

## ***Interactive comment on “Ideas and perspectives: New research examples of autumnal climate change ecology” by Ulf Büntgen and Paul J. Krusic***

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Received and published: 11 September 2017

This paper highlights how three novel data sources have been used to research the effects of climate change on autumn and winter ecology. The authors discuss the use of (1) records from big-game hunting to measure shifting ranges that coincide with warmer autumn conditions, (2) high-resolution observations of wood anatomy to measure late-season woody biomass production, and (3) mycological inventories and data from poison centers to measure fungal productivity, diversity, and phenology. I agree with the authors that innovative methods such as these are important to the future study of ecological shifts in the autumn season.

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General comments: While I appreciate the message that autumn and winter ecology should receive more focus in biogeoscience research, that does not seem to be the true goal or added value of this paper. The value this paper adds is to explore the feasibility and potential of novel, creative data sources for autumn research. To make that goal clear and to accomplish it, I believe this paper requires some reframing and additional information. I recommend the following changes:

1) The addition of an introduction would help to outline the specific problem/s this paper aims to solve. For instance– the effects of climate change on autumn and winter are relatively unknown, and traditional/historical data sets are limited. The authors suggest, therefore, that creative, novel data sources be used for autumn and winter ecology, and provide three examples of such data sources, including proof of their value to climate change research, future opportunities for their use, and unique features and biases of the data. This context would help to nest the three examples within the paper as just that– \*examples\* within the greater context of novel data sets, that might help the reader to identify additional creative data sources and identify the potential and biases of those data sets. Currently the examples come off as the main message of the paper, rather than as support for a larger, cohesive, original message.

2) Connecting the three examples with a common format would help to remind the reader of the main message they illustrate. For instance, if the message is that novel data sources have demonstrated value, future possibility, and unique quirks that should be understood for optimal use, I would suggest the following format for each example: I. a description of the data source II. a summary of what has been found so far using the data (including specific information– for instance, what is the magnitude/extent of the range shifts detected from big-game records?) III. a description of what is left to be discovered from these records, or similar records (what else could we learn from big-game records? What other game records could be used to fill gaps in our knowledge of autumn and winter ecology?) IV. what are the unique biases and limitations of the data (with all novel data sources, this is an important question for researchers to consider–

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for instance, are calls to poison centers a robust record of mushroom phenology or simply of foraging phenology?).

3) If the goal is to encourage researchers to identify additional novel resources for studying autumn and winter ecology, the conclusion could be reframed (away from what we do not know about autumn and winter) to explicitly point researchers toward other novel data sources, and/or to suggest a list of questions researchers might ask to determine the potential and limitations of their own unconventional data sources.

What I've described above is one potential direction for this paper that would be both valuable and original. If the authors prefer to go in another direction, it will still be important to identify a clear message that ties the three examples together, and to be explicit and detailed about what has already been demonstrated using these data sources and what is left to glean from them.

Specific comments:

L30-31: Mobility and behavioral plasticity also \*allow\* us to detect climate-induced population movements. Perhaps stating what other factors populations might move in response to, or being more specific about how detection is complicated, would help to clarify this sentence. It is also not clear whether this is about migration or range shifts.

L37: What is the magnitude of the shift?

L38-40: This sentence is vague; what full annual cycle is this in reference to? How will these findings improve awareness, and for whom?

L44: Better to explicitly state the physiological processes here, otherwise the point is vague until two sentences later.

L47-48: How far into autumn can xylem lignification persist? Specifics will help to justify the value of this data source.

L66: What is the duration of these phenology records? Are they all wild observations?

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L67-68: What magnitude of shift? For how many species? Any additional details here will, again, strengthen the evidence that this is a valuable data source.

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Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2017-265>, 2017.

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