

# **The role of the deep Atlantic in atmospheric CO<sub>2</sub> changes during the Younger Dryas equivalent at Termination III**

XUAN JI<sup>1\*</sup>, JIMIN YU<sup>1</sup>

<sup>1</sup> The Research School of Earth Sciences, The Australian National University, Canberra, ACT 2601, Australia

(\*correspondence: xuan.ji@anu.edu.au)

The Younger Dryas (YD) is one of the most abrupt climate change events until the initiation of anthropogenic global warming. Apart from the dramatic temperature change during that period, atmospheric CO<sub>2</sub> increased ~27 ppm [1]. It has been a subject of debate over whether it was a one-time outlier that only occurred at last Termination, or it was an integral part of the deglaciation. Broecker proposed that a YD equivalent were seen in records of Termination III (T-III) [2]. To test the idea of likely reappearance of YD equivalent at T-III, as well as understand the role of deep Atlantic in past rapid atmospheric CO<sub>2</sub> changes, we present a high resolution records for key carbonate system parameters during the Younger Dryas-like events at Termination III. Using a new tracer ( $[\text{CO}_3^{2-}]_{\text{as}}$ ) [3], we infer the CO<sub>2</sub> gas exchange histories between atmosphere and ocean in polar surface oceans and check the similarity of the Terminations I and III.

[1] Marcott, S. A., Bauska, T. K., Buizert, C., Steig, E. J., Rosen, J. L., Cuffey, K. M., ... & McConnell, J. R. (2014). Centennial-scale changes in the global carbon cycle during the last deglaciation. *Nature*, 514(7524), 616-619.

[2] Broecker, W. S., Denton, G. H., Edwards, R. L., Cheng, H., Alley, R. B., & Putnam, A. E. (2010). Putting the Younger Dryas cold event into context. *Quaternary Science Reviews*, 29(9-10), 1078-1081.

[3] Yu, J., Menviel, L., Jin, Z. D., Thornalley, D. J. R., Foster, G. L., Rohling, E. J., ... & He, F. (2019). More efficient North Atlantic carbon pump during the Last Glacial Maximum. *Nature communications*, 10(1), 1-11.