Configuration and sea level contribution from the Antarctic Ice Sheet during the Last Interglacial

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Data suggests higher global sea level during the Last Interglacial

Adapted from Kopp et al. 2009
Contributions to Last Interglacial sea level

Modern sea level = 0

LIG Sea Level
Kopp et al. 2009

8.0 m
6.6 m

67%
95%
Contributions to Last Interglacial sea level

LIG Sea Level
Kopp et al. 2009

Modern sea level = 0

- Greenland Ice Melt
  - Contributions: 90% - 0.3 – 3.2 m (Stone et al. 2013)
  - Max: 0.4 ± 0.3 m (McKay et al. 2011)
  - Max: 0.4 ± 0.1 m (Radic and Hock 2011)

- Ocean Thermal Expansion

- Mountain Glacier Melt

- 67% of LIG Sea Level
- 95% of LIG Sea Level
Contributions to Last Interglacial sea level

Meters

LIG Sea Level
Kopp et al. 2009

Modern sea level = 0

8.0 m

6.6 m

WAIS Melt?

Mountain Glacier Melt

Ocean Thermal Expansion

Greenland Ice Melt

Max: 0.4 ± 0.1 m (Radic and Hock 2011)

Max: 0.4 ± 0.3 m (McKay et al. 2011)

90%: 0.3 – 3.2 m (Stone et al. 2013)
Evidence of WAIS retreat during the past 750ka

Scherer et al. 1998
WAIS is a marine ice sheet with inland-sloping bed
Marine ice sheets on inland-sloping beds are prone to retreat
Inducing ice sheet reconfiguration using BISICLES model
Widespread retreat of the WAIS results

Modern

Retreated
Estimate surface mass balance for new ice sheet configuration
What is effect of uncertain ocean forcing on LIG ice sheet?

Experiments:
- 20 m/a
- 1 m/a
- 10 cm/a
Range of subshelf melt rates applied to all of AIS
Ice thickness for each experiment

Modern

20 m/a

1 m/a

10 cm/a
Grounded area of the AIS

![Graph showing the grounded area of the AIS over model time (years)]
Sea level equivalent from ice mass loss

- AIS
- WAIS
- EAIS

- collapse
- 20 m/a melt
- 1 m/a melt
- 10 cm/a melt
Major ice sheet retreat alters circulation
Proxies used to determine LIG ocean expansion

Figure 1. Maps of global ΔSST values in (a) our database, where symbols indicate proxy type (see legend) and (b) the synthesis of Turney and Jones [2010]. Note that in both maps, the locations of the symbols were adjusted slightly for visibility. To the right of each map, ΔSST values are plotted by latitude. For our database (Figure 1a), records interpreted to reflect annual, austral summer, and boreal summer temperatures are shown with different symbols.
Proxies used to determine LIG sea level

Figure 1 | Sites with at least one sea level observation in our database. The symbol shapes reflect the nature of the indicators (upward triangles, isotopic; circles, reef terraces; downward triangles, coral biofacies; squares, sedimentary facies and non-coral biofacies; diamonds, erosional). The colours reflect the number of observations at a site (blue, 1; green, 2; magenta, 3; red, 4 or more).