

Supplement of Biogeosciences, 17, 2579–2591, 2020
<https://doi.org/10.5194/bg-17-2579-2020-supplement>
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Supplement of

Reconstructing N₂-fixing cyanobacterial blooms in the Baltic Sea beyond observations using 6- and 7-methylheptadecane in sediments as specific biomarkers

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Table S1. Location of sediment trap, sediment cores, and monitoring stations.

| | Station | Lat. N | Long. E | Water depth (m) |
|---------------------|----------------|-----------|-----------|-----------------|
| Sediments | Core MSM51/20 | 57°59.866 | 19°52.845 | 198 |
| | Core EMB1215/7 | 57°59.950 | 19°52.950 | 197 |
| | Core POS435/10 | 62°52.160 | 19°02.550 | 214 |
| | Sediment trap | 57°18.300 | 20°00.460 | 180 |
| Monitoring stations | 32 | 57°58.500 | 20°31.999 | -- |
| | 34a | 57°58.000 | 21°33.000 | -- |
| | BMP J1 | 57°19.200 | 20°03.000 | -- |
| | BY15 | 57°19.200 | 20°03.000 | -- |
| | BY15 W | 57°18.899 | 19°54.600 | -- |
| | GB_12 | 57°11.640 | 19°48.822 | -- |
| | GB_B13 | 57°26.652 | 19°48.840 | -- |
| | GB_B14 | 57°11.658 | 20°16.644 | -- |
| | TF0260 | 56°38.004 | 19°34.998 | -- |
| | TF0270 | 57°51.900 | 20°11.412 | -- |
| | TF0271 | 57°19.212 | 20°03.018 | -- |
| | TF0271b | 57°18.348 | 20°04.650 | -- |
| | TF0272 | 57°04.002 | 19°49.986 | -- |
| | TF0286 | 58°00.000 | 19°54.000 | -- |

Table S2. Core MSM51-2/20 age model based on an event stratigraphy.

| Depth (cm) | Age | SR* (cm/yr) | Event |
|------------|------|-------------|---------------------------------------|
| 0.00 | 2016 | 0.2 | Core recovery |
| 2.75 | 2003 | 0.2 | Major Baltic Sea Inflow |
| 9.00 | 1994 | 0.7 | Major Baltic Sea Inflow |
| 12.75 | 1986 | 0.5 | Tchernobyl accident |
| 16.90 | 1977 | 0.5 | Major Baltic Sea Inflow |
| 22.00 | 1963 | 0.4 | start of atom waepons tests |
| 25.00 | 1954 | 0.3 | maximum in atom waepons tests |
| 31.00 | 1935 | 0.3 | start of PCB global production |
| 35.00 | 1900 | 0.1 | rising use of Pb-containing petroleum |
| 44.00 | 1860 | 0.2 | linear extrapolation |

* *Sedimentation Rate*

Table S3. Trap sediment material, monitoring, and satellite data from the Eastern Gotland Basin.

| Sediment trap | | | | | | Monitoring | | | Satellite | |
|---------------|--|--|--|----------------------------|------------------------|------------|--|--|-----------|------|
| Date | 7Me-C _{17:0} (µg/m ² /day) | 6Me-C _{17:0} (µg/m ² /day) | 6+7Me-C _{17:0} (µg/m ² /day) | <i>Aphanizomenon</i> spp.* | <i>Nodularia</i> spp.* | Date | <i>Aphanizomenon</i> spp. (mg/m ³) | <i>Nodularia</i> spp. (mg/m ³) | Date | FCA |
| 5/17/2010 | 29.9 | 5.4 | 35.3 | 1 | | 5/6/2010 | 3.1 | -- | 6/2/2010 | 0.0 |
| 5/27/2010 | 7.0 | 1.6 | 8.7 | 1 | | 5/17/2010 | 3.9 | -- | 6/7/2010 | 0.0 |
| 6/21/2010 | -- | -- | -- | -- | | 6/3/2010 | 16.3 | -- | 6/12/2010 | 0.0 |
| 7/11/2010 | -- | -- | -- | -- | | 7/1/2010 | 46.2 | 9.7 | 6/17/2010 | 0.0 |
| 7/16/2010 | 104.9 | 23.5 | 128.4 | 3 | 2 | 7/22/2010 | 42.1 | 95.3 | 6/22/2010 | 0.0 |
| 7/26/2010 | 2.9 | 0.6 | 3.4 | 3 | 2 | 8/19/2010 | 25.7 | 43.2 | 6/27/2010 | 0.0 |
| 8/5/2010 | 7.8 | 1.9 | 9.7 | 2 | 1 | 9/16/2010 | 6.6 | -- | 7/2/2010 | 0.2 |
| 8/15/2010 | 164.9 | 33.3 | 198.2 | 2 | 2 | 10/4/2010 | 36.0 | -- | 7/7/2010 | 5.3 |
| 9/4/2010 | 43.4 | 10.0 | 53.4 | 2 | 1 | 11/11/2010 | 4.6 | -- | 7/12/2010 | 38.4 |
| 9/24/2010 | -- | -- | -- | 1 | | 11/16/2010 | 14.2 | -- | 7/17/2010 | 21.5 |
| 10/4/2010 | 38.3 | 9.7 | 48.1 | 3 | 1 | 1/13/2011 | -- | -- | 7/22/2010 | 21.4 |
| 10/24/2010 | -- | -- | -- | 2 | | 2/7/2011 | 0.4 | -- | 7/27/2010 | 15.8 |
| 11/25/2010 | -- | -- | -- | -- | | 3/12/2011 | 0.1 | -- | 8/1/2010 | 0.6 |
| 12/1/2010 | -- | -- | -- | -- | | 3/26/2011 | -- | -- | 8/6/2010 | 0.2 |
| 12/7/2010 | -- | -- | -- | 1 | | 4/10/2011 | -- | -- | 8/11/2010 | 0.0 |
| 12/13/2010 | -- | -- | -- | 1 | | 5/14/2011 | 19.8 | -- | 8/16/2010 | 0.6 |
| 12/25/2010 | -- | -- | -- | 2 | | | | | 8/21/2010 | 0.0 |
| 1/9/2011 | -- | -- | -- | 1 | | | | | 8/26/2010 | 1.1 |
| | | | | | | | | | 8/30/2010 | 0.0 |

* 1: present; 2: abundant; 3: highly abundant

Table S4. Data from core MSM51-2/20, monitoring stations (summer and annual means), and satellite imagery (summer) for the period 1983-2016.

| Year | 7Me-C _{17:0} (µg/gTOC) | 6Me-C _{17:0} (µg/gTOC) | 6+7Me-C _{17:0} (µg/gTOC) | Summer (July-August) | | Annual | | FCA |
|------|---------------------------------|---------------------------------|-----------------------------------|--|--|--|--|------|
| | | | | <i>Aphanizomenon</i> spp. (mg/m ³) | <i>Nodularia</i> spp. (mg/m ³) | <i>Aphanizomenon</i> spp. (mg/m ³) | <i>Nodularia</i> spp. (mg/m ³) | |
| 2016 | -- | -- | -- | 33.6 | 121.6 | 15.0 | 24.4 | 14.3 |
| 2015 | 0.96 | 0.23 | 1.19 | 120.5 | 66.0 | 51.6 | 17.1 | 19.2 |
| 2014 | -- | -- | -- | 75.6 | 161.6 | 21.0 | 38.5 | 43.5 |
| 2013 | -- | -- | -- | 266.0 | 37.1 | 97.3 | 10.3 | 6.0 |
| 2012 | 1.69 | 0.29 | 1.98 | 40.1 | 38.6 | 26.1 | 23.1 | 11.0 |
| 2011 | -- | -- | -- | 66.8 | 89.0 | 25.3 | 28.0 | 18.6 |
| 2010 | 1.05 | 0.18 | 1.22 | 36.3 | 57.3 | 15.0 | 16.0 | 11.0 |
| 2009 | -- | -- | -- | 186.3 | 48.9 | 59.9 | 14.3 | 5.7 |
| 2008 | 1.06 | 0.20 | 1.26 | 85.8 | 149.1 | 46.3 | 41.5 | 47.2 |
| 2007 | -- | -- | -- | 122.5 | 44.5 | 32.3 | 8.9 | 7.2 |
| 2006 | -- | -- | -- | 12.2 | 7.3 | 7.2 | 1.5 | 14.0 |
| 2005 | 1.03 | 0.23 | 1.26 | 145.0 | 335.4 | 48.7 | 84.6 | 44.8 |
| 2004 | -- | -- | -- | 73.2 | 256.8 | 33.6 | 77.5 | 9.7 |
| 2003 | 0.64 | 0.12 | 0.76 | 34.6 | 58.8 | 14.6 | 16.4 | 41.9 |
| 2002 | 0.29 | 0.05 | 0.34 | 109.6 | 177.6 | 38.6 | 49.4 | 17.6 |
| 2001 | 0.20 | 0.05 | 0.25 | 121.1 | 39.3 | 39.8 | 10.9 | 4.7 |
| 2000 | 0.46 | 0.07 | 0.52 | 25.2 | 113.6 | 12.3 | 28.4 | 25.7 |
| 1999 | 1.34 | 0.25 | 1.58 | 56.5 | 192.8 | 28.4 | 48.3 | 37.3 |
| 1998 | 0.63 | 0.11 | 0.74 | 52.0 | 41.4 | 26.4 | 10.7 | 7.7 |
| 1997 | 0.38 | 0.07 | 0.45 | 239.8 | 56.0 | 75.2 | 14.2 | 11.2 |
| 1996 | 0.02 | <i>n.d.</i> | 0.02 | 47.1 | 69.7 | 39.4 | 27.8 | 3.1 |
| 1995 | 0.05 | <i>n.d.</i> | 0.05 | 104.1 | 60.8 | 39.5 | 14.3 | 5.1 |
| 1994 | 0.08 | <i>n.d.</i> | 0.08 | 319.1 | 228.4 | 97.7 | 65.3 | 24.4 |
| 1993 | 0.22 | 0.06 | 0.28 | 141.6 | 84.0 | 47.9 | 25.1 | 6.7 |
| 1992 | 0.40 | 0.09 | 0.50 | 69.3 | 2148.8 | 20.4 | 538.0 | 17.9 |
| 1991 | 0.45 | 0.11 | 0.56 | 283.8 | 87.3 | 121.6 | 37.4 | 19.6 |
| 1990 | 0.53 | 0.12 | 0.65 | -- | -- | 33.9 | 7.5 | 1.6 |
| 1989 | 1.12 | 0.21 | 1.33 | -- | -- | 7.1 | 0.2 | 2.8 |
| 1988 | 1.23 | 0.22 | 1.44 | 70.5 | 19.5 | 6.9 | 0.0 | 3.3 |

| | | | | | | | | |
|------|------|-------------|------|-------|--------|------|-------|-----|
| 1987 | 1.44 | 0.29 | 1.73 | 24.4 | 19.1 | 6.2 | 24.3 | 0.3 |
| 1986 | 0.88 | 0.16 | 1.04 | 41.2 | 3097.9 | 12.0 | 886.2 | -- |
| 1985 | 0.99 | 0.18 | 1.18 | 105.3 | 203.3 | 45.2 | 110.5 | -- |
| 1984 | 0.13 | <i>n.d.</i> | 0.13 | 46.3 | 16.3 | 17.5 | 5.4 | -- |
| 1983 | 0.15 | <i>n.d.</i> | 0.15 | 117.0 | 0.0 | 45.7 | 0.0 | -- |

Table S5. Core MSM51-2/20 (7Me-C_{17:0}, 6Me-C_{17:0}, 6+7Me-C_{17:0}, and TOC), AMO (Enfield et al., 2001), NAO (Hurrell, 1995; Jones et al., 1997), HadISST1 (Rayner et al., 2003), and annual riverine P input (Gustafsson et al., 2012) data since 1860.

| Depth (cm) | Year | 7Me-C _{17:0} (µg/gTOC) | 6Me-C _{17:0} (µg/gTOC) | 6+7Me-C _{17:0} (µg/gTOC) | TOC (%) | AMO | winter (DJFM) NAO | summer (J-A) HadISST1 (°C) | annual riverine P input (ktons) |
|------------|------|---------------------------------|---------------------------------|-----------------------------------|---------|-------|-------------------|----------------------------|---------------------------------|
| 0.25 | 2015 | 0.96 | 0.23 | 1.19 | 15.9 | 0.10 | 8.16 | -- | -- |
| -- | 2014 | -- | -- | -- | -- | 0.09 | 8.21 | -- | -- |
| -- | 2013 | -- | -- | -- | -- | 0.15 | -2.33 | -- | -- |
| 0.75 | 2012 | 1.69 | 0.29 | 1.98 | 14.6 | 0.20 | 8.23 | -- | -- |
| -- | 2011 | -- | -- | -- | -- | 0.09 | -3.65 | -- | -- |
| 1.25 | 2010 | 1.05 | 0.18 | 1.22 | 15.2 | 0.34 | -10.15 | -- | -- |
| -- | 2009 | -- | -- | -- | -- | 0.02 | -1.25 | -- | -- |
| 1.75 | 2008 | 1.06 | 0.20 | 1.26 | 14.4 | 0.12 | 5.47 | 17.6 | -- |
| -- | 2007 | -- | -- | -- | -- | 0.13 | 7.30 | 16.6 | -- |
| -- | 2006 | -- | -- | -- | -- | 0.25 | -0.79 | 18.7 | 24.8 |
| 2.25 | 2005 | 1.03 | 0.23 | 1.26 | 16.0 | 0.28 | -0.45 | 17.4 | 28.2 |
| -- | 2004 | -- | -- | -- | -- | 0.19 | -0.81 | 17.1 | 30.6 |
| 2.75 | 2003 | 0.64 | 0.12 | 0.76 | 14.6 | 0.22 | 1.59 | 18.0 | 24.5 |
| 3.50 | 2002 | 0.29 | 0.05 | 0.34 | 11.3 | 0.05 | 3.16 | 18.3 | 32.0 |
| 4.25 | 2001 | 0.20 | 0.05 | 0.25 | 10.9 | 0.10 | -2.00 | 18.0 | 35.1 |
| 4.75 | 2000 | 0.46 | 0.07 | 0.52 | 10.8 | 0.01 | 7.39 | 16.0 | 36.0 |
| 5.50 | 1999 | 1.34 | 0.25 | 1.58 | 10.6 | 0.10 | 3.93 | 18.0 | 37.4 |
| 6.25 | 1998 | 0.63 | 0.11 | 0.74 | 11.3 | 0.36 | 3.20 | 15.5 | 42.5 |
| 7.00 | 1997 | 0.38 | 0.07 | 0.45 | 10.6 | 0.04 | 0.70 | 18.6 | 34.6 |
| 7.75 | 1996 | 0.02 | <i>n.d.</i> | 0.02 | 12.1 | -0.07 | -9.29 | 15.9 | 32.2 |
| 8.25 | 1995 | 0.05 | <i>n.d.</i> | 0.05 | 12.5 | 0.12 | 9.75 | 16.4 | 40.3 |
| 8.75 | 1994 | 0.08 | <i>n.d.</i> | 0.08 | 9.6 | -0.19 | 7.20 | 17.8 | 39.7 |
| 9.25 | 1993 | 0.22 | 0.06 | 0.28 | 9.2 | -0.23 | 5.70 | 15.4 | 33.5 |
| 9.75 | 1992 | 0.40 | 0.09 | 0.50 | 11.1 | -0.23 | 6.72 | 16.4 | 32.8 |
| 10.25 | 1991 | 0.45 | 0.11 | 0.56 | 11.7 | -0.15 | 0.82 | 16.8 | 32.9 |
| 10.75 | 1990 | 0.53 | 0.12 | 0.65 | 11.7 | -0.05 | 9.49 | 16.3 | 35.6 |
| 11.25 | 1989 | 1.12 | 0.21 | 1.33 | 9.9 | -0.10 | 11.44 | 16.6 | 34.9 |
| 11.75 | 1988 | 1.23 | 0.22 | 1.44 | 9.6 | -0.02 | 0.39 | 16.9 | 42.2 |
| 12.25 | 1987 | 1.44 | 0.29 | 1.73 | 9.8 | 0.05 | 1.35 | 13.5 | 42.2 |

| | | | | | | | | | |
|-------|------|------|-------------|------|------|-------|-------|------|------|
| 12.75 | 1986 | 0.88 | 0.16 | 1.04 | 10.6 | -0.29 | -0.13 | 15.9 | 38.8 |
| 13.25 | 1985 | 0.99 | 0.18 | 1.18 | 10.7 | -0.28 | -1.52 | 15.6 | 41.4 |
| 13.75 | 1984 | 0.13 | <i>n.d.</i> | 0.13 | 9.6 | -0.22 | 2.97 | 16.6 | 36.8 |
| 14.25 | 1983 | 0.15 | <i>n.d.</i> | 0.15 | 10.4 | -0.09 | 8.00 | 16.2 | 37.6 |
| 14.75 | 1982 | 0.13 | <i>n.d.</i> | 0.13 | 9.6 | -0.23 | 0.99 | 16.6 | 40.4 |
| 15.25 | 1981 | 0.08 | <i>n.d.</i> | 0.15 | 8.9 | -0.09 | 3.60 | 15.1 | 48.4 |
| -- | 1980 | -- | -- | -- | -- | -0.03 | 0.29 | 16.1 | 45.2 |
| 15.75 | 1979 | 0.16 | <i>n.d.</i> | 0.16 | 7.6 | -0.13 | -5.38 | 15.4 | 40.0 |
| 16.25 | 1978 | 0.08 | <i>n.d.</i> | 0.08 | 8.3 | -0.19 | 1.32 | 15.1 | 38.4 |
| 16.75 | 1977 | 0.06 | <i>n.d.</i> | 0.06 | 8.9 | -0.20 | -4.38 | 14.8 | 38.7 |
| 17.25 | 1976 | 0.06 | <i>n.d.</i> | 0.06 | 8.7 | -0.38 | 2.34 | 15.8 | 25.5 |
| 17.75 | 1975 | 0.30 | 0.11 | 0.41 | 10.2 | -0.31 | 4.63 | 17.1 | 34.2 |
| -- | 1974 | -- | -- | -- | -- | -0.43 | 1.97 | 15.7 | 36.9 |
| 18.25 | 1973 | 0.68 | 0.15 | 0.83 | 8.4 | -0.23 | 5.74 | 17.8 | 25.9 |
| 18.75 | 1972 | 0.47 | 0.07 | 0.54 | 8.5 | -0.37 | 0.30 | 17.0 | 27.2 |
| 19.25 | 1971 | 0.44 | <i>n.d.</i> | 0.38 | 8.2 | -0.32 | -2.56 | 15.2 | 28.9 |
| -- | 1970 | -- | -- | -- | -- | -0.12 | -2.10 | 15.6 | 33.0 |
| 19.75 | 1969 | 0.51 | 0.09 | 0.60 | 9.0 | 0.00 | -8.34 | 17.3 | 24.4 |
| 20.25 | 1968 | 0.18 | <i>n.d.</i> | 0.18 | 8.4 | -0.18 | -0.07 | 16.3 | 30.8 |
| -- | 1967 | -- | -- | -- | -- | -0.11 | 6.42 | 16.1 | 34.7 |
| 20.75 | 1966 | 0.10 | <i>n.d.</i> | 0.10 | 8.6 | -0.01 | 0.90 | 15.7 | 31.7 |
| 21.25 | 1965 | 0.20 | <i>n.d.</i> | 0.20 | 7.9 | -0.17 | -4.03 | 14.1 | 26.3 |
| 21.75 | 1964 | 0.21 | <i>n.d.</i> | 0.21 | 8.1 | -0.11 | -3.06 | 14.7 | 20.9 |
| -- | 1963 | -- | -- | -- | -- | -0.01 | -3.86 | 15.7 | 22.5 |
| 22.25 | 1962 | 0.14 | <i>n.d.</i> | 0.14 | 7.6 | 0.06 | -2.29 | 13.9 | 30.9 |
| 22.75 | 1961 | 0.60 | 0.14 | 0.74 | 9.8 | 0.09 | 8.06 | 15.1 | 24.3 |
| 23.25 | 1960 | 0.82 | 0.12 | 0.94 | 9.4 | 0.23 | -0.59 | 15.6 | 22.9 |
| 23.75 | 1959 | 0.26 | <i>n.d.</i> | 0.26 | 6.8 | 0.04 | 1.43 | 16.9 | 24.9 |
| 24.25 | 1958 | 0.31 | <i>n.d.</i> | 0.31 | 6.5 | 0.21 | -1.06 | 14.6 | 27.0 |
| 24.75 | 1957 | 0.20 | <i>n.d.</i> | 0.20 | 7.0 | 0.03 | 6.60 | 15.4 | 23.2 |
| 25.25 | 1956 | 0.11 | <i>n.d.</i> | 0.11 | 4.9 | -0.03 | -3.20 | 14.8 | 21.1 |
| 25.75 | 1955 | 1.00 | 0.24 | 1.24 | 3.0 | 0.18 | -4.84 | 16.4 | 20.7 |
| -- | 1954 | -- | -- | -- | -- | 0.03 | 0.53 | 15.7 | 17.5 |

| | | | | | | | | | |
|-------|------|------|-------------|------|-----|-------|-------|------|------|
| 26.25 | 1953 | 0.71 | 0.15 | 0.86 | 3.3 | 0.26 | 1.46 | 16.4 | 18.9 |
| -- | 1952 | -- | -- | -- | -- | 0.29 | 2.47 | 15.5 | 16.2 |
| 26.75 | 1951 | 0.48 | <i>n.d.</i> | 0.48 | 3.3 | 0.20 | -2.14 | 15.3 | 16.9 |
| -- | 1950 | -- | -- | -- | -- | -0.02 | 4.79 | 16.9 | 16.5 |
| 27.25 | 1949 | 0.41 | <i>n.d.</i> | 0.41 | 2.6 | 0.09 | 5.64 | 15.8 | 13.8 |
| -- | 1948 | -- | -- | -- | -- | 0.01 | 4.95 | 15.3 | 12.7 |
| 27.75 | 1947 | 0.35 | <i>n.d.</i> | 0.35 | 2.7 | -0.09 | -4.27 | 16.4 | 10.5 |
| -- | 1946 | -- | -- | -- | -- | 0.01 | 1.76 | 16.0 | 11.9 |
| 28.25 | 1945 | 0.41 | <i>n.d.</i> | 0.41 | 3.1 | 0.21 | 5.32 | 16.7 | 13.0 |
| 28.75 | 1944 | 0.52 | 0.10 | 0.62 | 3.1 | 0.34 | 0.83 | 16.1 | 12.4 |
| -- | 1943 | -- | -- | -- | -- | 0.03 | 5.45 | 15.7 | 10.0 |
| 29.25 | 1942 | 0.57 | 0.13 | 0.70 | 3.0 | 0.18 | -1.83 | 14.9 | 9.3 |
| -- | 1941 | -- | -- | -- | -- | 0.17 | -3.75 | 14.7 | 11.5 |
| 29.75 | 1940 | 0.71 | 0.17 | 0.88 | 3.0 | -0.03 | -4.99 | 15.7 | 10.4 |
| -- | 1939 | -- | -- | -- | -- | 0.11 | 1.80 | 17.5 | 10.7 |
| -- | 1938 | -- | -- | -- | -- | 0.24 | 5.28 | 17.2 | 10.6 |
| 30.50 | 1937 | 0.95 | 0.24 | 1.19 | 2.5 | 0.29 | 4.23 | 18.8 | 10.3 |
| -- | 1936 | -- | -- | -- | -- | 0.15 | -6.12 | 17.8 | 12.2 |
| -- | 1935 | -- | -- | -- | -- | 0.02 | 3.91 | 16.3 | 11.8 |
| -- | 1934 | -- | -- | -- | -- | -0.01 | 2.22 | 16.9 | 10.3 |
| -- | 1933 | -- | -- | -- | -- | 0.19 | 2.08 | 16.6 | 10.1 |
| -- | 1932 | -- | -- | -- | -- | 0.23 | -0.64 | 17.7 | 12.0 |
| 31.50 | 1931 | 0.87 | 0.15 | 1.02 | 2.5 | 0.18 | 0.23 | 14.8 | 13.5 |
| -- | 1930 | -- | -- | -- | -- | 0.01 | 4.01 | 16.8 | 11.8 |
| -- | 1929 | -- | -- | -- | -- | -0.11 | -1.03 | 14.2 | 11.4 |
| -- | 1928 | -- | -- | -- | -- | -0.01 | 2.48 | 13.9 | 12.0 |
| -- | 1927 | -- | -- | -- | -- | 0.11 | 5.31 | 17.1 | 13.2 |
| -- | 1926 | -- | -- | -- | -- | 0.08 | 3.38 | 16.8 | 12.5 |
| -- | 1925 | -- | -- | -- | -- | -0.16 | 8.04 | 16.5 | 11.0 |
| -- | 1924 | -- | -- | -- | -- | -0.15 | -1.39 | 15.8 | 14.0 |
| -- | 1923 | -- | -- | -- | -- | -0.33 | 5.98 | 14.7 | 11.5 |
| 32.50 | 1922 | 0.39 | <i>n.d.</i> | 0.39 | 2.5 | -0.32 | 5.56 | 15.6 | 10.4 |
| -- | 1921 | -- | -- | -- | -- | -0.22 | 5.49 | 15.1 | 8.1 |

| | | | | | | | | | |
|-------|------|------|-------------|------|-----|-------|-------|------|------|
| -- | 1920 | -- | -- | -- | -- | -0.34 | 10.17 | 15.7 | 11.7 |
| -- | 1919 | -- | -- | -- | -- | -0.19 | 1.57 | 14.4 | 10.8 |
| -- | 1918 | -- | -- | -- | -- | -0.26 | 0.96 | 15.7 | 10.9 |
| -- | 1917 | -- | -- | -- | -- | -0.28 | -6.68 | 15.0 | 11.5 |
| -- | 1916 | -- | -- | -- | -- | -0.08 | 1.36 | 14.6 | 11.4 |
| -- | 1915 | -- | -- | -- | -- | 0.09 | 2.22 | 15.4 | 9.6 |
| -- | 1914 | -- | -- | -- | -- | -0.29 | 5.98 | 18.2 | 9.9 |
| 33.50 | 1913 | 0.16 | <i>n.d.</i> | 0.16 | 2.5 | -0.39 | 8.75 | 16.1 | 11.0 |
| -- | 1912 | -- | -- | -- | -- | -0.23 | 4.16 | 16.9 | 11.1 |
| -- | 1911 | -- | -- | -- | -- | -0.21 | 1.37 | 15.8 | 10.0 |
| -- | 1910 | -- | -- | -- | -- | -0.25 | 6.49 | 15.2 | 10.5 |
| -- | 1909 | -- | -- | -- | -- | -0.14 | 0.66 | 14.7 | 10.0 |
| -- | 1908 | -- | -- | -- | -- | -0.13 | 4.54 | 15.8 | 9.8 |
| -- | 1907 | -- | -- | -- | -- | -0.23 | 5.24 | 13.3 | 10.4 |
| -- | 1906 | -- | -- | -- | -- | -0.07 | 5.50 | 15.9 | 10.8 |
| -- | 1905 | -- | -- | -- | -- | -0.20 | 7.01 | 16.6 | 11.1 |
| 34.50 | 1904 | 0.09 | <i>n.d.</i> | 0.09 | 2.4 | -0.35 | 1.66 | 13.9 | 11.6 |
| -- | 1903 | -- | -- | -- | -- | -0.19 | 11.46 | 14.4 | 12.1 |
| -- | 1902 | -- | -- | -- | -- | -0.10 | -0.87 | 14.2 | 10.2 |
| -- | 1901 | -- | -- | -- | -- | 0.09 | 0.99 | 16.0 | 9.5 |
| -- | 1900 | -- | -- | -- | -- | 0.10 | -4.97 | 15.6 | 9.2 |
| -- | 1899 | -- | -- | -- | -- | 0.13 | 2.15 | 16.2 | 10.0 |
| 35.50 | 1898 | 0.04 | <i>n.d.</i> | 0.04 | 2.4 | 0.08 | 2.89 | 15.1 | 9.4 |
| -- | 1897 | -- | -- | -- | -- | 0.11 | 5.13 | 15.7 | 9.0 |
| -- | 1896 | -- | -- | -- | -- | 0.11 | 3.51 | 16.9 | 9.2 |
| -- | 1895 | -- | -- | -- | -- | -0.09 | -6.08 | 15.3 | 9.9 |
| -- | 1894 | -- | -- | -- | -- | -0.24 | 8.33 | 15.6 | 9.2 |
| 36.50 | 1893 | 0.08 | <i>n.d.</i> | 0.08 | 2.3 | 0.00 | -0.16 | 15.5 | 10.2 |
| -- | 1892 | -- | -- | -- | -- | -0.09 | -1.65 | 15.0 | 10.1 |
| -- | 1891 | -- | -- | -- | -- | 0.04 | -0.84 | 16.0 | 8.8 |
| -- | 1890 | -- | -- | -- | -- | -0.14 | 5.75 | 15.3 | 8.7 |
| 37.50 | 1889 | 0.04 | <i>n.d.</i> | 0.04 | 2.4 | 0.20 | 1.81 | 15.5 | 9.2 |
| -- | 1888 | -- | -- | -- | -- | 0.20 | -5.16 | 14.0 | 10.7 |

| | | | | | | | | | |
|-------|------|------|-------------|------|-----|-------|-------|------|------|
| -- | 1887 | -- | -- | -- | -- | 0.12 | 3.20 | 15.1 | 9.4 |
| -- | 1886 | -- | -- | -- | -- | 0.13 | -1.27 | 15.8 | 8.9 |
| -- | 1885 | -- | -- | -- | -- | -0.02 | 0.17 | 15.8 | 9.0 |
| 38.50 | 1884 | 0.04 | <i>n.d.</i> | 0.04 | 2.5 | -0.07 | 5.90 | 16.7 | 7.9 |
| -- | 1883 | -- | -- | -- | -- | -0.03 | 1.19 | 15.9 | 9.3 |
| -- | 1882 | -- | -- | -- | -- | -0.02 | 12.65 | 16.7 | 9.1 |
| -- | 1881 | -- | -- | -- | -- | 0.05 | -5.21 | 14.8 | 9.9 |
| 39.50 | 1880 | 0.12 | <i>n.d.</i> | 0.12 | 2.5 | 0.07 | 2.98 | 15.8 | 8.1 |
| -- | 1879 | -- | -- | -- | -- | 0.13 | -3.25 | 15.3 | 9.8 |
| -- | 1878 | -- | -- | -- | -- | 0.46 | 5.53 | 15.7 | 8.9 |
| -- | 1877 | -- | -- | -- | -- | 0.25 | 2.77 | 14.6 | 10.0 |
| 40.50 | 1876 | 0.09 | <i>n.d.</i> | 0.09 | 2.5 | -0.02 | 1.64 | 15.5 | 8.5 |
| -- | 1875 | -- | -- | -- | -- | 0.04 | -2.14 | 16.5 | 8.0 |
| -- | 1874 | -- | -- | -- | -- | -0.01 | 7.11 | 15.3 | 8.8 |
| -- | 1873 | -- | -- | -- | -- | 0.05 | 1.00 | 15.6 | 8.8 |
| -- | 1872 | -- | -- | -- | -- | 0.10 | 0.22 | 16.3 | 8.4 |
| 41.50 | 1871 | 0.12 | <i>n.d.</i> | 0.12 | 2.5 | 0.04 | 0.01 | 14.6 | 8.6 |
| -- | 1870 | -- | -- | -- | -- | 0.03 | -4.42 | 15.5 | 7.9 |
| -- | 1869 | -- | -- | -- | -- | 0.10 | 7.25 | -- | 9.3 |
| -- | 1868 | -- | -- | -- | -- | 0.16 | 7.80 | -- | 7.9 |
| 42.50 | 1867 | 0.21 | <i>n.d.</i> | 0.21 | 2.4 | 0.15 | 0.57 | -- | 9.2 |
| -- | 1866 | -- | -- | -- | -- | 0.21 | 3.23 | -- | 9.0 |
| -- | 1865 | -- | -- | -- | -- | 0.18 | -2.07 | -- | 8.4 |
| -- | 1864 | -- | -- | -- | -- | 0.07 | 2.15 | -- | 8.1 |
| -- | 1863 | -- | -- | -- | -- | -0.11 | 9.02 | -- | 8.3 |
| -- | 1862 | -- | -- | -- | -- | -0.19 | -3.86 | -- | 7.9 |
| -- | 1861 | -- | -- | -- | -- | 0.19 | 0.16 | -- | 8.2 |
| -- | 1860 | -- | -- | -- | -- | 0.09 | 1.63 | -- | 8.6 |

n.d. = not detected

Table S6. Correlation coefficients (r) and p values (in italic). r values are in bold for $p < 0.05$.

| | AMO | winter NAO | summer HadISST | P input | 6+7Me-C _{17:0} |
|-------------------------|--------------|-------------|----------------|-------------|-------------------------|
| AMO | | <i>0.03</i> | <i>0.00</i> | <i>0.01</i> | <i>0.01</i> |
| winter NAO | -0.25 | | <i>0.13</i> | <i>0.76</i> | <i>0.43</i> |
| summer HadISST | 0.38 | 0.18 | | <i>0.01</i> | <i>0.04</i> |
| P input | -0.30 | -0.04 | -0.30 | | <i>0.47</i> |
| 6+7Me-C _{17:0} | 0.30 | 0.10 | 0.25 | -0.09 | |

Table S7. Core POS435/10 data.

| Depth (cm) | Age (yr cal. BP) | 7Me-C _{17:0} (µg/gTOC) | 6Me-C _{17:0} (µg/gTOC) | 6+7Me-C _{17:0} (µg/gTOC) |
|------------|------------------|---------------------------------|---------------------------------|-----------------------------------|
| 0.25 | -61.8 | 0.90 | 0.30 | 1.18 |
| 32.5 | -40.9 | 0.22 | 0.04 | 0.27 |
| 58.5 | -0.6 | 1.10 | 0.30 | 1.41 |
| 85 | 50.0 | 0.24 | 0.03 | 0.27 |
| 115 | 130.1 | 0.50 | 0.20 | 0.69 |
| 145 | 210.1 | 1.19 | 0.19 | 1.38 |
| 175 | 290.2 | 0.70 | 0.20 | 0.92 |
| 205 | 370.3 | 1.96 | 0.35 | 2.31 |
| 260 | 533.5 | 0.64 | 0.23 | 0.87 |
| 310 | 717.0 | 0.20 | 0.04 | 0.24 |
| 340 | 827.1 | 0.28 | 0.07 | 0.36 |
| 410 | 1083.9 | 0.48 | 0.10 | 0.58 |
| 465 | 1285.7 | 1.05 | 0.25 | 1.30 |
| 500 | 1414.2 | 0.30 | 0.11 | 0.41 |
| 520 | 1515.3 | 0.18 | 0.04 | 0.20 |
| 540 | 1617.2 | 1.00 | 0.26 | 1.26 |
| 560 | 1719.0 | 0.66 | 0.19 | 0.86 |
| 580 | 1820.9 | 1.17 | 0.33 | 1.50 |
| 600 | 1922.7 | 0.17 | 0.03 | 0.18 |
| 610 | 1977.4 | 0.40 | 0.10 | 0.49 |
| 620 | 2053.1 | 0.23 | 0.06 | 0.25 |
| 640 | 2204.7 | 1.57 | 0.36 | 1.93 |
| 650 | 2280.5 | 1.87 | 0.65 | 2.52 |
| 660 | 2466.8 | 2.60 | 0.60 | 3.20 |
| 670 | 2642.3 | 1.82 | 0.49 | 2.30 |
| 680 | 2817.8 | 0.20 | 0.05 | 0.28 |
| 707 | 3291.6 | 0.13 | 0.02 | 0.15 |
| 731 | 3733.3 | 0.12 | 0.03 | 0.14 |
| 739 | 3884.0 | 0.13 | 0.05 | 0.25 |
| 747 | 4034.7 | 0.69 | 0.17 | 0.86 |

| | | | | |
|-------|--------|--------|-------|--------|
| 759 | 4395.9 | 1.94 | 0.45 | 2.39 |
| 771 | 4824.8 | 0.30 | 0.08 | 0.41 |
| 783 | 5253.7 | 0.14 | 0.05 | 0.23 |
| 791 | 5539.7 | 0.14 | 0.05 | 0.18 |
| 803 | 5833.1 | 0.29 | 0.09 | 0.38 |
| 811 | 5922.0 | 0.12 | 0.05 | 0.17 |
| 817 | 5988.7 | 0.20 | 0.07 | 0.24 |
| 833 | 6166.4 | 9.50 | 3.00 | 12.50 |
| 839 | 6230.2 | 17.20 | 4.00 | 21.20 |
| 847 | 6296.1 | 61.30 | 15.57 | 76.87 |
| 863 | 6529.2 | 51.14 | 10.98 | 62.12 |
| 871 | 6662.6 | 218.19 | 62.74 | 280.93 |
| 879 | 6808.6 | 220.00 | 66.60 | 286.56 |
| 893.5 | 7080.8 | 0.24 | 0.05 | 0.29 |
| 905.5 | 7306.0 | 0.30 | 0.06 | 0.41 |