

# 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. By better understanding the influence of known climatic and geographic factors for predicting false spring risk, we will be able to advance forecasting in the field. (45 words)

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

Our results highlight how 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 have documented the impacts of false springs but few have agreed on how risk will shift with climate change. New models, such as ours, are essential to best predict spatiotemporal, species-specific shifts in false springs, which could have escalating effects on temperate forests and ultimately augment climatic shifts. (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 temperate, deciduous tree species from Europe, we unravel the species-specific effects and multiple climatic and geographic factors on false spring risk in the face of climate change. We found that climate change reshaped the influence of these factors and magnified species-level variation in risk. (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