

Title:

Neutrally averaged radiocarbon climatology

Investigators:

Casimir de Lavergne, University of New South Wales, Australia

Gurvan Madec, Université Pierre et Marie Curie, France

Fabien Roquet, Stockholm University, Sweden

Ryan M. Holmes, University of New South Wales, Australia

Trevor J. McDougall, University of New South Wales, Australia

Abstract:

This gridded product consists of a global (80°S-62°N) climatological estimate of radiocarbon content ($\Delta^{14}\text{C}$) at half-degree horizontal resolution, provided both on neutral density and depth surfaces. It is based on the GLODAPv2 data compilation (Key et al. 2016, Olsen et al. 2016) and the neutral density (γ^n ; Jackett and McDougall 1997) field of the WOCE global hydrographic climatology (Gouretski and Koltermann 2004). The mapping has been performed separately along 140 neutral density surfaces, using the distance look-up system described at <http://www.marine.csiro.au/~dunn/cars2009/DLU/>, following the procedure described in de Lavergne et al. (2017).

Please note that:

- The product does not correct for bomb-produced ^{14}C .
- The search radius of 1200 km used north of 58°S is reduced to 800 km south of 62°S, with a linear transition over the intervening latitude range. Use of these radii allows the vast majority of the ocean to be mapped but smoothens out smaller scale structures that may be present in the data.
- The gridded product provided on the depth vertical coordinate has been obtained through vertical interpolation of the climatology constructed on density surfaces, except for depth levels shallower than 100 m, for which we performed additional mapping along depth surfaces.
- Uncertainty in the constructed maps varies with the underlying data density. In addition to the 'gridded $\Delta^{14}\text{C}$ ' fields, we provide 'measured $\Delta^{14}\text{C}$ ' fields which contain the data values that entered the mapping on each vertical level. The gridded fields should be considered alongside the underlying measurements.

The dataset contains two netcdf files providing:

- (1) gridded $\Delta^{14}\text{C}$, measured $\Delta^{14}\text{C}$ and depth as a function of latitude, longitude and neutral density (γ^n).
- (2) gridded $\Delta^{14}\text{C}$, measured $\Delta^{14}\text{C}$ and neutral density (γ^n) as a function of latitude, longitude and depth;

Please cite this dataset as:

de Lavergne, C., Madec, G., Roquet, F., Holmes, R. M. and McDougall, T. J., 2017. Abyssal ocean overturning shaped by seafloor distribution. In review.

References:

Key, R. M. *et al.*, 2016. Global Ocean Data Analysis Project, Version 2 (GLODAPv2), ORNL/CDIAC-162, NDP-093, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, US Department of Energy, Oak Ridge, Tennessee.

Olsen, A. *et al.*, 2016. The global ocean data analysis project version 2 (GLODAPv2) - an internally consistent data product for the world ocean. *Earth Syst. Sci. Data* **8**, 297-323. doi:10.5194/essd-8-297-2016

Jackett, D. R. and McDougall, T. J., 1997. A neutral density variable for the world's oceans. *J. Phys. Oceanogr.* **27**, 237-263. doi:10.1175/1520-0485(1997)027<0237:ANDVFT>2.0.CO;2

Gouretski, V. V. and Koltermann, K. P. , 2004. WOCE global hydrographic climatology: a technical report. Berichte des Bundesamtes für Seeschifffahrt und Hydrographie 35/2004, 52 pp.
<http://icdc.cen.uni-hamburg.de/1/daten/ocean/woce-climatology.html>