LAKE SEDIMENT RECORDS FROM ISOLATION BASINS CONSTRAIN RELATIVE SEA LEVEL CHANGES DURING THE HOLOCENE NEAR NORDENSKIÖLD GLETSCHER, WESTERN GREENLAND

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Purpose

The goal was to add data to a gap in relative sea level (RSL) and Greenland Ice Sheet deglaciation data in West Greenland using lake sediment analysis. This study constrains timing of emergence for three lakes (S1, S2, and S4) below marine limit and timing of deglaciation from one lake above marine limit (S3).

Methods

Sediment analysis:

- ^{14}C radiocarbon dating
- Loss-on-ignition (LOI)
- Magnetic Susceptibility (MS)

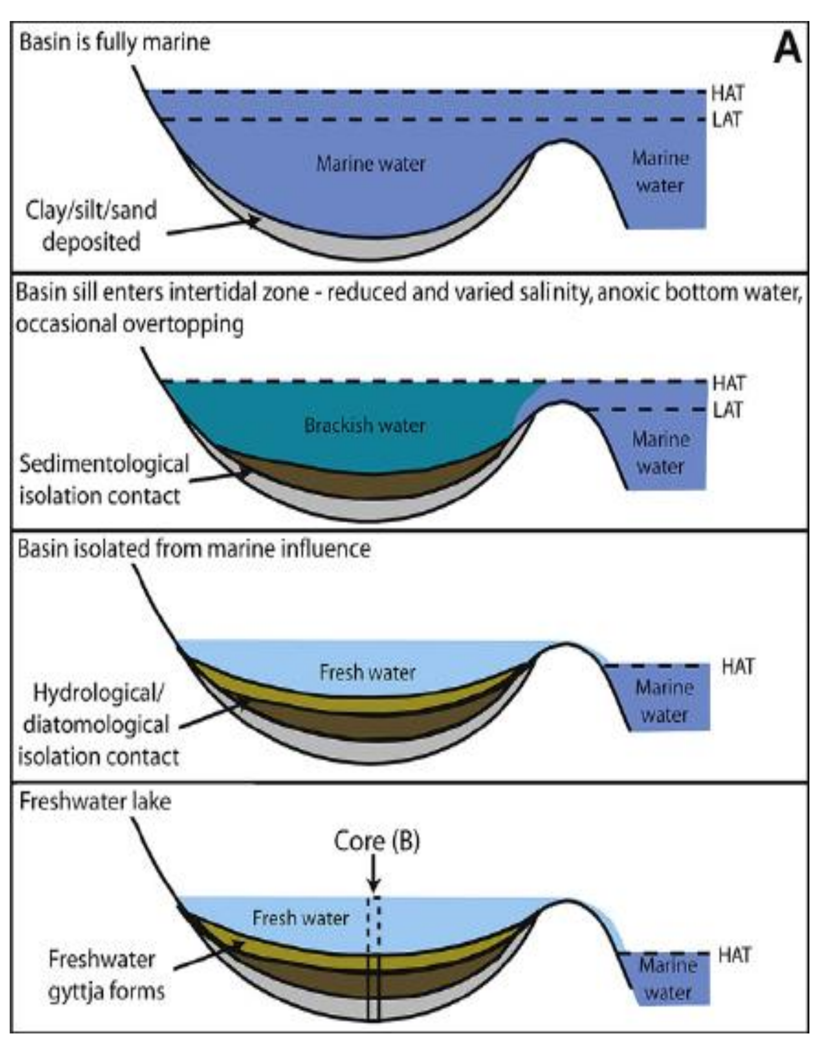

Figure 1

Figure 1 shows the three main phases of sedimentation expected from a basin to experience during a fall in RSL: a fully marine phase characterized by sand, silts, and clays; a brackish phase characterized by olive grey-black laminated gyttja which may contain minerogenic glacial lacustrine deposits; and a freshwater phase characterized by freshwater lacustrine sediments comprised of varying mixtures of freshwater gyttja, plant macrofossils and mineral matter from the local catchment. Figure from Long et al., (2011).

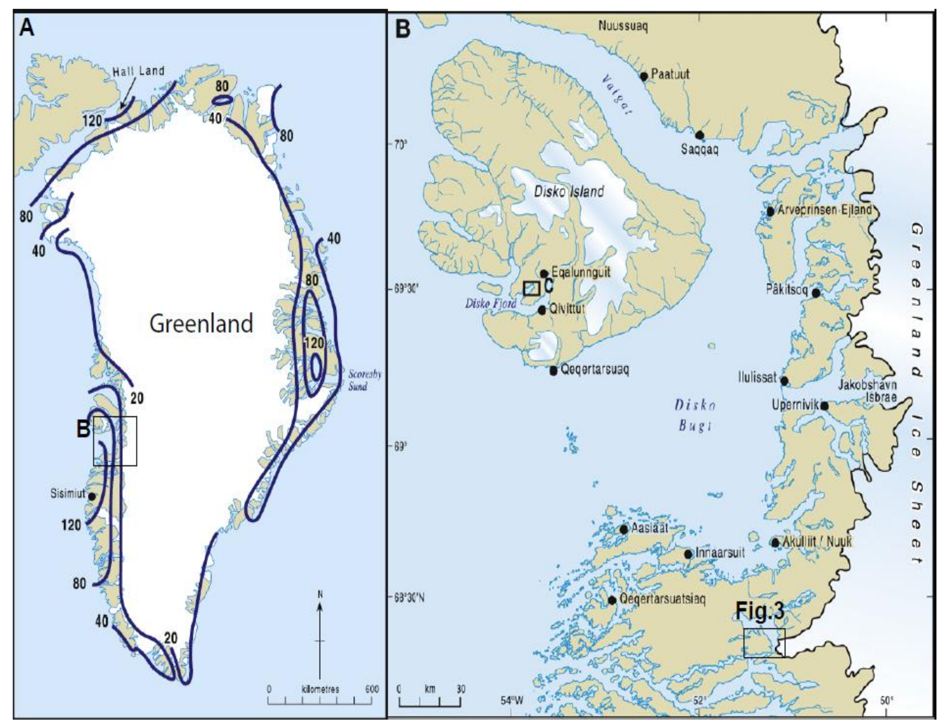

Figure 2

A) Marine limit elevation contours (m asl) in Greenland B) The study location is to the south of Disko Bugt, near an inland marine inlet ~100 km to the east of Baffin Bay and ~100 km to the south of Ilulissat. Figures modified from Long et al., (2011).

Figure 3

Figure 3 shows study location and sediment core collection sites denoted by red circles. Lakes S1, S2, S3, and S4 are situated ~5-10 km to the west of the present ice margin at Nordenskiöld Gletscher.

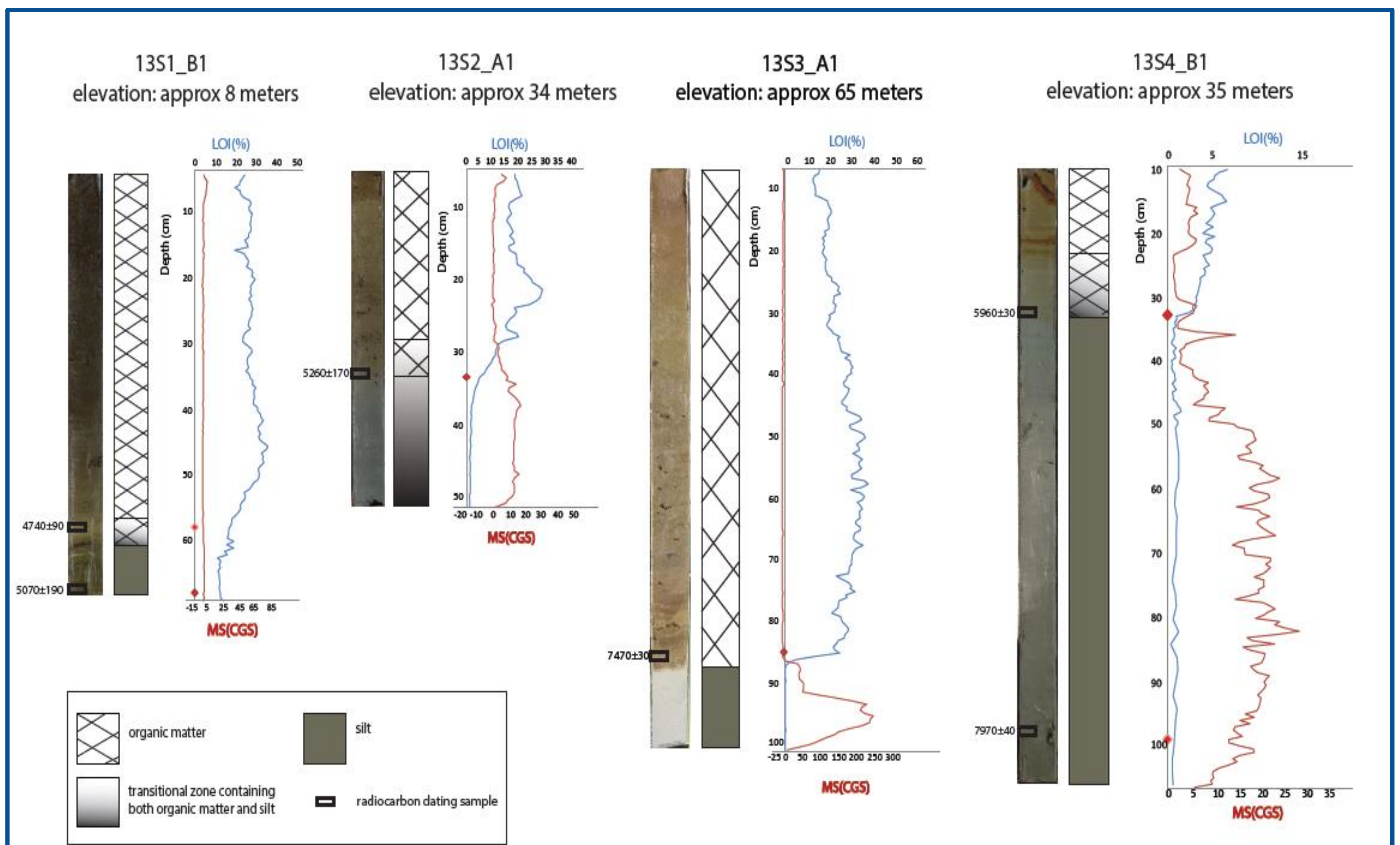

Figure 4

Figure 4 shows the results of Loss-on-ignition (LOI) and Magnetic Susceptibility (MS) analyses. Where the LOI and MS cross over signifies the transition from marine to freshwater sediments in cores from Lakes S1, S2 and S4 and the transition from glacial to non-glacial sediments in the core from Lake S3.

Interpretations

Emergence Curves

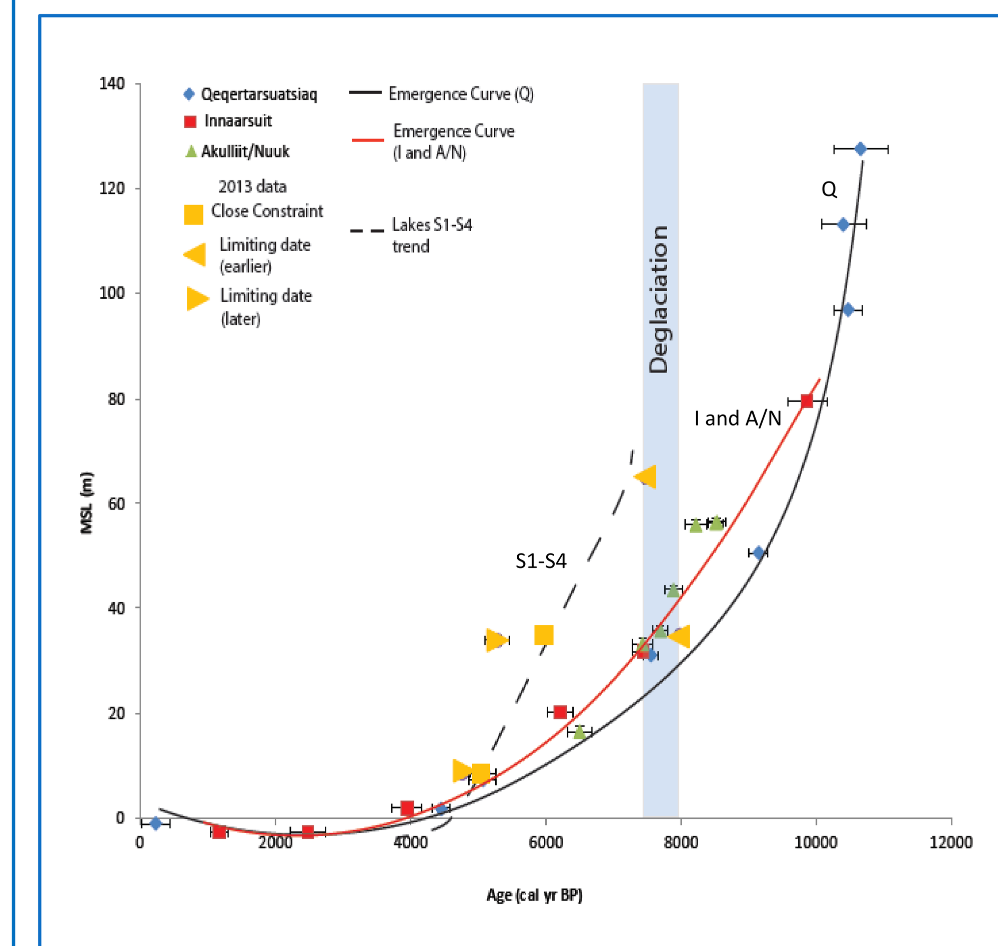

Figure 5

The trend determined by the dates in lakes S1, S2 and S4 is younger than but similar in steepness to that of Qeqertarsuatsiaq (Q; Long and Roberts, 2003). It is also younger than and steeper than the RSL curve from Innaarsuit and Akulliit/Nuuk (I and A/N; Long et al, 2003 and Long and Roberts, 2002, respectively).

Conclusion

- The deglacial age was determined to be between 7,470 ± 30 and 7,970 ± 40 cal yr BP.
- The radiocarbon ages produce a trend that is younger than both pre-existing RSL emergence curves.
  - The slope is similar but not as steep as Qeqertarsuatsiaq
  - The slope is steeper than Akulliit/Nuuk and Innaarsuit
- A comparison of the curves shows a higher rate of emergence at the lower latitude sites than the higher latitude sites.

References

Long et al., QSR, 2011.
Long and Roberts, JQS, 2002.
Long et al., QR, 2003
Long and Roberts, BOREAS, 2003