Rethinking False Spring Risk: Submission Questions

What is the scientific question you are addressing?

Climate change has renewed interest in late spring freezes, commonly called false springs, which shape species ranges and life history strategies. Combining theory from various fields in an attempt to advance forecasting we ask: what are the effects of false springs and what factors drive plants' risk to frost damage?

What is/are the key finding(s) that answers this question?

We find that current definitions for false springs remain generally simple. Most definitions fail to incorporate factors such as species, functional group, phenological cue requirements, regional effects and other climatic regimes. We argue that a new approach that integrates these and other crucial factors is needed.

Why is this work important and timely?

Recent studies have documented how climate change is reshaping late spring freezes, with cascading ecological and economic impacts. Most studies, however, take a simplified view of false springs, which can lead to incorrect forecasting. New methods are essential to predict the effects of false spring events, especially under climate change.

Does your paper fall within the scope of GCB; what biological AND global change aspects does it address?

The manuscript will demonstrate how an integrated view of false spring that incorporates the complexity of factors underlying plant strategies to frost would rapidly advance progress in this field, including improved predictions of spring freeze risk with global change, and, novel insights into how plants are shaped by spring frost.

What are the three most recently published papers that are relevant to this question?

Vitra, A., Lenz, A. & Vitasse, Y. (2017) Frost hardening and dehardening potential in temperate trees from winter to budburst. *New Phytologist* **216**, 113–123

Lenz, A., Hoch, G., Körner, C. & Vitasse, Y. (2016) Convergence of leaf-out towards minimum risk of freezing damage in temperate trees. *Functional Ecology* **30**, 1–11

Liu, Q., Piao, S., Janssens, I.A., Fu, Y., Peng, S., Lian, X., Ciais, P., Myneni, R.B., Peñuelas, J. & Wang, T. (2018) Extension of the growing season increases vegetation exposure to frost. *Nature Communications* **9**

If you listed non-preferred reviewers, please provide a justification for each.

N/A

If your manuscript does not conform to author or formatting guidelines (e.g. exceeding word limit), please provide a justification.

N/A

References

Lenz, A., Hoch, G., Körner, C. & Vitasse, Y. (2016) Convergence of leaf-out towards minimum risk of freezing damage in temperate trees. *Functional Ecology* **30**, 1–11.

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