

**Climate change reshapes the drivers of false spring risk across European trees: Submission Questions (max 50 words per answer)**

**What is the scientific question you are addressing?**

Since the onset of recent major climate change, there is growing interest in false spring events, which can affect both plant performance and survival. We ask which climatic and geographic factors are the strongest for predicting false springs, and how these have shifted with climate change across species. (48 words)

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

Our results show that climate change complicates forecasting through multiple levels. It has shifted the influence of climatic and geographic factors, fundamentally reshaping relationships with major climatic factors such that relationships before climate change no longer hold. It has also magnified species-level variation in false spring risk. (47 words)

**Why is this work important and timely?**

Recent studies assess the effects of one predictor (e.g. temperature, elevation or distance from the coast), rendering inconsistent predictions for false springs. Our study shows how robust forecasting must integrate major climatic and geographic factors that underlie false spring, and allow for variation across species and time as warming continues. (50 words)

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

By investigating leafout observations of six deciduous tree species from Europe, we unravel the species-specific effects, spring temperature, elevation, distance from the coast and NAO index on false spring risk with climate change. We found that climate-induced warming reshaped the influence of these factors. (50 words)

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

Ma, Q., Huang, J.G., Hänninen, H. & Berninger, F. (2018) Divergent trends in the risk of spring frost damage to trees in Europe with recent warming. *Global Change Biology* **0**

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**

Vitasse, Y., Schneider, L., Rixen, C., Christen, D. & Rebetez, M. (2018) Increase in the risk of exposure of forest and fruit trees to spring frosts at higher elevations in Switzerland over the last four decades. *Agricultural and Forest Meteorology* **248**, 60 – 69

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