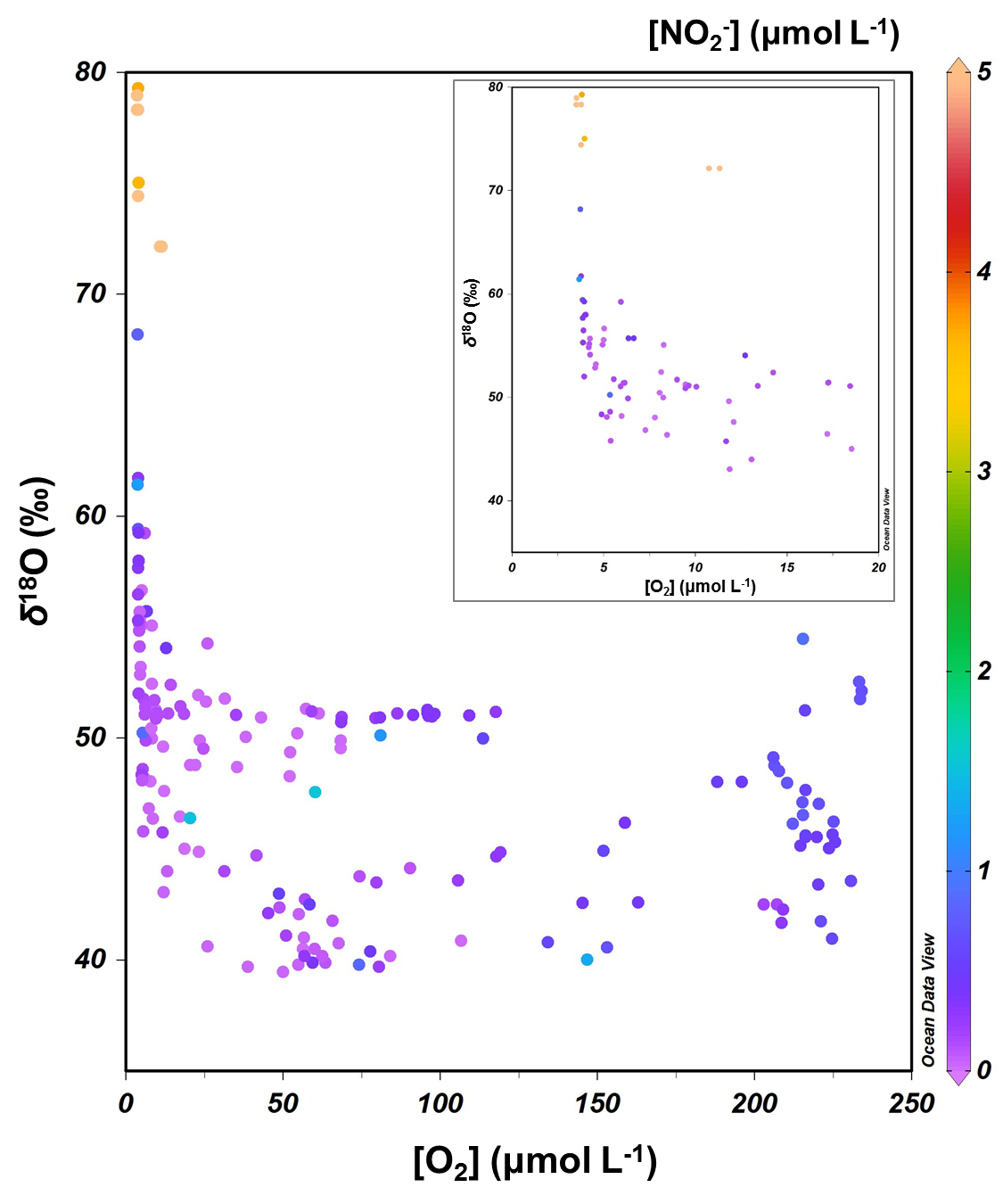


**Figure S1** Linear regression of N2O isotopes and site preference plotted against inverse N2O concentrations (nmol-1 L) at four different water bodies (see table 1 for descriptions of water bodies).



**Figure S2** Dissolved oxygen concentrations vs. *δ*18O-N2O and associated nitrite concentrations from samples collected in October 2015.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Station  (depth range) | Year / Month | Latitude | Longitude | Reference |
| A  (0 – 1000 m) | 2015 / 10 | 0 | 85.50°W | This study |
| 2012 / 11 | 0 | 85.83°W | Kock et al., 2016 |
| B  (0 – 800 m) | 2015 / 10 | 2.50°S | 85.50°W | This study |
| 2012 / 11 | 2.00°S | 85.83°W | Kock et al., 2016 |
| C  (0 – 800 m) | 2015 / 10 | 9.51°S | 80.31°W | This study |
| 2012 / 12 | 9.93°S | 80.25°W | Kock et al., 2016 |
| D  (0 – 70 m) | 2015 / 10 | 12.25°S | 77.08°W | This study |
| 2011 / 10 | 12.05°S | 77.29°W | Baustian et al., 2012 |
| E  (0 – 100 m) | 2015 / 01 | 13.50°S | 76.60°W | Ji, unpublished data |
| 2009 / 01 | 13.50°S | 76.46°W | Löscher et al., 2012 |
| F  (0 – 250 m) | 2015 / 01 | 16.30°S | 73.90°W | Ji, unpublished data |
| 1985 / 02 | 16.38°S | 74.67°W | Friederich et al., 1985 |

**Table S1** Data sources for water column N2O distributions between El Niño (shaded rows) and normal years. All the data can be downloaded from MEMENTO database (doi:10.1029/2015EO023665)

**Table S2** Isotopic and isotopomeric reference materials (in ‰) used in the N2O isotopic/isotopomeric measurements. Values for δ15Nbulk δ15Nα and δ15Nβ are relative to atmospheric N2 and δ18O to Vienna standard mean ocean water (VSMOW).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Standard name** | **Calibrated isotopic value** | | | | |
| *δ*15Nα | *δ*15Nβ | *δ*15Nbulk | Site preference | *δ*18O |
| CB09715 | -82.14 | -78.02 | -80.08 | -4.12 | 21.64 |
| CB09766 | 5.55 | -12.87 | -3.66 | 18.42 | 32.73 |
| CB08976 | 15.7 | -3.21 | 6.25 | 18.91 | 35.16 |
| 53504 | 1.71 | 94.44 | 48.08 | -92.73 | 36.01 |

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