

The Cryosphere Discuss., referee comment RC1  
<https://doi.org/10.5194/tc-2021-326-RC1>, 2021  
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## Comment on tc-2021-326

Anonymous Referee #1

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Referee comment on "Tricentennial trends in spring ice break-ups on three rivers in northern Europe" by Stefan Norrgård and Samuli Helama, The Cryosphere Discuss., <https://doi.org/10.5194/tc-2021-326-RC1>, 2021

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The manuscript presents a new ice breakup dataset for the Kokemaki river and compare it with dates of ice breakup at two other rivers - Aura and Torne, as well as with air temperature values. The long time series (220-320 years) constructed from archives are very helpful to get an assessment of long-term variability of ice breakup.

General remarks.

The manuscript often gets very descriptive, especially starting from section 4 (Results), and one may easily feel overwhelmed by various details and lose track of what is important and what is just a side observation. I strongly suggest to streamline the manuscript by a) shortening some parts and focusing only on important issues, b) clarifying importance of some facts (and not just enumerating them) and c) providing intermediate conclusions.

Dates of ice breakup are dependent on various factors, including earlier or late ice formation, severity of winter (reflected in ice thickness). Influence of air temperature on ice growth and decay may further be modulated by snow depth (as you mention in the "Discussion"). I understand that the authors do not have the data on ice formation dates and other parameters to take all these factors into account. However it would be very helpful to indicate - even roughly - the duration of presence of ice cover on rivers (or average dates of ice formation), as well as maximal ice thickness, typical range of depth of snow on ice. Otherwise ice breakup dates are somewhat taken out of context.

I suggest to provide an overview map with location of the three rivers, otherwise it is not easy to imagine their location. Provide at some point in the introduction some rough average values of river discharge, river length and size of the watershed for each of the three rivers.

Also - if you have those data - provide in sub-sections 2.1-2.2-2.3 some estimates of river depth at place of measurement/observations.

Climatic correlations - why use air temperature for fixed months for correlation and not do some dynamic approach (if ice breakup this winter happens in month X, then we will look at air temperatures in months X and X-1)? Or - better still - do some integration/aggregation of air temperatures, such as sums of negative/positive degree-months or similar, to account the severity of each winter and estimate influence of spring air temperatures on ice breakup.

Specific comments.

Line 9 - please specify that Pori it is a name of settlement and not a person's name.

Abstract - provide at least rough location of the three rivers, distance between them.

Line 47-48 please clarify the difference between "ice breakup series" and "observations"

Line 53 - please clarify. Ok, it did not escape the boom, but then what - the time series are not homogeneous? Or else?

Line 68 - "because of their length" - rephrase so that it is clear that it is length of time series and not length of rivers

Line 101 - put comma after "by temperature"

Line 120 - here and for other sub-sections I would suggest to put river name first and then city name (and also specify that it is a city/settlement)

Line 141 - specify that it is 80 km upstream. Any significant tributaries between power plant and Torne?

Line 141 - observation site - Torne or Tornio?

Line 160-161. Rephrase this sentence ("For example...") or split in two sentences..

Lines 169 and 170 - so this river has a delta or estuary?

Line 283 - please remind the reader on which river the power plant is located

Line 316 - "16 respectively" => "16 and respectively"?

Line 318 - please remind what are these distances

Lines 360-370 (and also in general). Please use expressions such as "worth noting", "noticeable", "remarkable", "noteworthy", "notable" etc sparingly. See also my general remark on the descriptive style of the manuscript.

Lines 419 and 420. Temperature and breakup dates are presented in Fig 4 but they are not discussed in the text. Is figure 4 really necessary then?

Figure 1 - upper panel, and also Figure 5: Tornio or Torne river?