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Letter to the Editor

Discussion of "Late Quaternary megafloods from Glacial Lake Atna, Southcentral Alaska, U.S.A."

Based on our extensive field work and mapping in the area, we have serious reservations about the proposed hypothesis by Wiedmer et al. (2010) for a series of colossal floods through the Matanuska corridor, across the lowland westward through the Elmendorf moraine, and beyond, and outline four key issues that require further consideration before their hypothesis is acceptable.

1. Multiple outburst floods from Glacial Lake Atna could not have deposited flood features in the Wasilla area. Glacial Lake Atna existed during the MIS 2 glaciation, latest in a series of ice-impounded lakes in the Copper River basin (CRB) (Nichols, 1965, 1989). Dating of that meltwater lake is based on an age of 17.6 ^{14}C ka BP (W-1134) for driftwood enclosed in sandy lake-bottom sediments at 670 m elevation at Slana in the northeastern CRB (Schmoll, 1984; Ferrians, 1989). The highest elevation reached by Glacial Lake Atna was ~800 m (Ferrians, 1989; Williams, 1989), so waters of Glacial Lake Atna could not have reached Tahneta Pass (~914 m elevation), let alone 975 m elevation, and drained catastrophically through the Matanuska corridor. However, deposits of Glacial Lake Susitna, Glacial Lake Atna's predecessor, reach 975 m elevation in the western CRB (Williams and Galloway, 1986). Glacial Lake Susitna drained westward down the Susitna River prior to 29.6 ^{14}C ka BP (DIC-1819), the age of a mammoth bone in sandy fluvial gravel that overlies fine-grained deposits of Glacial Lake Susitna and underlies glaciofluvial and glacial deposits of the MIS 2 glaciation (Thorson et al., 1981; Williams, 1989). That minimum age links Glacial Lake Susitna to the MIS 4 glaciation now recognized in eastern Beringia (Briner et al., 2005; Ward et al., 2007). Obviously, landforms in the lowland west of Matanuska corridor, which date to the latest stade of the MIS 2 glaciation (Reger et al., 1995; Kopczynski, 2008), could not have been deposited by spillages from Glacial Lake Atna or Glacial Lake Susitna.
2. The distribution of deposits in the Matanuska corridor is inconsistent with massive flooding. Notably missing in the Matanuska corridor are definitive megaflood deposits, particularly waning flood deposits, in many locations where one would expect them. According to the proposed model (p. 418), colossal floods through the Matanuska corridor disrupted existing glacial ice, so we assume that glacial ice there could not have survived the deluge in the corridor. Wiedmer et al. (2010) (Fig. 5, F) infer the presence of a flood-deposited river-mouth bar at the western end of the Matanuska corridor. That pitted feature is a continuation of a high-level pitted outwash terrace upvalley in the corridor that is younger than a prominent esker train beside it, which clearly escaped destruction by the proposed megafloods (Reger and Updike, 1983, p. 219). Also, we question survival of the extensive, unmodified esker complex near Palmer downvalley from the inferred bar (not shown in Fig. 5). Lack of definitive flood features, like gravel expansion fans and distinctive flood channels, along proposed spreading flood paths A–C (Fig. 5) and unmodified small moraines in the western and northwestern Elmendorf moraine (Reger and Updike, 1983, plate 1) also argue against megaflooding.
3. Landform compositions in the Wasilla area. Wiedmer et al. (2010) place emphasis on an exposure of cross-bedded fluvial gravels west of Wasilla (Fig. 2F), which they claim (p. 416) shows the composition and internal structure of a very large subaqueous dune (VLD). Instead, their GPS coordinates confirm that the exposure is located in previously mapped esker deposits (Reger, 1981a; Kopczynski, 2008). Numerous exposures in the so-called VLDs (Reger, 1981a,b) and coring between the ridges (Kopczynski, 2008) demonstrate that those features are actually composed of dense diamicton. Wiedmer and his coauthors apparently have not actually seen a section in or sampled their VLDs and apparently have not seen or checked out any of the six, field-verified, 1:25,000-scale, published geologic maps of the area that are missing from their list of references (Reger, 1981a,b, c,d, Daniels, 1981a,b). The Wiedmer et al. (2010) dune hypothesis infers flood-water depths from 110 to <45 m, declining to the west over their VLD ridges. The passage of floods that deep should have left evidence upstream and downstream of the VLDs. Our mapping shows ~360 distinct, unmodified gravel eskers extending from the mouth of the Matanuska corridor westward to the Elmendorf moraine along the east and south sides of the VLD ridges (Daniels, 1981a,b; Reger, 1981a,b; Kopczynski, 2008). The explanation that a lobe of ancestral Knik Glacier readvanced to either form these eskers as boulder berms or protect them from massive floods (p. 418) is not supported by lithologic analysis of 123 pebble collections in the area (Kopczynski, 2008).
4. The pygmy whitefish in Inner Lake George are not unique in the Cook Inlet region, but are also present in Lake Chakachamna 112 km west of Inner Lake George on the west side of Cook Inlet (Bechtel Civil & Minerals, Inc., 1983, p. 2–6). Other populations of pygmy whitefish likely exist in the CRB and upper Cook Inlet region, where little is known about this small fish (Bird and Roberson, 1979). The presence of pygmy whitefish on opposite sides of the broad upper Cook Inlet trough considerably increases the likelihood that they followed the Susitna River between the CRB and the Cook Inlet trough rather than the hypothesized flood course through the Matanuska corridor.

Finally, we are encouraged that emerging hypotheses force re-evaluation of our previous interpretations. However, when viewed in the context of the known lake chronology in the CRB, the nature of deposits in and west of the Matanuska corridor, and incomplete data on fish distribution, we urge caution before accepting this particular megaflood hypothesis.

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