

## ***Interactive comment on “Short communication: Driftwood provides reliable chronological markers in Arctic coastal deposits” by Lasse Sander et al.***

**Lasse Sander et al.**

lasse.sander@awi.de

Received and published: 13 January 2021

Dear Prof. Jull, thank you very much for reading and commenting on our manuscript. Below we reply to all comments in a point-by-point fashion and repeat your question to ensure transparency for all readers interested in the public peer-review process.

**Comment 1 (Jull):** *In the introduction figure S1, the uncertainties in driftwood 14C ages from various other publications are presented. It seems that these data give more information that could be useful in the authors’ analysis, but they just summarize them here.*

**Reply (Authors):** The purpose of comparing the 14C age uncertainties from different

C1

studies here is to show that (1) the uncertainties associated with the radiocarbon-dating of driftwood are generally moderate, and (2) that the uncertainty of age determinations decreased considerably over the last 30 years (based on methodological/technological developments). We show the data to visually substantiate our argument in that regard (the main in-text reference is found in line 39-41 of the manuscript text). Discussing the data further requires insight into details (such as the calculation of individual laboratory errors), that we have discussed with our own laboratory at AWI Bremerhaven, but that are not disclosed in the reviewed studies. I hope you agree that it is useful to display the data in the supplementary file in order to build our argument: It matters to specify the position of the 14C-dated material in relation to the outermost tree-ring (e.g. regarding wood abrasion or decay, see line 206-210), as the error of not knowing likely is larger than the methodological uncertainty of the 14C method today.

**Comment 2 (Jull):** *As the authors note about line 51, a big unknown in the assumptions of the dates presented in this paper is the duration of the time when the tree falls and the wood is transported by a river system to the sea. Although figure S1 suggests 50-100 years is reasonable, this depends to some extent on the nature of the forest and the authors note it could be several centuries.*

**Reply (Authors):** In lines 53-58, we argue that the duration of river-borne transport of any individual driftwood sample of central Siberian provenance prior to deposition on an Arctic beach is and remains an unknown factor. This problem cannot be resolved in a straight-forward fashion, but as you correctly point out, the findings of our study suggest that samples from the same stratigraphic position have the same age within the uncertainty of 14C dating and calibration. We further elaborate on this matter in line 61-65 and line 200-206, and state, based on the age of the four dendro-dated samples, that transport times likely are much shorter than the uncertainty of the 14C age determination. Nevertheless, the real duration of transport remains unknown, hence we do not propose the application of a correction factor to account for time lost by transport (if this is what you are implying). The dynamics of large woody debris in

C2

rivers still is an emerging field of research and the coming decades will shed more light on this matter – and we hope to be able to contribute to this by investigating coastal driftwood deposition.

**Comment 3 (Jull):** *The results discussed in table 1 and figure 2 suggest that one can assign a radiocarbon date probability distribution to various discrete events. For example, BY1 and BY2 overlap well, as are MA-27, 28 and 29. A problem with figure 2 is that the images on the right are practically unreadable for the site locations – especially if one has a BW image. I recommend these images be improved.*

**Reply (Authors):** The maps for the site locations in Figure 2 have been modified to improve readability (see attachment). Along with other minor adjustments, the font size was increased and numbers for the clusters were added for orientation in B/W print-outs.

**Comment 4 (Jull):** *In section 3.2, no radiocarbon measurements appear to have been made on the “modern” driftwood. This seems like an important oversight. Although the authors dendrodated 4 Larix samples successfully, it would be interesting and useful to see the 14C bomb spike in the wood sequences, for example for the other species, as this would give some information also useful to the hypothesis presented.*

**Reply (Authors):** This is right, we do rely entirely on dendro-dating for the samples from the modern beach. Your comment to use the 14C bomb spike as an independent reference (and to support the dendro-dating) is a really useful suggestion – thank you for that. For future work, we hope to be able to return to the Siberian Arctic in order to extend this study in by dating more driftwood specimen and to include the 14C dating of younger material (pre- and post-bomb).