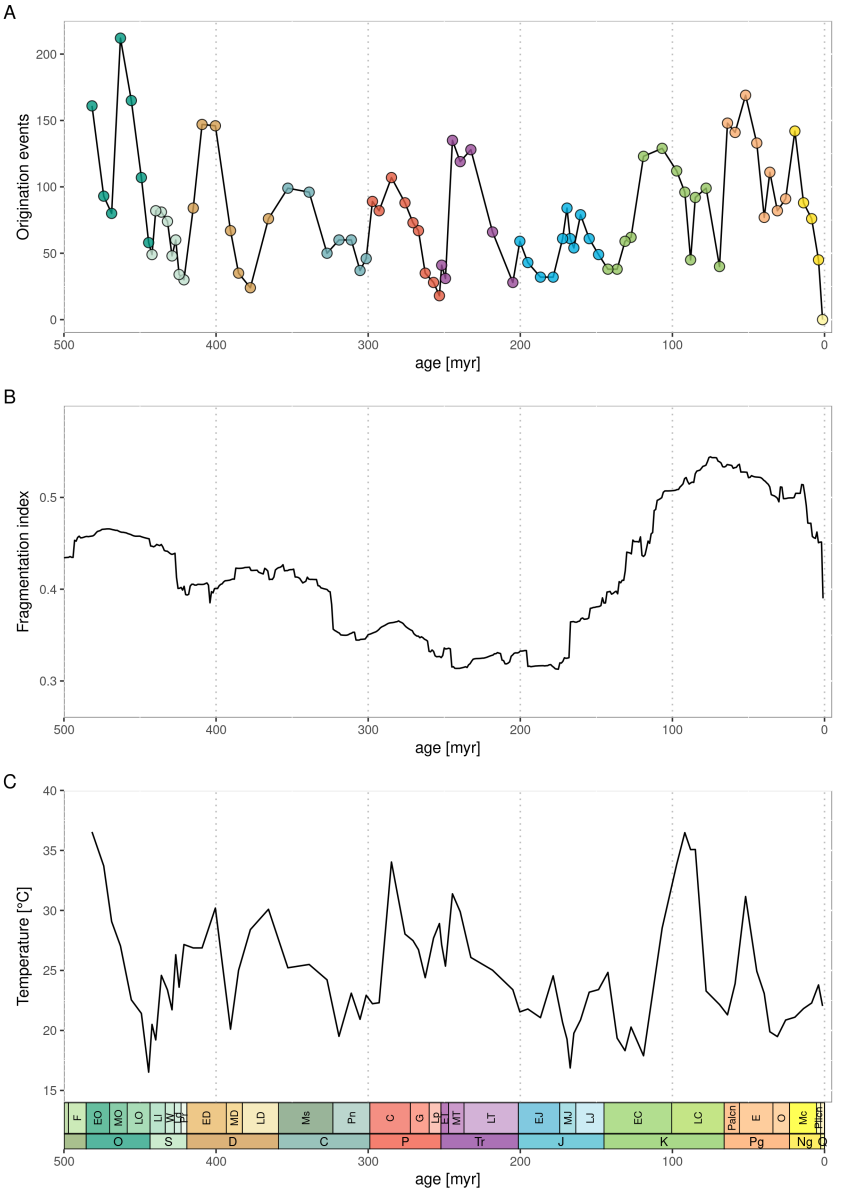
- Biodiversity → High Impact[1]
- Extinction → High Impact[2]
- **Origination → ???**

[1] Antão et al. 2020

[2] Mathes et al. 2021

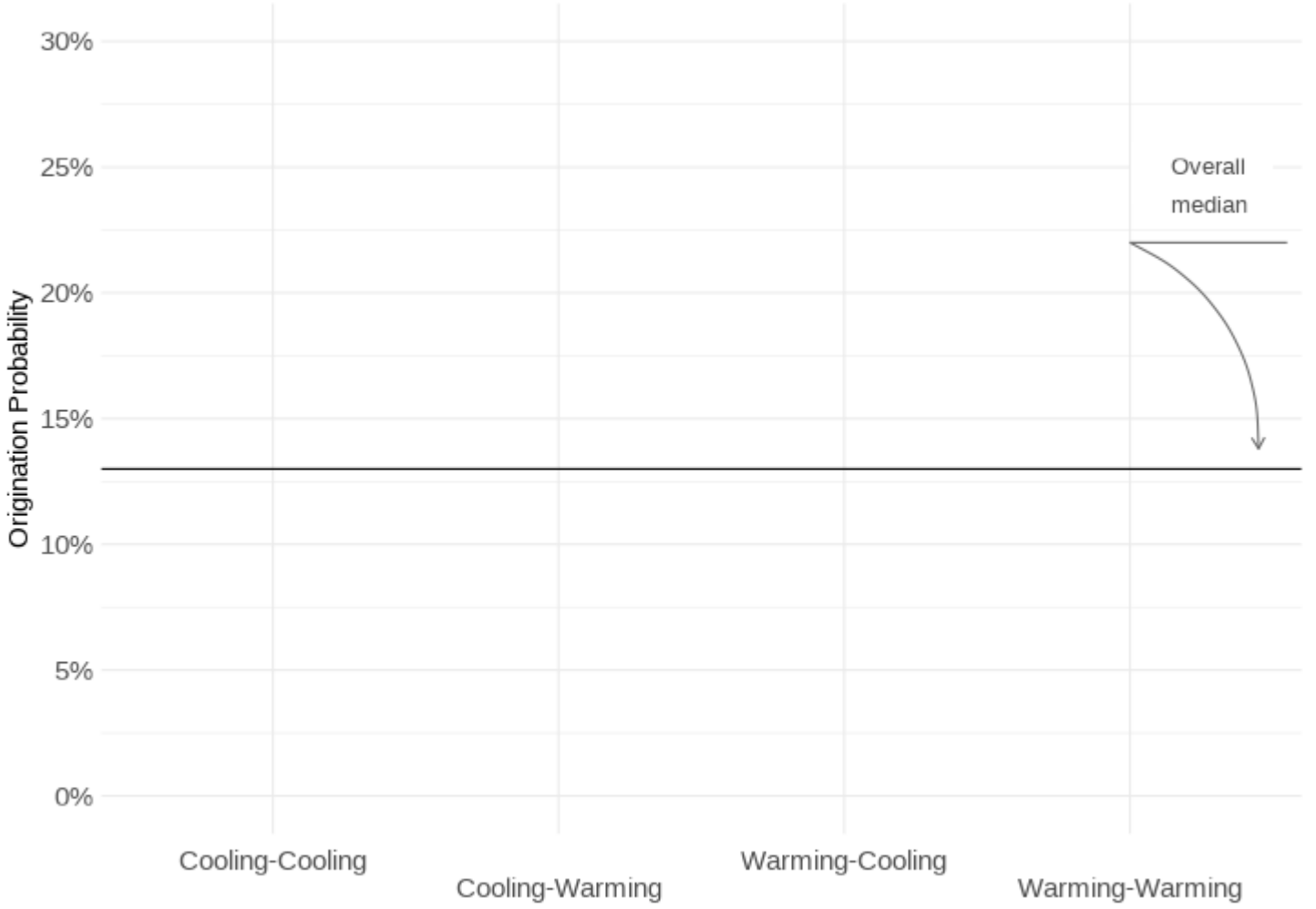
Methodology

- Subsampled fossil data
  - Shareholder quorum subsampling
  - PBDB
  - Genus level
  - Sepkoski's compendium
- Oxygen isotopes for temperature
  - Veizer and Prokoph 2015
  - Song et al. 2019
- Generalized linear mixed effect models
  - dynamic modeling framework
  - Bayesian estimation

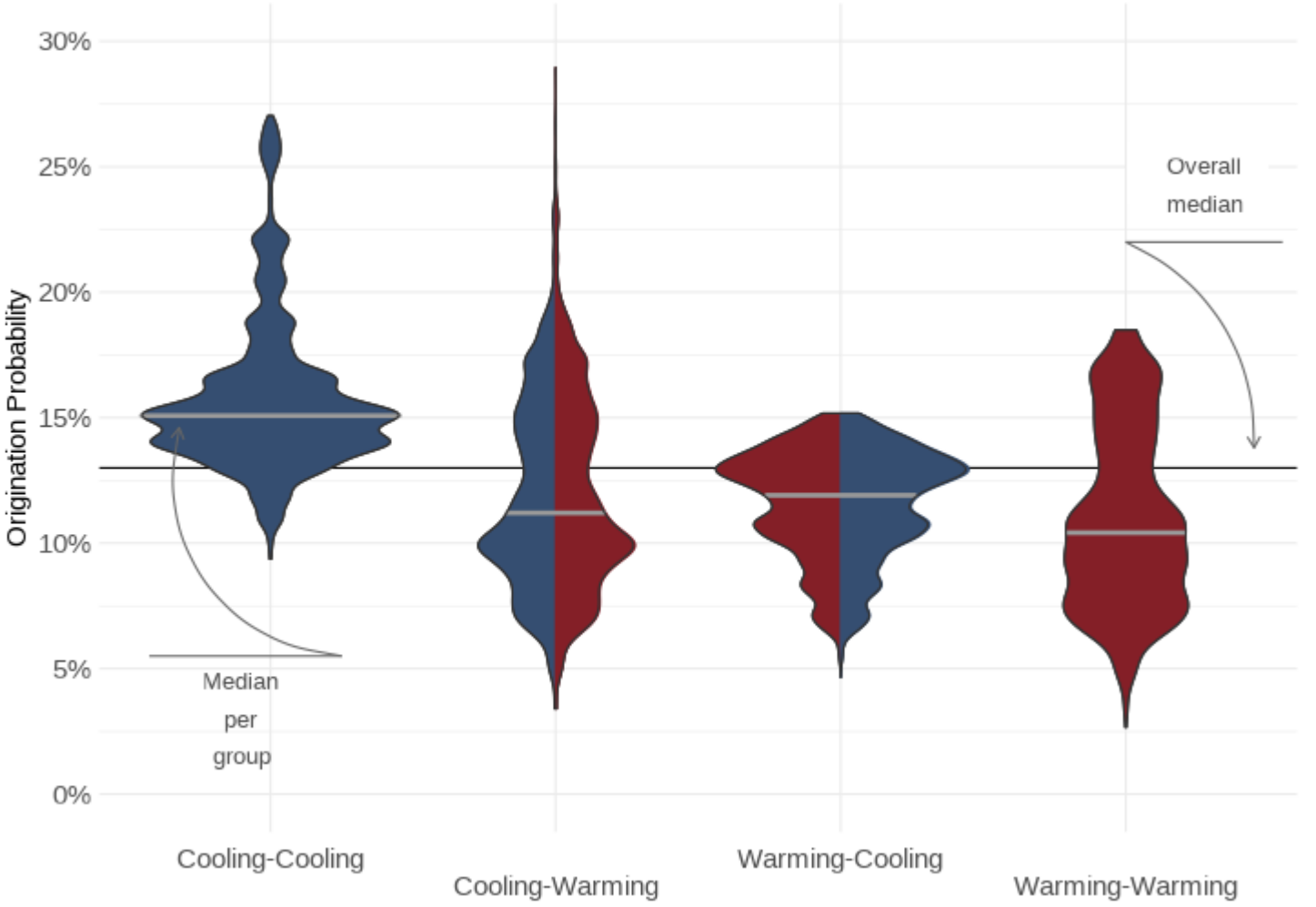


Mathes et al.
2021, in review

Origination response

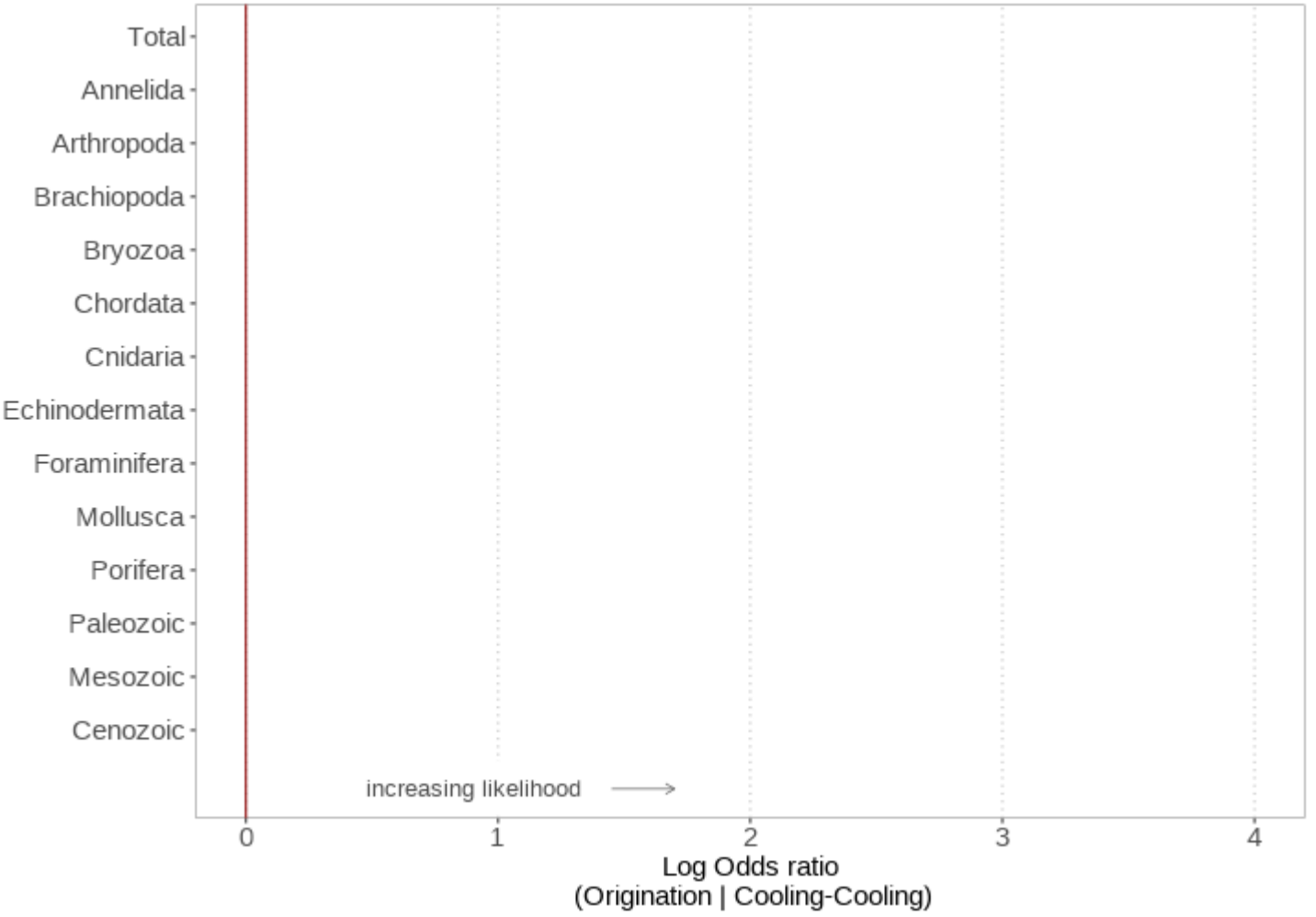


Origination response

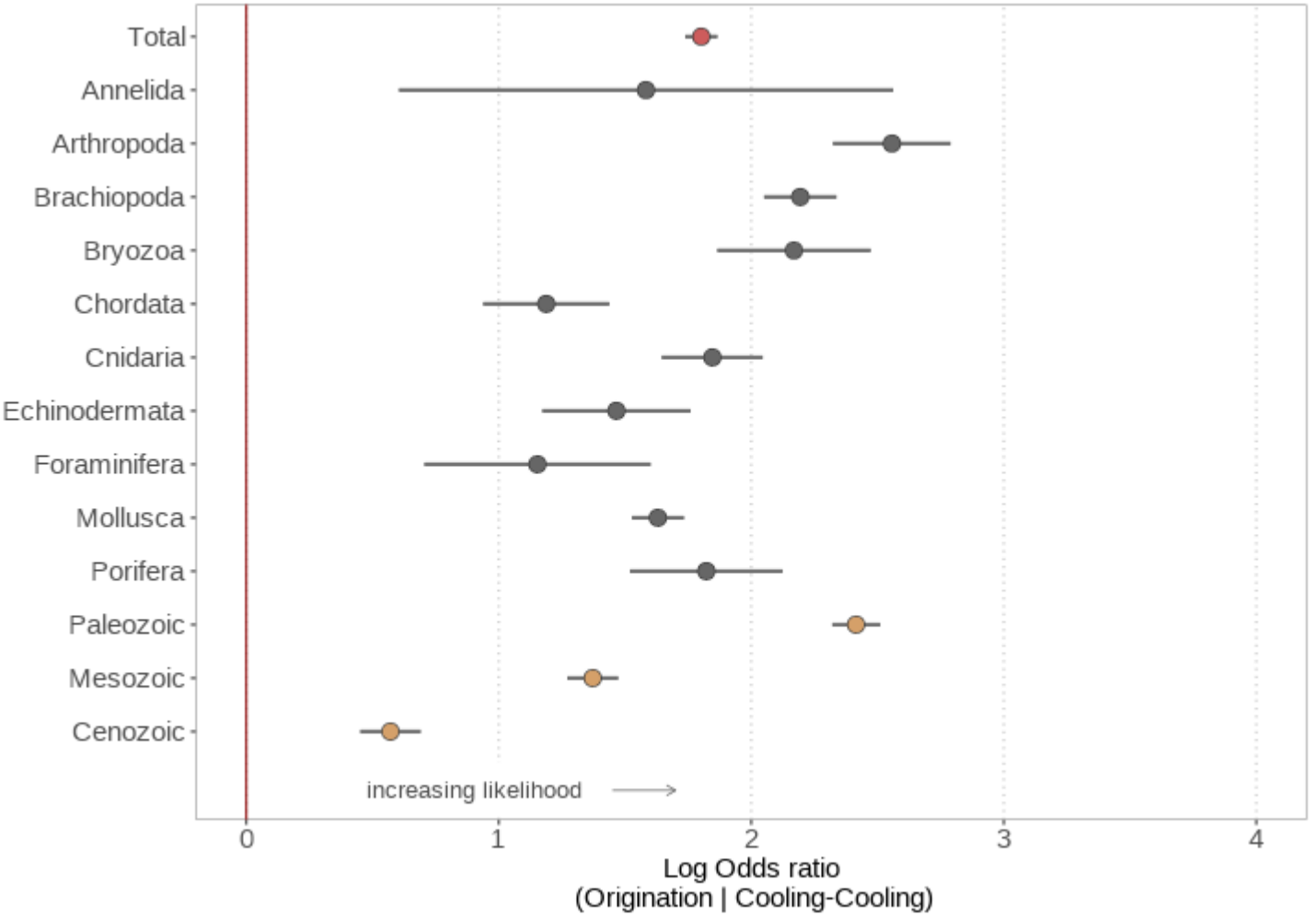


Effect size

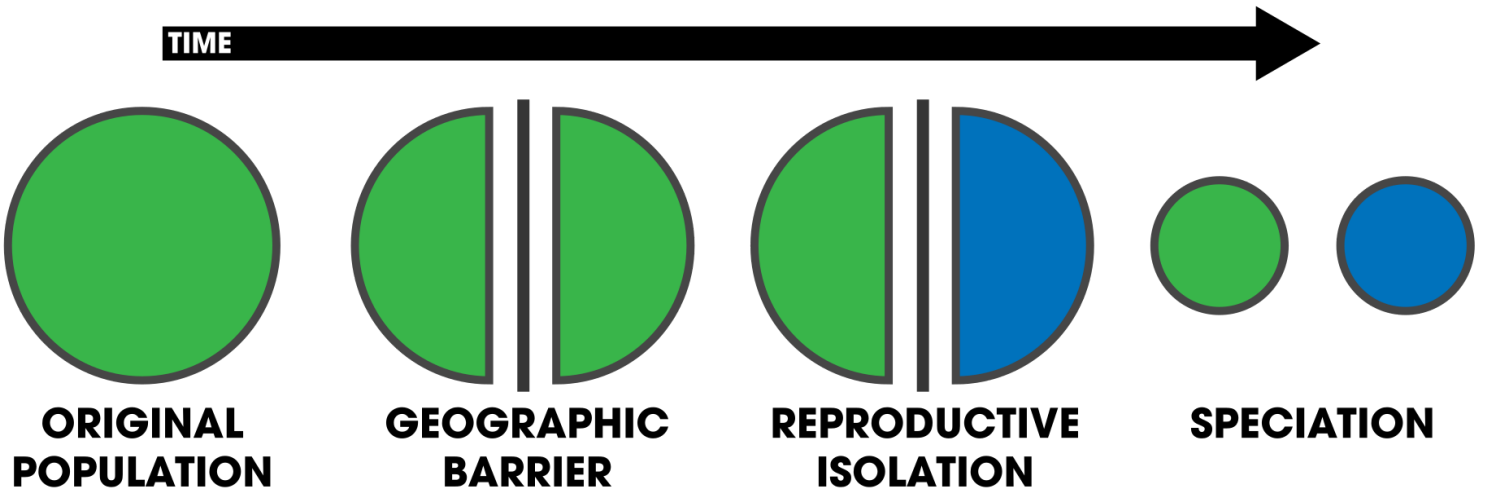
Effect per group



Effect per group



How?



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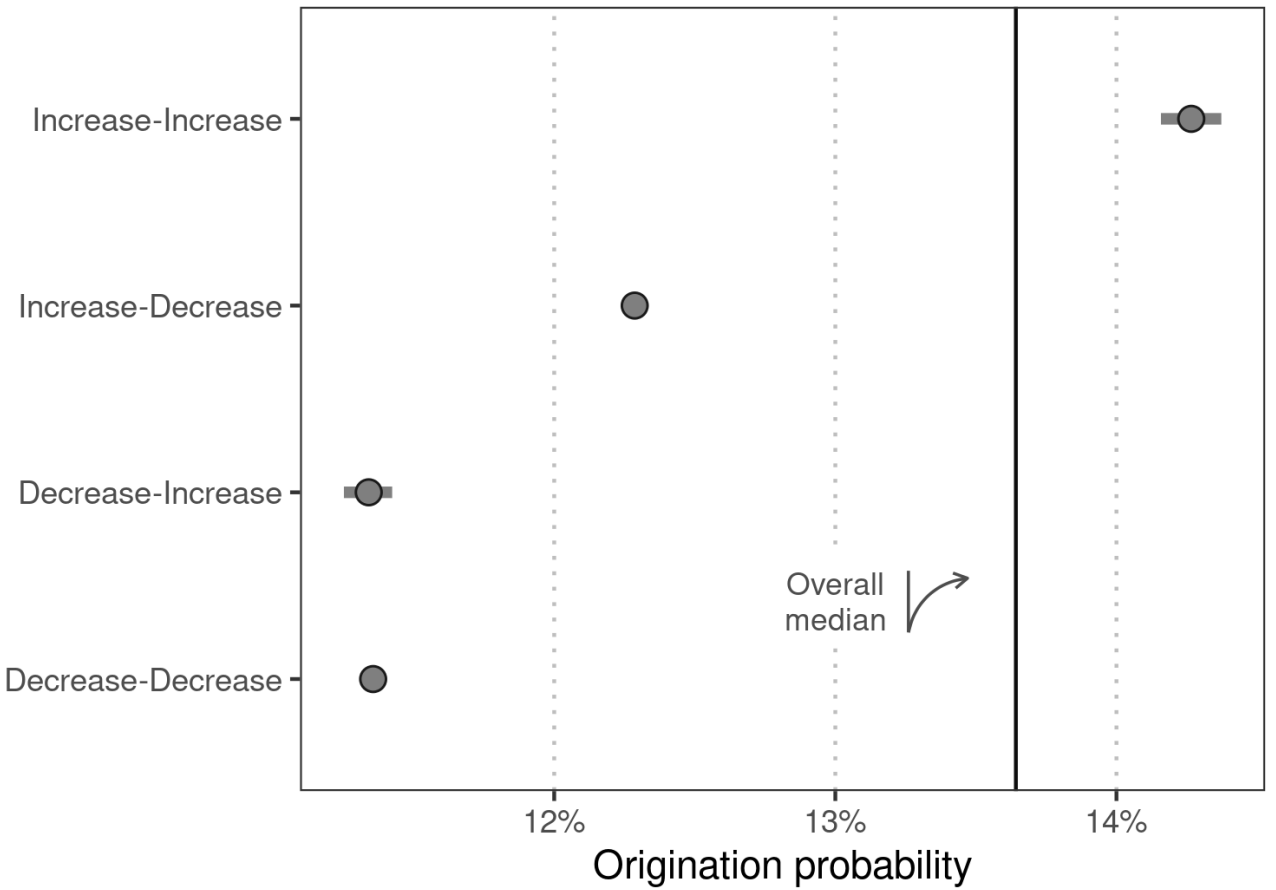
Andrew Z. Colvin

Continental fragmentation



Summary

- high impact of palaeoclimate interactions on origination
- higher origination signal after cooling-cooling
- allopatric speciation?
- test with continental fragmentation
- allopatric speciation!

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