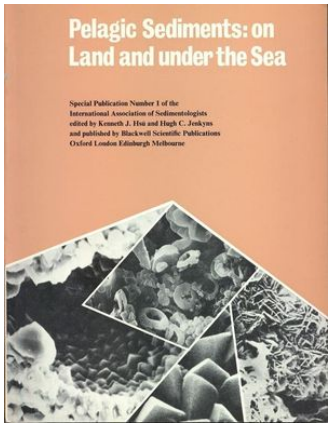
IAS Special Publications

Examples:

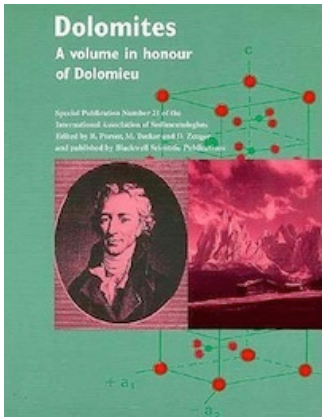
Volume 1 in 1974:



Pelagic Sediments:
On Land and under the Sea

Editors:
K.J. Hsü, H.C. Jenkyns

Volume 21 in 1994:



Dolomites: A Volume in Honour of Dolomieu

Editors:
B.H. Purser, M.E. Tucker, D.H. Zenger

New volume:

Nucleation and growth of sedimentary minerals

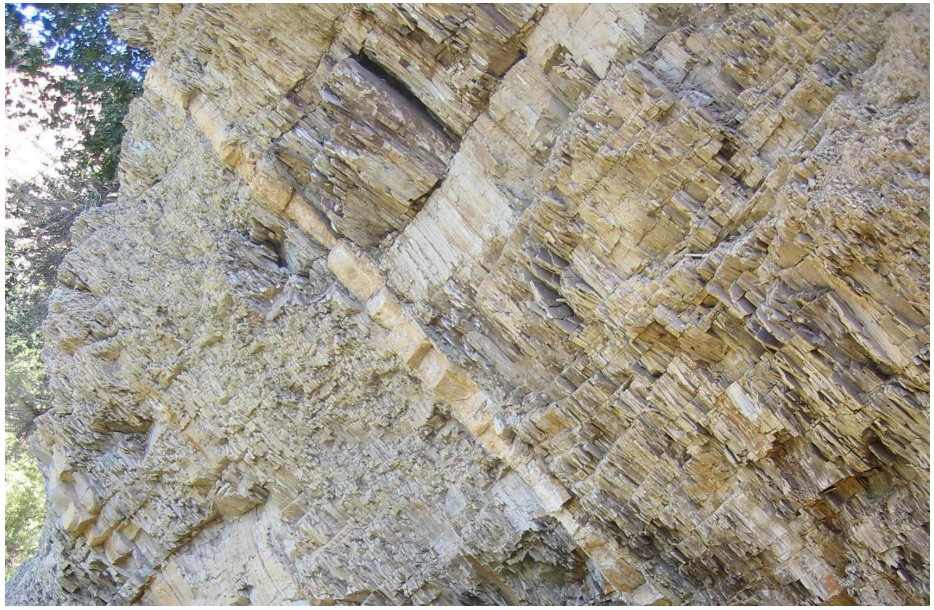
Guest Editors: Patrick Meister
Cornelius Fischer
Nereo Preto

The goal of this volume will be to integrate new theoretical concepts with ongoing processes of sedimentary mineral formation (which includes early diagenetic minerals) in modern environments and with observations from the geological record. The volume will particularly emphasize a process oriented and quantitative view.

We believe this topic is novel and timely to be disseminated among a broad sedimentology (sedimentary geology) audience, for which other more specialized mineralogical literature is not easily accessible. The volume is partially an outcome of a series of sessions on mineral nucleation and growth at the EGU conferences 2014-2020, with the goal to provide this link between the fields of mineralogy and sedimentology.

The carbon isotope record of the sub-seafloor biosphere

Patrick Meister & Carolina Reyes



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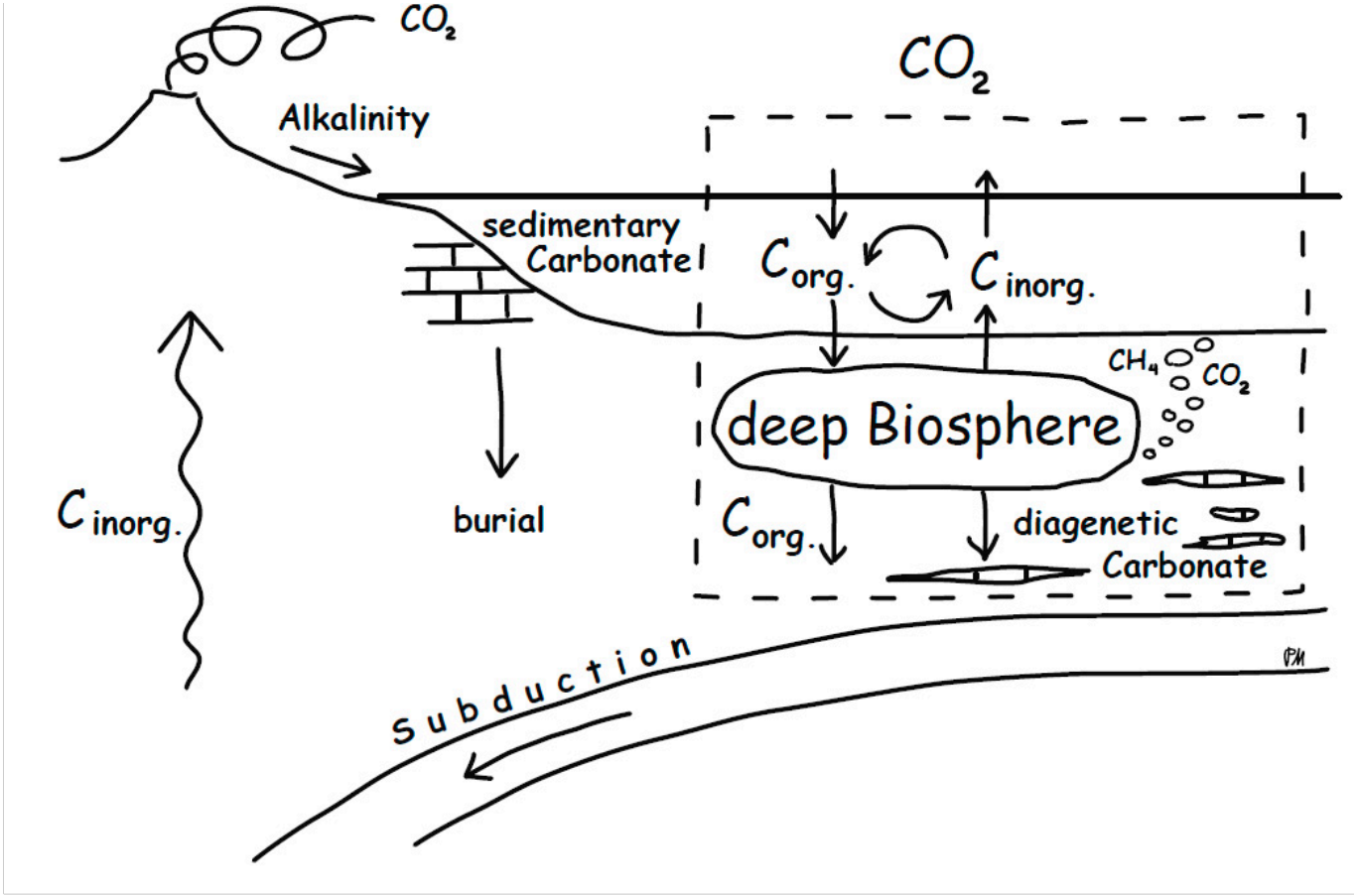
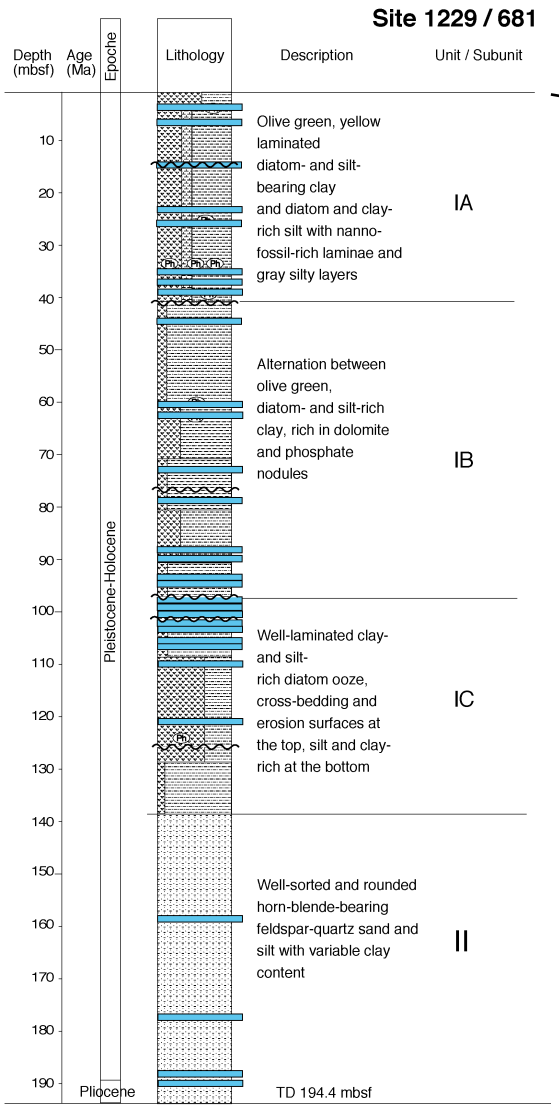
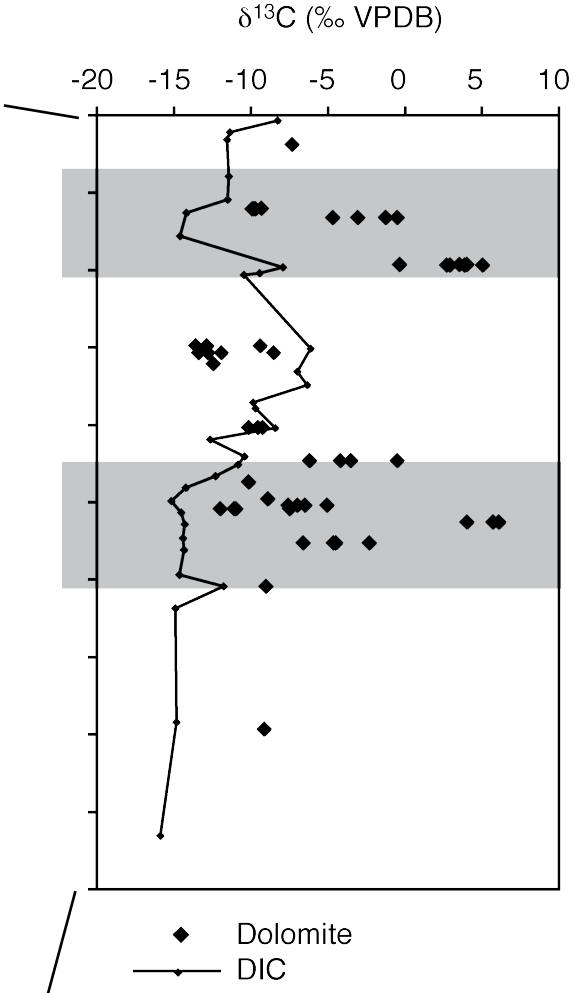
Diagenetic carbonate affects the global carbon cycle



Meister, P. and Reyes, C. (2019) The carbon-isotope record of the sub-seafloor biosphere. In: "*Tracking the Deep Biosphere through Time*" (Eds. H. Drake, M. Ivarsson, C. Heim), *Geosciences* 9, 507, 1-25.
https://doi:10.3390/geosciences9120507

Diagenetic carbonates as archive of past deep biosphere

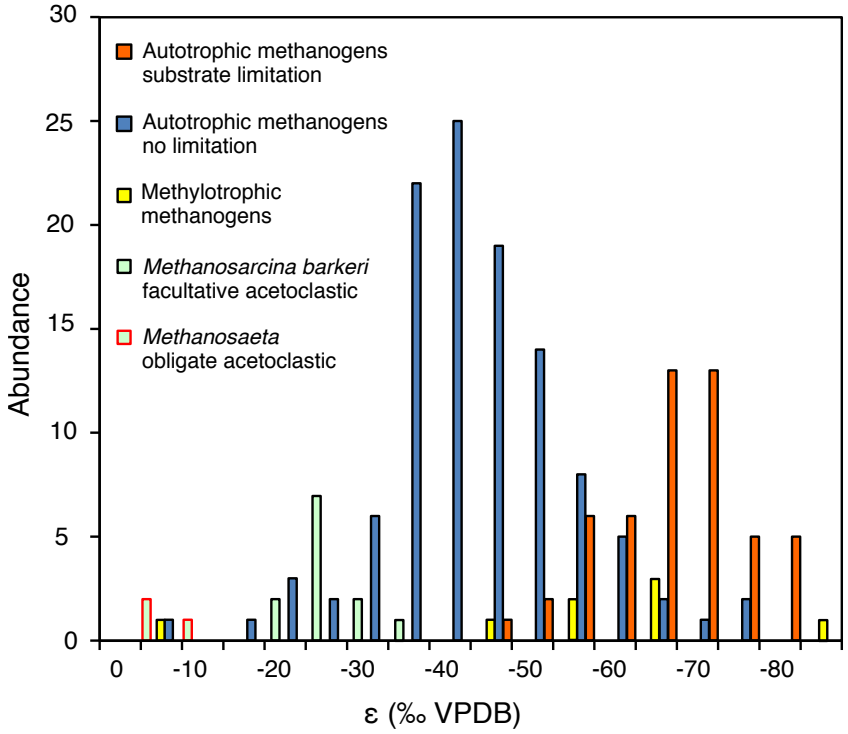


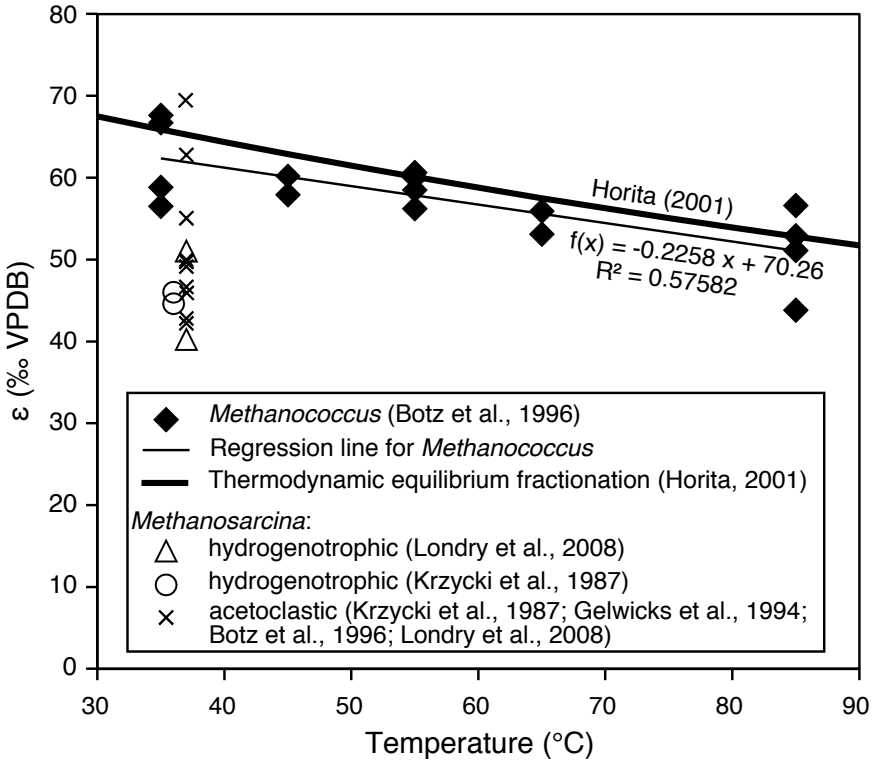


Data from Peru Margin ODP Site 1230 show strongly varying carbon isotope values through a 200 m thick interval.

Meister et al. (2007)

Carbon-isotope fractionation during methane metabolism



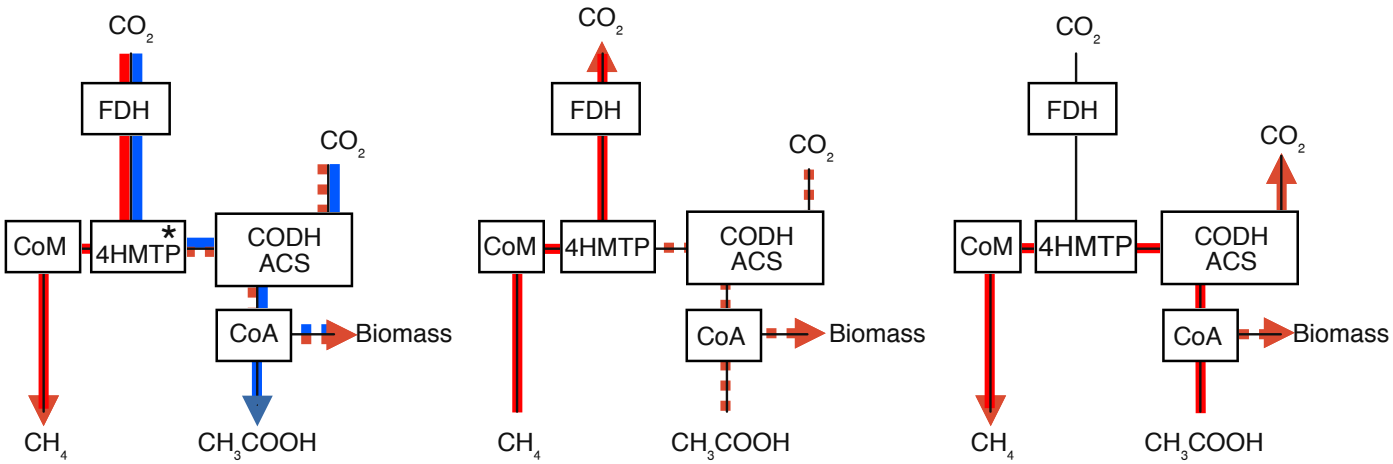


Different archaeal cultures reported in the literature showed different fractionation factors. Using strong substrate limitation in a reactor, Botz et al. (1996) could find a temperature-dependent fractionation effect that matches the inorganic fractionation effect of Horita (2001).

Horita (2001): Carbon isotope exchange was investigated for the system CO_2-CH_4 at 150 to 600°C in the presence of several potential catalysts.

Meister, P. and Reyes, C. (2019) The carbon-isotope record of the sub-seafloor biosphere. In: "*Tracking the Deep Biosphere through Time*" (Eds. H. Drake, M. Ivarsson, C. Heim), *Geosciences* 9, 507, 1-25.
https://doi:10.3390/geosciences9120507

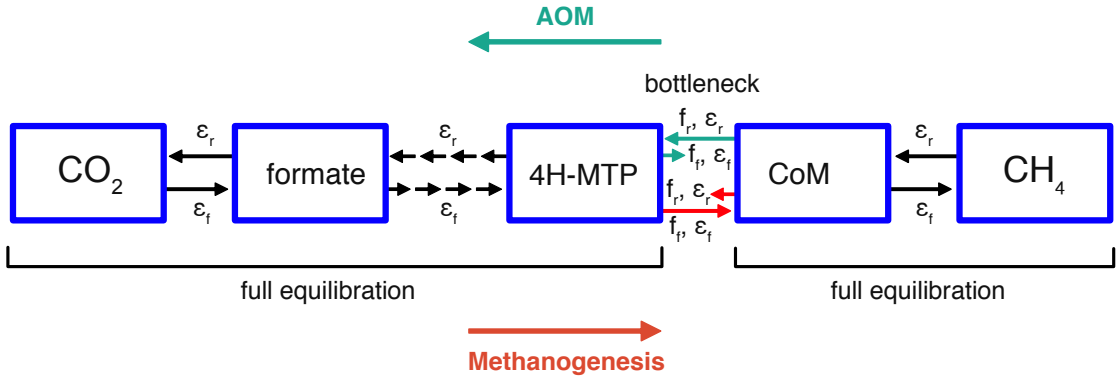
Different routes through the Wood-Ljungdahl pathway:



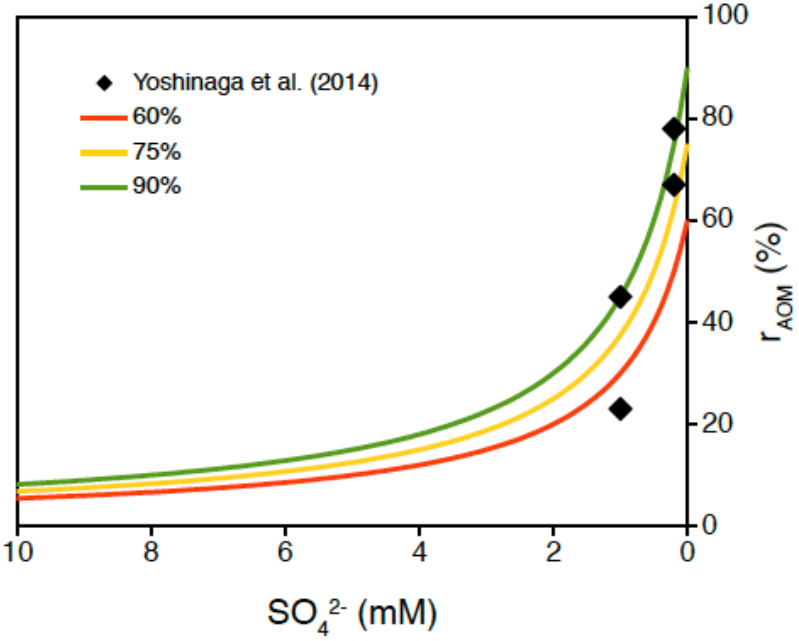
* In Bacteria: Tetrahydrofolate

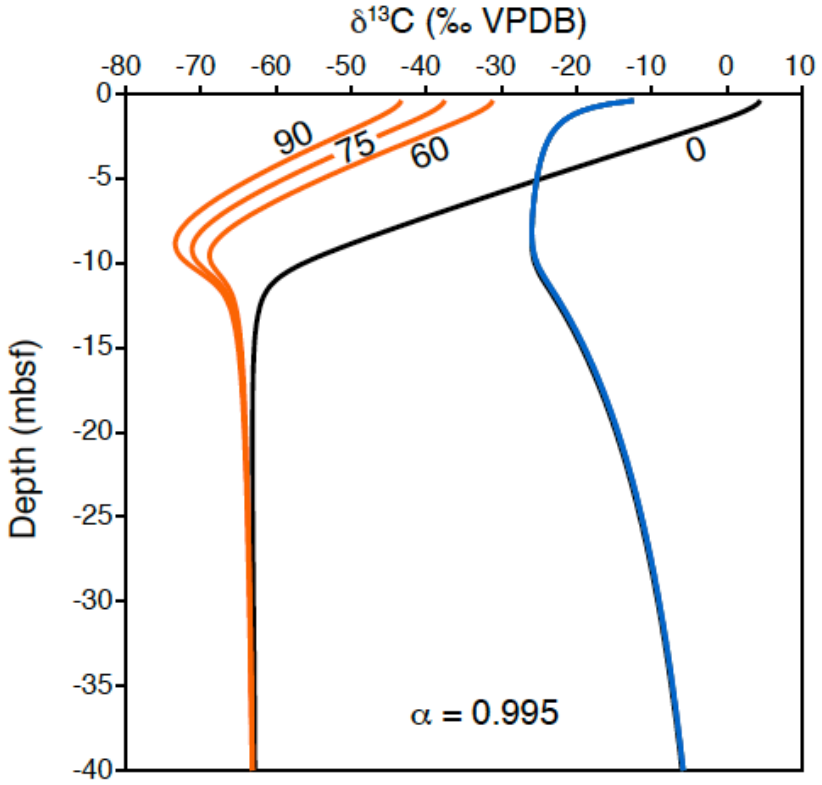
Acetogenesis Methanogenesis/AOM Anabolic branch

Equilibrium isotope fractionation is most likely the result of differential reversibility of the co-enzyme M (CoM) branch of the pathway (Valentine et al., 2004). A kinetic bottleneck may occur at the CoM-step:



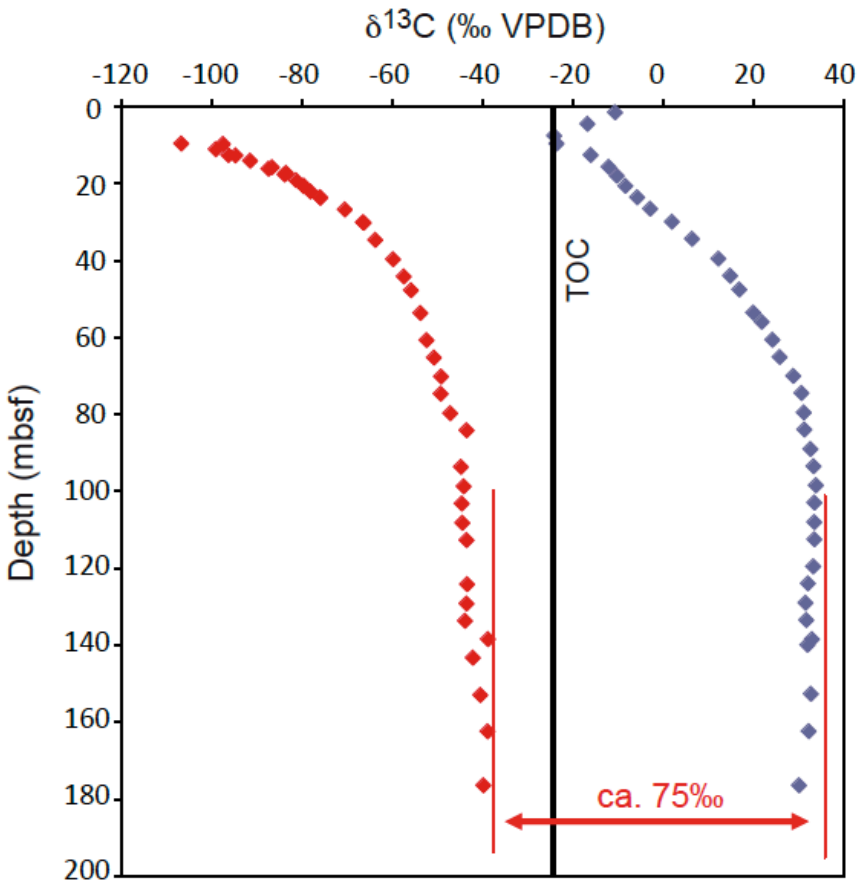
Partial isotopic equilibration was suggested for anaerobic methane oxidation (Yoshinaga et al., 2014): This effect can be reproduced by numerical modelling. Only then, the strongly negative trend of $d^{13}C$ in methane at the sulphate/methane transition zone can be explained.



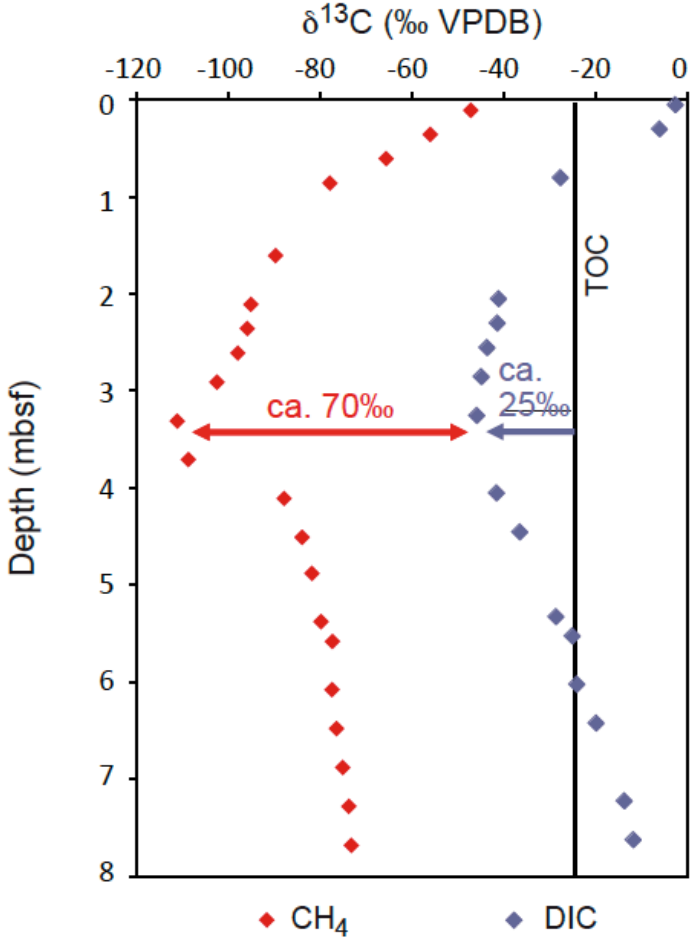


Meister, P., Liu, B., Khalili, A., Böttcher, M.E., and Jørgensen, B.B. (2019b) Factors controlling the carbon isotope composition of dissolved inorganic carbon and methane in marine porewater: An evaluation by reactive-transport modelling. *J. Marine Systems* 200, 103227, 1-18.
https://doi.org/10.1016/j.jmarsys.2019.103227

Both isotopic equilibration during AOM and methanogenesis is necessary to explain porewater profiles → ca. 75‰ difference between CH_4 and DIC

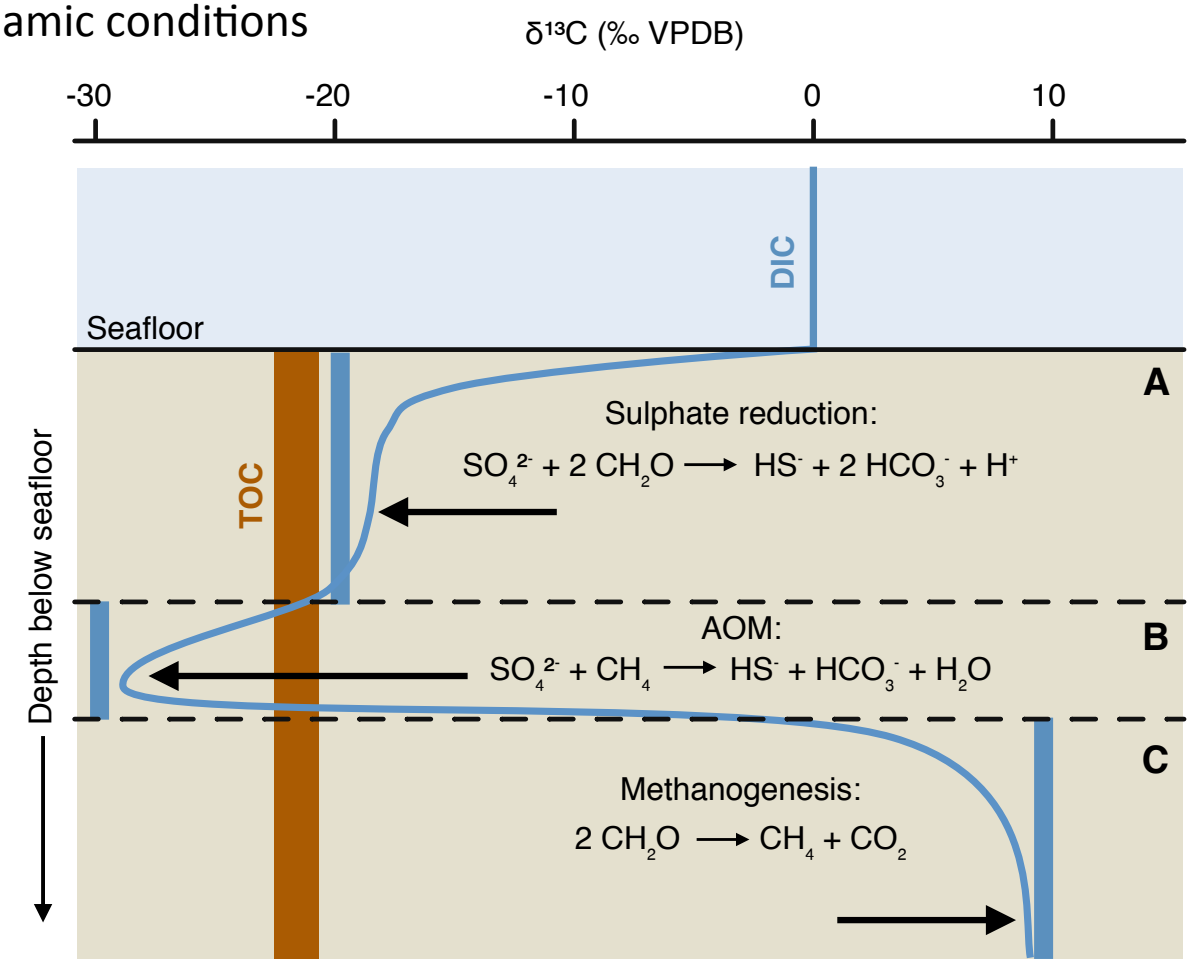


Cascadia Margin (IODP Site U1329; 946 m water depth; Heuer et al. (2009)



Site C-2, Bullseye vent, Cascadia Margin, water depth 1311 m; Pohlman et al. (2008)

Variable $\delta^{13}C$ values in diagenetic carbonates document dynamic conditions in the deep biosphere



TOC = Total organic carbon

DIC (Dissolved inorganic carbon) = $CO_2(aq) + HCO_3^- + CO_3^{2-}$

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