Altitudinal gradients do not predict plant-symbiont responses to experimental warming

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3 May 2017

How will climate change alter species interactions?

Altitudinal Gradients and Experimental Warming

Questions

- How do fungal symbionts change with altitude and experimental warming?

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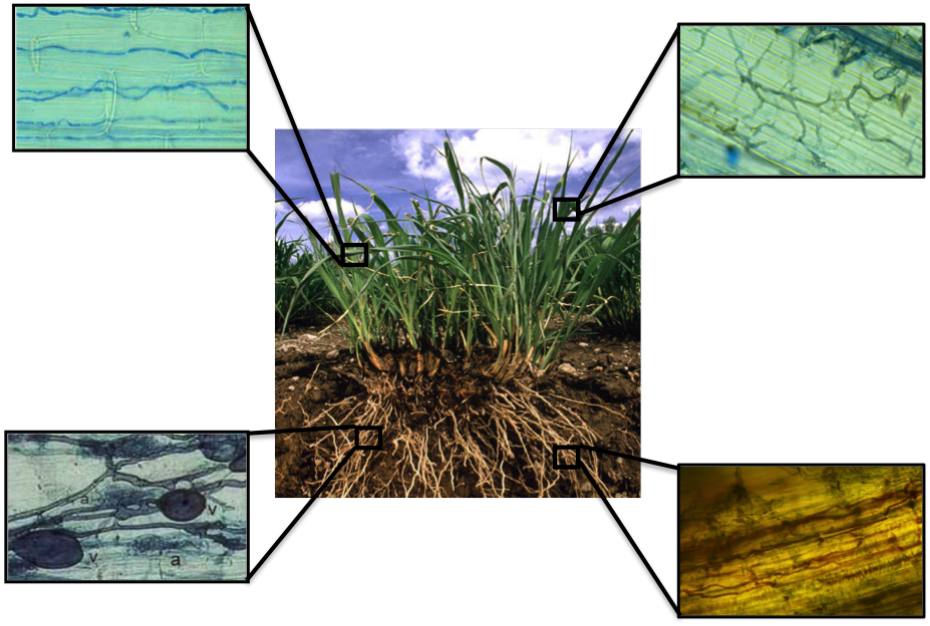
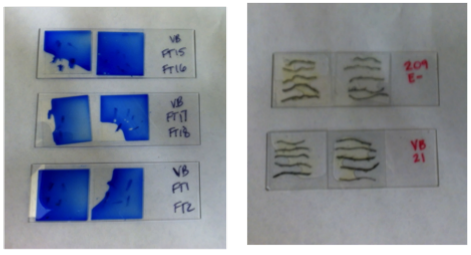
- How do fungal symbionts change with altitude and experimental warming?
- Do these changes correspond?

Study System and Methods





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Statistics

Linear Mixed Effects Models

```
library(nlme)

# Altitudinal Gradient Code
alt <- lme(Colonization~Elevation*HostSpecies
                *Year*JulianDay, data = altData,
                random = ~1|Gradient, method="ML")
anova(alt)

# Experimental Warming Code
warm <- lme(Colonization~WarmingTreatment*HostSpecies
                 *Month, data = warmingData,
                 random = ~1|Plot, method="ML")
anova(warm)
```

Statistics

PERMANOVA

```
library(vegan)

adonis(formula = compMatrix~Elevation*HostSpecies
       *Year*JulianDay*Gradient, data = envData,
       permutations = 999)
```

NMDS

```
NMDS <- metaMDS(compMatrix, k=2, try=100,
                autotransform=TRUE)
```

Results

- Responses differed among plant species and fungal functional groups

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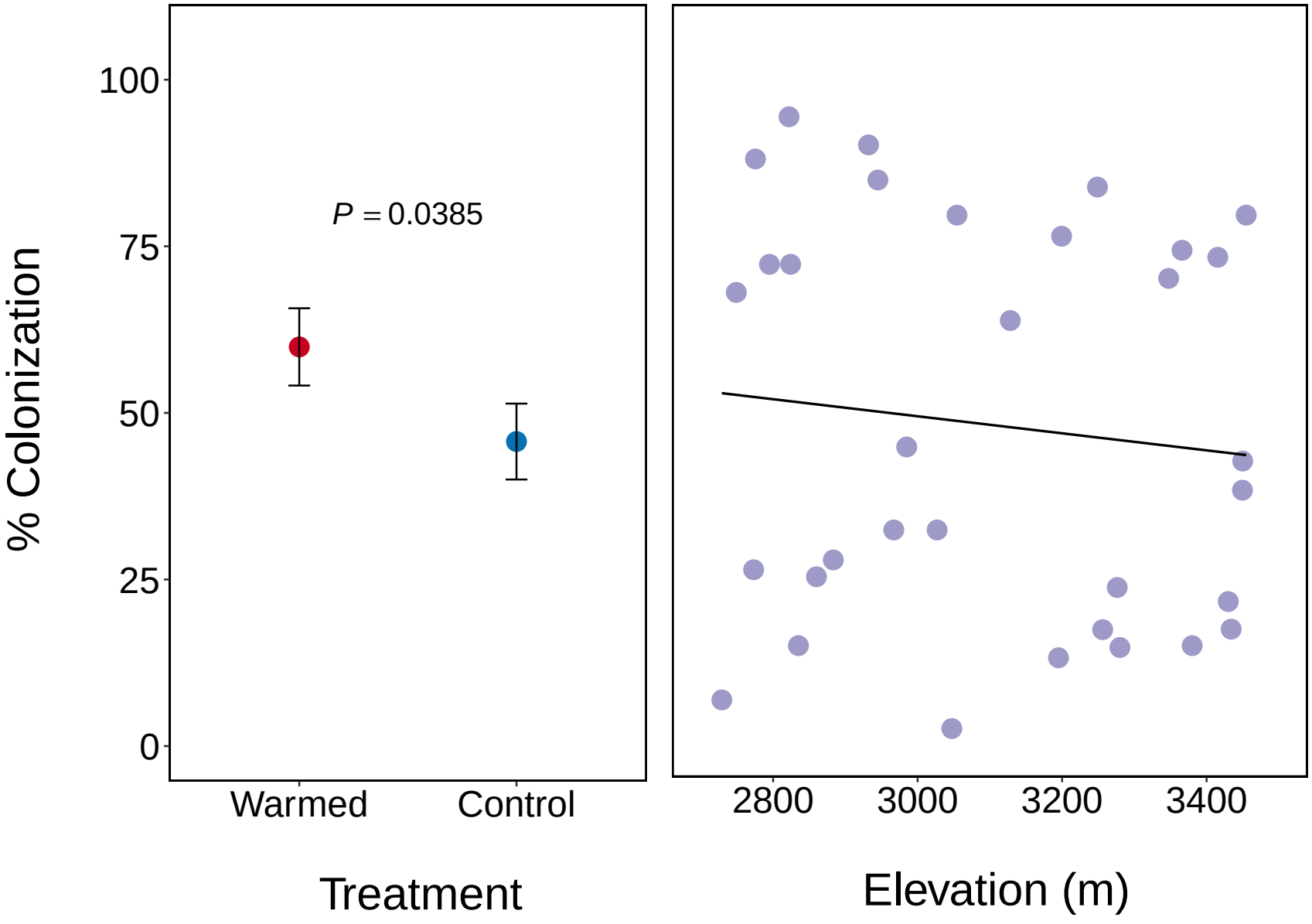
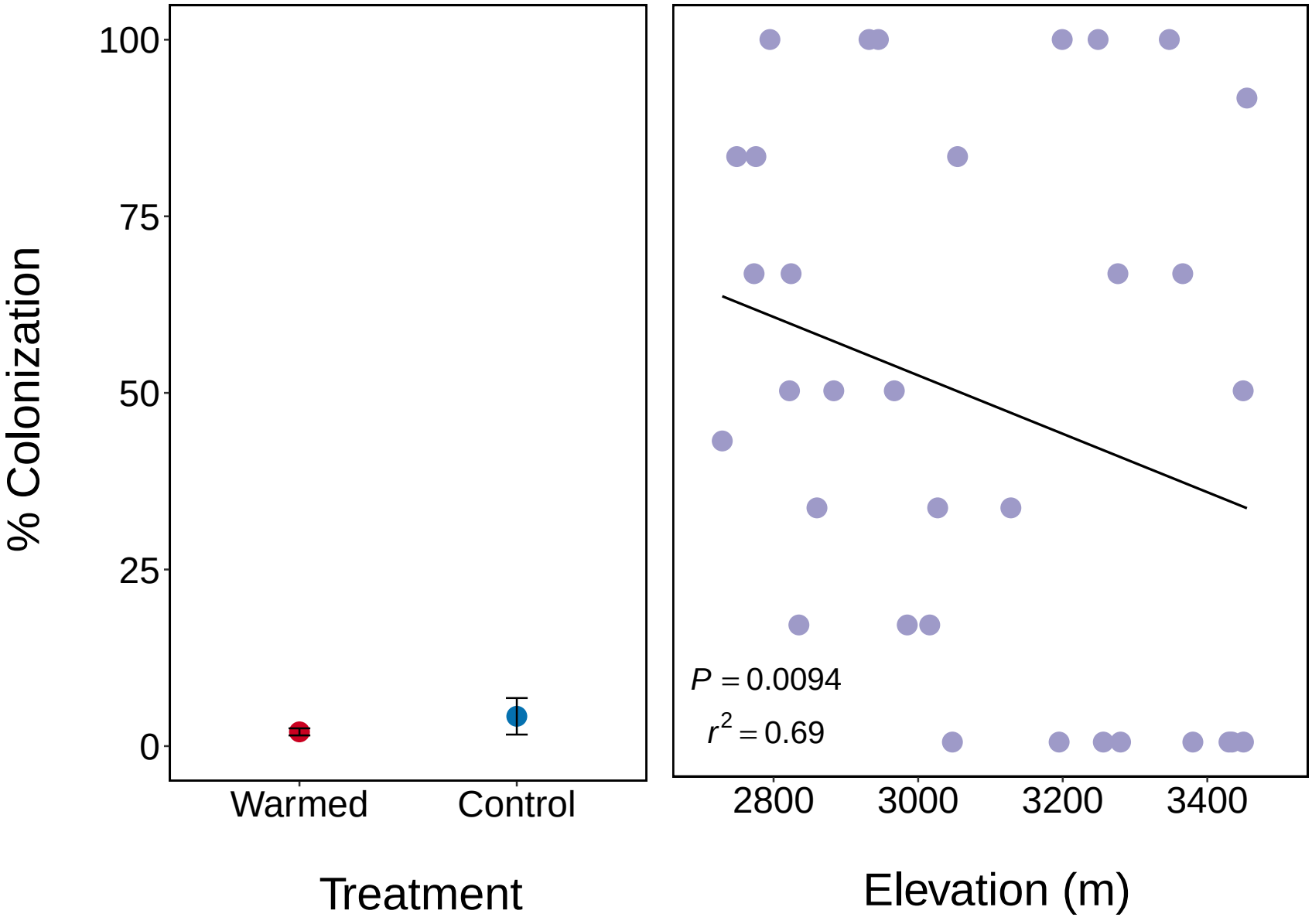
- Responses differed among plant species and fungal functional groups
- Little correspondence of altitude and warming trends

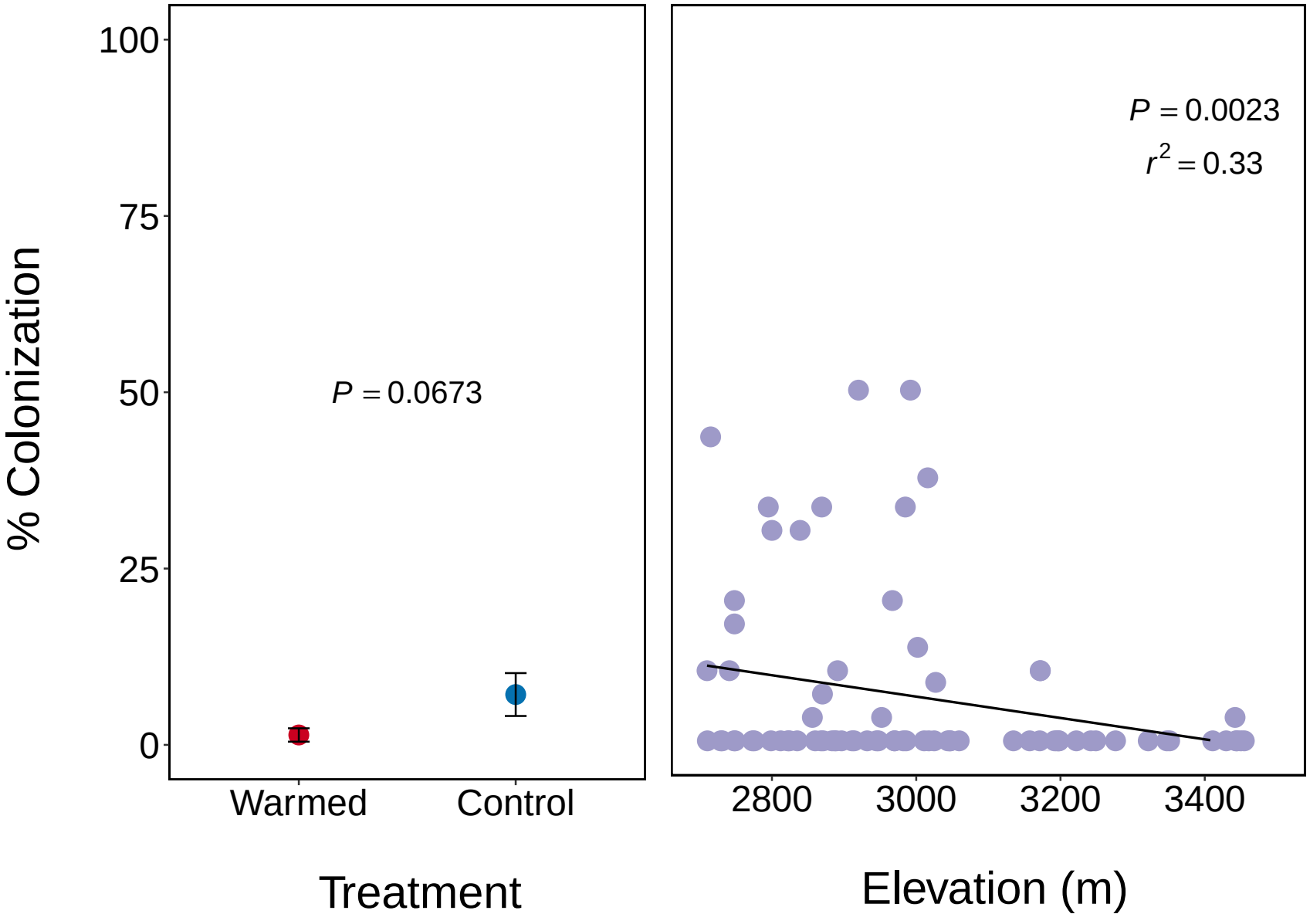
Colonization of *Achnatherum lettermanii* by arbuscular mycorrhizal fungi



Colonization of *Achnatherum lettermanii* by horizontally transmitted leaf fungi



Colonization of *Festuca thurberi* by vertically transmitted leaf fungi



Possible Explanations for Lack of Correspondence in Altitude and Warming Trends

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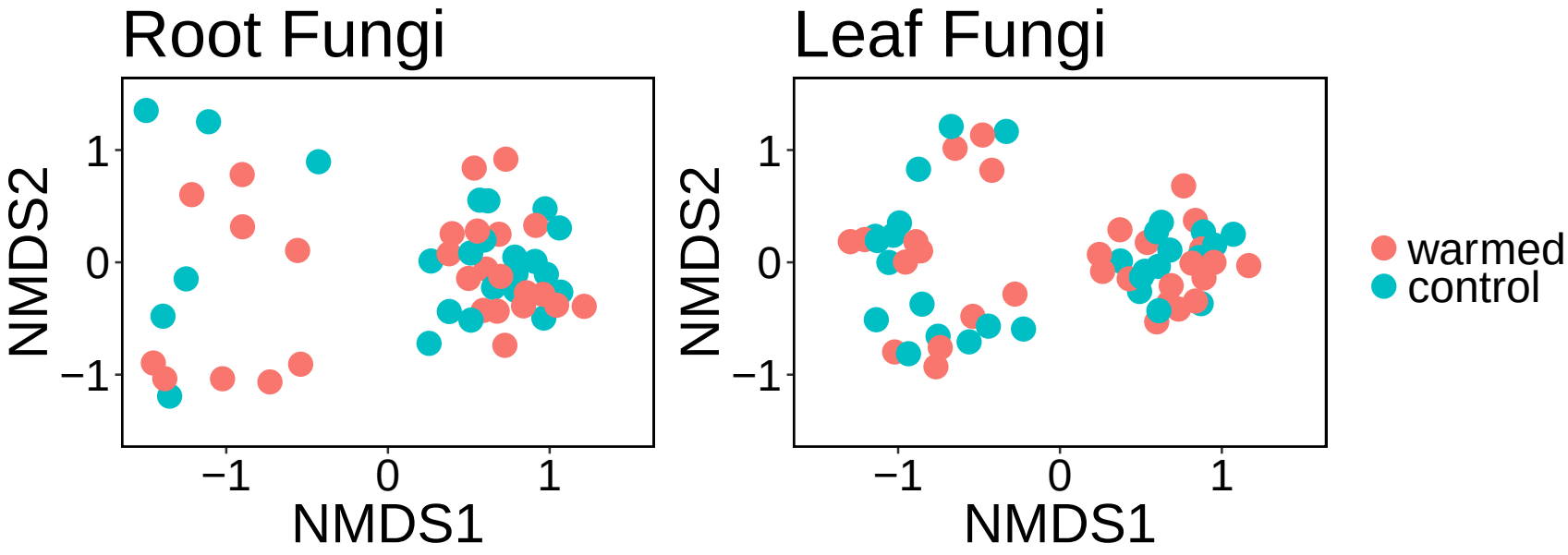
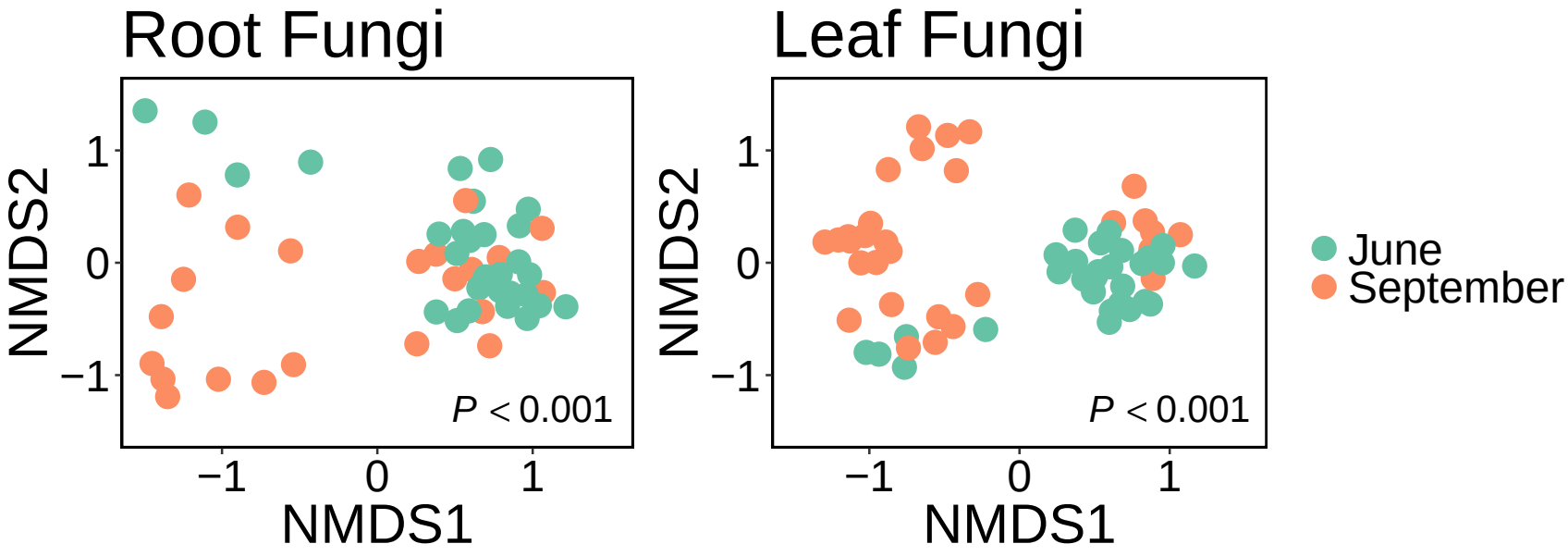
- Factors other than temperature drive altitudinal patterns
- Gradients captured a broader range of temperatures
- In different parts of their ranges, organisms can respond differently to warming
- Experimental warming represents an immediate step change in temperature

Fungal community composition did not respond to altitude or warming



Fungal community composition varied across the growing season



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- Climate change may affect fungal colonization more strongly than composition
- Potential for phenological mismatches under climate change

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Questions?