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Long-term experimental field manipulations that directly test the predictions about organisms’ responses to climate change across latitude are lacking. This field experiment uses octagonal, 5-m-diameter (c. 22 m³) open-top chambers to simulate warming at a high (Harvard Forest, Massachusetts) and low (Duke Forest, North Carolina) latitude hardwood forest site. **Our objective was to identify the effects of warming on ant and other arthropod populations and communities near the edges of their ranges.** Each site has 12 plots containing open-top chambers that manipulate air temperature incrementally from ambient to 6 °C above ambient.

These open-top warming chambers have been running for 3 years, and in that time we have found that the responses of arthropods to warming do, in fact, have a strong geographic signal, and variation in thermal tolerance is a good indicator of individual species’ responses to warming. Overall, our results suggest that ants living in historically warmer, less variable locations are at greater risk of overheating with climate warming, even after accounting for spatial heterogeneity in warming effects, i.e. greater warming at high latitudes. More specifically, at our low latitude experimental site, where environmental temperatures exceed some ants’ upper thermal tolerances (CT_max), ants with higher CT_max increased in density with warming; however, at the high latitude site, where environmental temperatures do not exceed CT_max, ants reach the highest densities in the warmest chambers regardless of their CT_max. Intraspecies variation in CT_max is also correlated with changes in foraging activity under warming.

Altogether, these changes in ant abundance and activity are not consistently accompanied by changes at the community level. We did see changes in individual species—15% of the species observed in the chambers at the high latitude site occurred fewer times (none occurred more) in warmer conditions, but there have not been changes in species diversity or composition. In contrast, although the same number of species responded to warming at the low latitude sites (but a smaller percentage), species composition did change and diversity decreased with warming. This supports other findings that ecological communities at low latitude sites may be more vulnerable to declines under warming, but additionally we found that individual species responded poorly, not favorably as expected, at high latitude sites as well. **Changes at the community level may take longer to manifest at high latitude sites, or the communities there may be more resilient to changes in individual species.**