

## **Daniel M. Sigman – Publications**

### **2024:**

1. Moretti, S., Auderset, A., Deutsch, C., Schmitz, R., Gerber, L., Thomas, E., Luciani, V., Petrizzo, M.R., Schiebel, R., Tripathi, A., Sexton, P., Norris, R., D'Onofrio, R., Zachos, J., **Sigman, D.M.**, Haug, G.H & Martínez-García, A. Oxygen rise in the tropical upper ocean during the Paleocene-Eocene Thermal Maximum (2024) *Science*, 383, 6684, pp. 727-731.
2. Ai, X.E., Thöle, L.M., Auderset, A., Schmitt, M., Moretti, S., Studer, A.S., Michel, E., Wegmann, M., Mazaud, A., Bijl, P.K., **Sigman, D.M.**, Martínez-García, A. & Jaccard, S.L. The southward migration of the Antarctic Circumpolar Current enhanced oceanic degassing of carbon dioxide during the last two deglaciations (2024) *Communications Earth & Environment*, 5, p. 58.
3. Comans, C.M., Smart, S. M., Kast, E.R., Lu, Y., Lüdecke, T., Leichliter, J.N., **Sigman, D.M.**, Ikejiri, T. & Martínez-García, A. Enameloid-bound  $\delta^{15}\text{N}$  reveals large trophic separation among Late Cretaceous sharks in the northern Gulf of Mexico (2024) *Geobiology*, 22. doi: 10.1111/gbi.12585
4. **Sigman, D.M.** & Hain, M.P. Ocean Oxygen, Performed Nutrients, and the Cause of the Lower Carbon Dioxide Concentration in the Atmosphere of the Last Glacial Maximum (2024) *Paleoceanography and Paleoclimatology* 39. doi: 10.1029/2023pa004775
5. Choisnard, N., Duprey, N.N., Wald, T., Thibault, M., Houlbrèque, F., Foreman, A.D., Cuet, P., Guillaume, M.M.M., Vonhof, H., **Sigman, D.M.**, Haug, G.H., Maguer, J.-F., L'Helguen, S., Martínez-García, A. & Lorrain, A. Tracing the fate of seabird-derived nitrogen in a coral reef using nitrate and coral skeleton nitrogen isotopes (2024) *Limnology and Oceanography*. doi: 10.1002/lno.12485.

### **2023**

6. Fripiat, F., **Sigman, D.M.**, Martínez-García, A., Marconi, D., Ai, X.E., Auderset, A., Fawcett, S.E., Moretti, S., Studer, A.S. & Haug, G.H. The impact of incomplete nutrient consumption in the Southern Ocean on global mean ocean nitrate  $\delta^{15}\text{N}$  (2023) *Global Biogeochemical Cycles* 37. doi: 10.1029/2022GB007442
7. Marshall, T.A., Beal, L., **Sigman, D.M.** & Fawcett, S.E. Instabilities across the Agulhas Current enhance upward nitrate supply in the southwest subtropical Indian Ocean (2023) *American Geophysical Union Advances* 4. doi: 10.1029/2023AV000973
8. Hess, A.V., Auderset, A., Rosenthal, Y., Miller, K.G., Zhou, X., **Sigman, D.M.** & Martínez-García, A. A well-oxygenated eastern tropical Pacific during the warm Miocene (2023) *Nature* 619, pp.521-525. doi: 10.1038/s41586-023-06104-6

9. Leichliter, J.N., Lüdecke, T., Foreman, A.D., Bourgon, N., Duprey, N.N., Vonhof, H., Souksavatdy, V., Bacon, A.-M., **Sigman, D.M.**, Tütken, T. & Martínez-García, A. Tooth enamel nitrogen isotope composition records trophic position: a tool for reconstructing food webs (2023) *Communications Biology* 6, 373. doi: 10.1038/s42003-023-04744-y
  10. Marshall, T.A., **Sigman, D.M.**, Beal, L.M., Foreman, A., Martínez-García, A., Blain, S., Campbell, E., Fripiat, F., Granger, R., Harris, E., Haug, G.H., Marconi, D., Oleynik, S., Rafter, P.A., Roman, R., Sinyanya, K., Smart, S.M. & Fawcett, S.E. The Agulhas Current Transports Signals of Local and Remote Indian Ocean Nitrogen Cycling (2023) *Journal of Geophysical Research: Oceans* 128. doi: 10.1029/2022JC019413
  11. Farmer, J.R., Pico, T., Underwood, O.M., Stout, R.C., Granger, J., Cronin, T.M., Fripiat, F., Martínez-García, A., Haug, G.H. & **Sigman, D.M.** The Bering Strait was flooded 10,000 years before the Last Glacial Maximum (2023) *Proceedings of the National Academy of Sciences*, 120, e2206742119. doi: 10.1073/pnas.2206742119
  12. Straub, M., Auderset, A., Leval, L. de, Piazzon, N., Maison, D., Vozenin, M.-C., Ollivier, J., Petit, B., **Sigman, D.M.** & Martínez-García, A. Nitrogen isotopic composition as a gauge of tumor cell anabolism-to-catabolism ratio (2023) *Scientific Reports*, 13, 19796. doi: 10.1038/s41598-023-45597-z
- 2022:**
13. Martínez-García, A., Jung, J., Ai, X.E., **Sigman, D.M.**, Auderset, A., Duprey, N.N., Foreman, A., Fripiat, F., Leichliter, J., Lüdecke, T., Moretti, S. & Wald, T. Laboratory assessment of the impact of chemical oxidation, mineral dissolution, and heating on the Nitrogen isotopic composition of fossil-bound organic matter. (2022) *Geochemistry, Geophysics, Geosystems*, 23. doi: 10.1029/2022GC010396
  14. Lüdecke, T., Leichliter, J.N., Aldeias, V., Bamford, M.K., Biro, D., Braun, D.R., Capelli, C., Cybulski, J.D., Duprey, N.N., Silva, M.J.F. da, Foreman, A.D., Habermann, J.M., Haug, G.H., Martínez, F.I., Mathe, J., Mulch, A., **Sigman, D.M.**, Vonhof, H., Bobe, R., Carvalho, S. & Martínez-García, A. Carbon, nitrogen, and oxygen stable isotopes in modern tooth enamel: A case study from Gorongosa National Park, central Mozambique (2022) *Frontiers in Ecology and Evolution*. 10, 958032. doi: 10.3389/fevo.2022.958032
  15. Marshall, T., Granger, J., Casciotti, K.L., Dähnke, K., Emeis, K.-C., Marconi, D., McIlvin, M.R., Noble, A.E., Saito, M.A., **Sigman, D.M.** & Fawcett, S.E. The Angola Gyre is a hotspot of dinitrogen fixation in the South Atlantic Ocean (2022) *Communications Earth & Environment*. 3, 151. doi: 10.1038/s43247-022-00474-x
  16. Wang, X.T., Wang, Y., Auderset, A., **Sigman, D.M.**, Ren, H., Martínez-García, A., Haug, G.H., Su, Z., Zhang, Y.G., Rasmussen, B., Sessions, A.L. & Fischer, W.W.

Oceanic nutrient rise and the late Miocene inception of Pacific oxygen-deficient zones (2022) *Proceedings of the National Academy of Sciences*. 119, e2204986119. doi: 10.1073/pnas.2204986119

17. Lueders-Dumont, J.A., Forden, A.G., Kast, E.R., Mohan, J.A., Walther, B.D., **Sigman, D.M.**, Ward, B.B. Controls on the nitrogen isotopic composition of fish otolith organic matter: Lessons from a controlled diet switch experiment (2022) *Geochimica et Cosmochimica Acta*, 316, pp. 69-86. doi: 10.1016/j.gca.2021.09.030
18. Kast, E.R., Griffiths, M.L., Kim, S.L., Rao, Z.C., Shimada, K., Becker, M.A., Maisch, H.M., Eagle, R.A., Clarke, C.A., Neumann, A.N., Karnes, M.E., Lüdecke, T., Leichter, J.N., Martínez-García, A., Akhtar, A.A., Wang, X.T., Haug, G.H. & **Sigman, D.M.** Cenozoic megatooth sharks occupied extremely high trophic positions (2022) *Science Advances*, 8, eabl6529. doi: 10.1126/sciadv.abl6529
19. Auderset, A., Moretti, S., Taphorn, B., Ebner, P.-R., Kast, E., Wang, X.T., Schiebel, R., **Sigman D.M.**, Haug, G.H. & Martínez-García, A. Enhanced ocean oxygenation during Cenozoic warm periods (2022) *Nature*, 609, pp.77-82. doi: 10.1038/s41586-022-05017-0

**2021:**

20. Straub, M., **Sigman, D.M.**, Auderset, A., Ollivier, J., Petit, B., Hinnenberg, B., Rubach, F., Oleynik, S., Vozenin, M.-C., Martínez-García, A. Distinct nitrogen isotopic compositions of healthy and cancerous tissue in mice brain and head&neck micro-biopsies (2021) *BMC Cancer*, 21 (1), art. no. 805. doi: 10.1186/s12885-021-08489-x
21. Fripiat, F., Martínez-García, A., Marconi, D., Fawcett, S.E., Kopf, S.H., Luu, V.H., Rafter, P.A., Zhang, R., **Sigman, D.M.**, Haug, G.H. Nitrogen isotopic constraints on nutrient transport to the upper ocean (2021) *Nature Geoscience*, 14 (11), pp. 855-861. doi: 10.1038/s41561-021-00836-8
22. Farmer, J.R., **Sigman, D.M.**, Granger, J., Underwood, O.M., Fripiat, F., Cronin, T.M., Martínez-García, A., Haug, G.H. Arctic Ocean stratification set by sea level and freshwater inputs since the last ice age (2021) *Nature Geoscience*, 14 (9), pp. 684-689. doi: 10.1038/s41561-021-00789-y
23. Swart, K.A., Oleynik, S., Martínez-García, A., Haug, G.H., **Sigman, D.M.** Correlation between the carbon isotopic composition of planktonic foraminifera-bound organic matter and surface water pCO<sub>2</sub> across the equatorial Pacific (2021) *Geochimica et Cosmochimica Acta*, 306, pp. 281-303. doi: 10.1016/j.gca.2021.03.007
24. Studer, A.S., Mekik, F., Ren, H., Hain, M.P., Oleynik, S., Martínez-García, A., Haug, G.H., **Sigman, D.M.** Ice Age-Holocene Similarity of Foraminifera-Bound

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*Paleoceanography and Paleoclimatology*, 36 (5), art. no. e2020PA004063. doi:  
 10.1029/2020PA004063

25. Leichter, J.N., Lüdecke, T., Foreman, A.D., Duprey, N.N., Winkler, D.E., Kast, E.R., Vonhof, H., **Sigman, D.M.**, Haug, G.H., Clauss, M., Tütken, T., Martínez-García, A. Nitrogen isotopes in tooth enamel record diet and trophic level enrichment: Results from a controlled feeding experiment (2021) *Chemical Geology*, 563, art. no. 120047. doi: 10.1016/j.chemgeo.2020.120047
  26. **Sigman, D.M.**, Fripiat, F., Studer, A.S., Kemeny, P.C., Martínez-García, A., Hain, M.P., Ai, X., Wang, X., Ren, H., Haug, G.H. The Southern Ocean during the ice ages: A review of the Antarctic surface isolation hypothesis, with comparison to the North Pacific (2021) *Quaternary Science Reviews*, 254, art. no. 106732. doi: 10.1016/j.quascirev.2020.106732
- 2020:**
27. Ai, X.E., Studer, A.S., **Sigman, D.M.**, Martínez-García, A., Fripiat, F., Thöle, L.M., Michel, E., Gottschalk, J., Arnold, L., Moretti, S., Schmitt, M., Oleynik, S., Jaccard, S.L., Haug, G.H. Southern Ocean upwelling, Earth's obliquity, and glacial-interglacial atmospheric CO<sub>2</sub> change (2020) *Science*, 370 (6522), pp. 1348-1352. doi: 10.1126/science.abd2115
  28. Zhang, R., Wang, X.T., Ren, H., Huang, J., Chen, M., **Sigman, D.M.** Dissolved Organic Nitrogen Cycling in the South China Sea from an Isotopic Perspective (2020) *Global Biogeochemical Cycles*, 34 (12), art. no. e2020GB006551. doi: 10.1029/2020GB006551
  29. Zhang, X., Ward, B.B., **Sigman, D.M.** Erratum: Global nitrogen cycle: Critical enzymes, organisms, and processes for nitrogen budgets and dynamics (Chemical Reviews (2020) 120:12 (5308-5351) DOI: 10.1021/acs.chemrev.9b00613) (2020) *Chemical Reviews*, 120 (17), p. 9834. doi: 10.1021/acs.chemrev.0c00743
  30. Zhang, X., Zhang, X., Ward, B.B., Ward, B.B., **Sigman, D.M.** Global Nitrogen Cycle: Critical Enzymes, Organisms, and Processes for Nitrogen Budgets and Dynamics (2020) *Chemical Reviews*, 120 (12), pp. 5308-5351. doi: 10.1021/acs.chemrev.9b00613
  31. Duprey, N.N., Wang, T.X., Kim, T., Cybulski, J.D., Vonhof, H.B., Crutzen, P.J., Haug, G.H., **Sigman, D.M.**, Martínez-García, A., Baker, D.M. Megacity development and the demise of coastal coral communities: Evidence from coral skeleton  $\delta^{15}\text{N}$  records in the Pearl River estuary (2020) *Global Change Biology*, 26 (3), pp. 1338-1353. doi: 10.1111/gcb.14923
  32. Smart, S.M., Fawcett, S.E., Ren, H., Schiebel, R., Tompkins, E.M., Martínez-García, A., Stirnimann, L., Roychoudhury, A., Haug, G.H., **Sigman, D.M.** The Nitrogen

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33. Sims, Z.C., Cohen, A.L., Luu, V.H., Wang, X.T., **Sigman, D.M.** Uptake of groundwater nitrogen by a near-shore coral reef community on Bermuda (2020) *Coral Reefs*, 39 (1), pp. 215-228. doi: 10.1007/s00338-019-01879-5
34. Lueders-Dumont, J.A., **Sigman, D.M.**, Johnson, B.J., Jensen, O.P., Oleynik, S., Ward, B.B. Comparison of the isotopic composition of fish otolith-bound organic N with host tissue (2020) *Canadian Journal of Fisheries and Aquatic Sciences*, 77 (2), pp. 264-275. doi: 10.1139/cjfas-2018-0360

### **2019:**

35. Auderset, A., Martínez-García, A., Tiedemann, R., Hasenfratz, A.P., Eglinton, T.I., Schiebel, R., **Sigman, D.M.**, Haug, G.H. Gulf Stream intensification after the early Pliocene shoaling of the Central American Seaway (2019) *Earth and Planetary Science Letters*, 520, pp. 268-278. doi: 10.1016/j.epsl.2019.05.022
36. Marconi, D., Weigand, M.A., **Sigman, D.M.** Nitrate isotopic gradients in the North Atlantic Ocean and the nitrogen isotopic composition of sinking organic matter (2019) *Deep-Sea Research Part I: Oceanographic Research Papers*, 145, pp. 109-124. doi: 10.1016/j.dsr.2019.01.010
37. Fripiat, F., Martínez-García, A., Fawcett, S.E., Kemeny, P.C., Studer, A.S., Smart, S.M., Rubach, F., Oleynik, S., **Sigman, D.M.**, Haug, G.H. The isotope effect of nitrate assimilation in the Antarctic Zone: Improved estimates and paleoceanographic implications (2019) *Geochimica et Cosmochimica Acta*, 247, pp. 261-279. doi: 10.1016/j.gca.2018.12.003
38. **Sigman, D.M.**, Fripiat, F. Nitrogen isotopes in the ocean (2019) *Encyclopedia of Ocean Sciences*, pp. 263-278. doi: 10.1016/B978-0-12-409548-9.11605-7
39. Kast, E.R., Stolper, D.A., Auderset, A., Higgins, J.A., Ren, H., Wang, X.T., Martínez-García, A., Haug, G.H., **Sigman, D.M.** Nitrogen isotope evidence for expanded ocean suboxia in the early Cenozoic (2019) *Science*, 364 (6438), pp. 386-389. doi: 10.1126/science.aau5784
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cellular and released fixed nitrogen in *Azotobacter vinelandii* (2019) *Geochimica et Cosmochimica Acta*, 244, pp. 12-23. doi: 10.1016/j.gca.2018.09.023

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45. Wang, X. T., A. L. Cohen, V. Luu, H. Ren, Z. Su, G.H. Haug, **D. M. Sigman**. Natural forcing of the North Atlantic nitrogen cycle in the Anthropocene. *Proceedings of the National Academy of Sciences*. (2018) doi: 10.1073/pnas.1801049115
46. Granger, J., **D.M. Sigman**, J. Gagnon, J.- E. Tremblay and A. Mucci, On the Properties of the Arctic halocline and deep water masses of the Canada Basin from nitrate isotope ratios. *Journal of Geophysical Research: Oceans*. (2018) doi:10.1029/2018JC014110
47. Peng, X., S. E. Fawcett, N. van Oostende, M. J. Wolf, D. Marconi, **D.M. Sigman**, B. B. Ward, Nitrogen uptake and nitrification in the subarctic North Atlantic Ocean. *Limnology and Oceanography*, 63, 1462-1487. (2018) doi:10.1002/lno.10784
48. Studer, A. S., **D.M. Sigman**, A. Martinez-Garcia, L. M. Thole, E. Michel, S.L. Jaccard, Jorg A. Lippold, Alain Mazaud, X.T. Wang, L. F. Robinson, J. F. Adkins and G. H. Haug. Increased nutrient supply to the Southern Ocean during the Holocene and its implications for the pre-industrial atmospheric CO<sub>2</sub> rise. *Nature Geoscience* (2018) doi:10.1038/s41561-018-0191-8
49. Smart, Sandi M., H. Ren, S. E. Fawcett, R. Schiebel, M. Conte, P.A. Rafter, K. K. Ellis, M. A. Weigand, S. Oleynik, G. H. Haug, **D. M. Sigman**. Ground-truthing the planktic foraminifer-bound nitrogen isotope paleo-proxy in the Sargasso Sea. *Geochimica et Cosmochimica Acta*, 235, 463-482. (2018)

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doi:10.1038/s41467-017-01219-7
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54. Marconi, D., **D.M. Sigman**, K. L. Casciotti, E. C. Campbell, M. A. Weigand, S. E. Fawcett, A. N. Knapp, P. A. Rafter, B. B. Ward and G. H. Haug. Tropical Dominance of N<sub>2</sub> Fixation in the North Atlantic Ocean. *Global Biogeochemical Cycles*, 31 (10), 1608-1623. (2017) doi:10.1002/2016GB005613
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