Last Interglacial Antarctic Ice Sheet: what effect on water stable isotopes ?

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(paper under preparation)

1. Method: 10 elevation idealised simulations by the isotope-enable **HadCM3 model** relative to EPICA Dome

$$Z'_A = Z_A / \beta$$

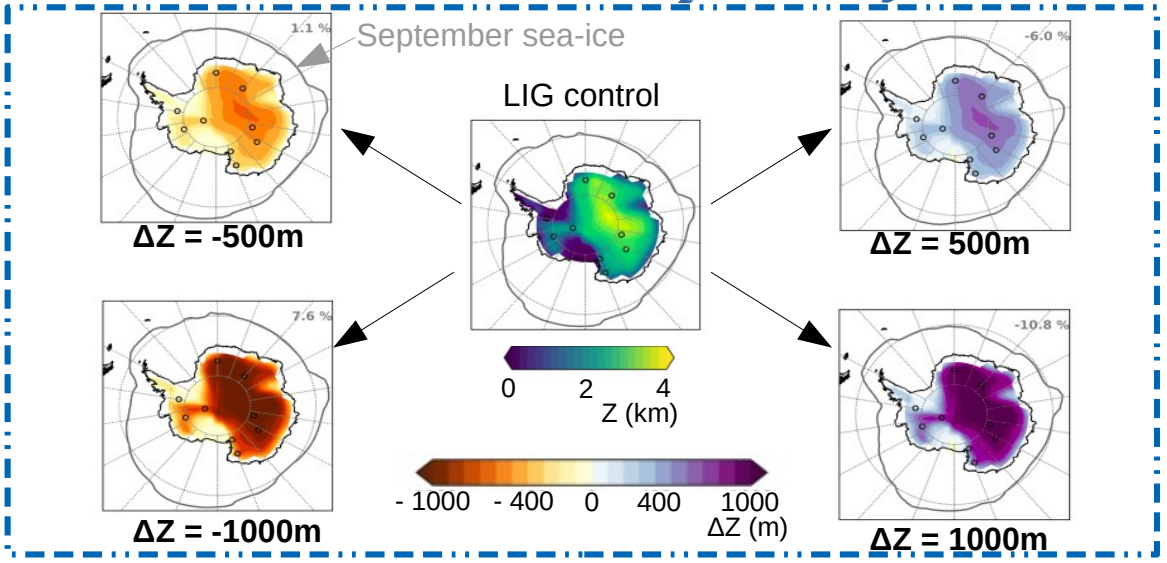
New elevation — *LIG elevation*

with

$$\beta = \frac{Z_{EDC}}{(Z_{EDC} + \Delta z)}$$

Prescribed changes compared to Last Interglacial (LIG)

Elevation anomalies compared to LIG



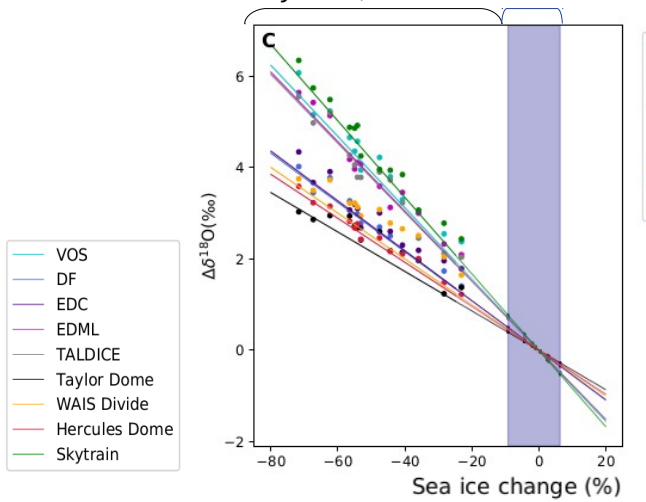
ΔZ =
- 1000 m
- 500 m
- 200 m
0 (LIG)
+ 200 m
+ 500 m
+ 1000 m

2. Key results:

1.Sea-ice correction

from the $\delta^{18}O$ LIG anomalies – sea-ice extent LIG anomalies relationships

Simulations from *Holloway et al., 2016* Our simulations



2. $\delta^{18}O$ LIG gradients

Using our simulations

Experiment	Slope (‰/100m)	r^2	p-value
Vostok	-0.49	0.79	<0.05
DomeF	-0.51	0.77	<0.05
EDC	-0.69	0.88	<0.05
EDML	-0.48	0.84	<0.05
Taldice	-0.93	0.97	<0.05
Taylor Dome	-0.79	0.92	<0.05
WAIS	-0.76	1.00	0.140
Hercules Dome	-0.79	0.99	<0.05
Skytrain	-3.52	0.99	<0.05

Our conclusions:

1. Indirect AIS-sea ice impacts on $\delta^{18}O$ are small, an interesting feature in terms of understanding controls on sea ice.
2. The elevation linearly changes the $\delta^{18}O$ values with gradient increasing from the plateau to coastal regions.

Reference:

Holloway, M. D., Sime, L. C., Singarayer, J. S., Tindall, J. C., Bunch, P., & Valdes, P. J. (2016). Antarctic last interglacial isotope peak in response to sea ice retreat not ice-sheet collapse. Nature communications, 7(1), 1-9..

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