

Interactive comment on “Post-glacial flooding of the Beringia Land Bridge dated to 11,000 cal yrs BP based on new geophysical and sediment records” by Martin Jakobsson et al.

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Review of Jakobsson et al

The purpose of this paper is to add new knowledge to the age of submergence of the Bering Land Bridge, the large Arctic – Pacific gateway of the Western Arctic. This gateway is extremely important for understanding how oceanography controls and climate change are linked when this gateway is open or closed over the past few million years. They describe new cores from the Herald Canyon, a site that has been eyed by many science groups as the one of the best places for new information on post-glacial sea level rise in the western Arctic. This paper provides evidence of new sediment cores and new dating control from the Herald Canyon (off the Chukchi Shelf) on when post-

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glacial submergence occurred reestablishing communication between the Atlantic and Pacific, circulation that was otherwise cut off 30k yrs ago.

This is a welcome paper that adds to the growing number of studies that show submergence of the Land Bridge sometime between 13,000 and 11,000 yrs ago. Variations within this 3 ka window (using it broadly) has to do with what was dated, what was the stratigraphy, what reservoir corrections were made, and where might be the deepest locations to capture a record of the first submergence. Proxies used by different studies also add to the challenge and this paper does a good job summarizing what is known.

Let me list here some issues to be considered

1. Beringia and the Bering Land Bridge are easily confused in this paper. Eric Hultén's early 1937 definition of Beringia (page 2) was originally about the submerged portion of the land bridge now known as the Bering Land Bridge. But Beringia was broadened in the decades after Hultén by Hopkins and many other scientists to refer to the entire area from the McKenzie River in the Canadian Yukon to the Kolyma River in Arctic Russia. The title of the paper and many places in the text use Beringia Land Bridge very incorrectly. This paper is focused on the Bering Land Bridge, following the definition used since about 1970.

Page 3 – among the accumulation of errors in estimating the time of submergence, one has to include tectonic adjustments across the Bering Strait. But I think we all acknowledge that >3-4 meters of throw on the graben beneath the Bering Strait since 20 ka is small compared to the dating issues and other bathymetric concerns, including reconciling the ARDEM and other bathymetric systems.

Page 5 – The reservoir correction at 3.6 ka associated with the Aniakchak Tephra, a well known tephra in stratigraphies on land in Alaska, may not provide the only solution for the reservoir age of waters isolated in the Arctic Basin or the Pacific/Bering Sea just prior to submergence. The Pearce et. al paper states, “The final estimate for the radiocarbon reservoir age offset at our core site, based on the presence of the

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Aniakchak CFE II tephra, is thus $\Delta R = 477 \pm 60$ years. This value represents the reservoir age at the time of the eruption and is not necessarily constant throughout the entire late Holocene.” We don’t really know what the reservoir age was at 11,000. I accept the Jacobson et al interpretation for what it is, but their shift from a reservoir age of 50 years to one that is 477 yrs during submergence may not hold up as we gain more knowledge of these systems. Page 5, Line 28 – should be “lose”. Page 6, line 31. A transition across 12 centimeters in outcrop would be gradual, not sharp. Trival point. Page 7 and elsewhere: be sure to use consistent notation for Core 2-PC1. Sometimes the 1 is left off in parts of the manuscript. Same for Core 4-PC1. Discussion: The first paragraph here seems to ignore the archeological record that early cultures crossing the land bridge were probably traveling by boat. The so-called Kelp Highway along the southern edge of the Bering Land Bridge was likely inhabited during the late Pleistocene LGM and deglaciation. So submergence at 11,000 did not likely cut off anyone. See the nice summary in Earth magazine Jan/Feb 2017 issue, as a nice summary of the debates going on in the literature. This is not a technical journal, of course but gives you the names of people documenting the coastal routes. Page 9 The idea that the Hope Valley fed the Harold Canyon is extremely likely in my view. So I agree with this interpretation of the R1 unconformity. I also agree that the waters flooding the Herald Canyon first were probably from the Arctic Ocean and not the Bering Strait – page 10, line 25, based on the clear bathymetric arguments. Page 9 Line 30. There must be an unconformity in core 4-PC1 just above 400 cm. The radiocarbon dates suggest this, as do the other proxies. Why not present a sedimentation rate curve for both cores? This would help explain the relationship between submergence and marine processes. Figures are well done but please add sedimentation rate curves for the 2 cores. Figure 7: green text in the figure should be “Age estimate for Bering Strait flooding from core 4-PC1 (407M depth).

All the best, Julie Brigham-Grette

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