

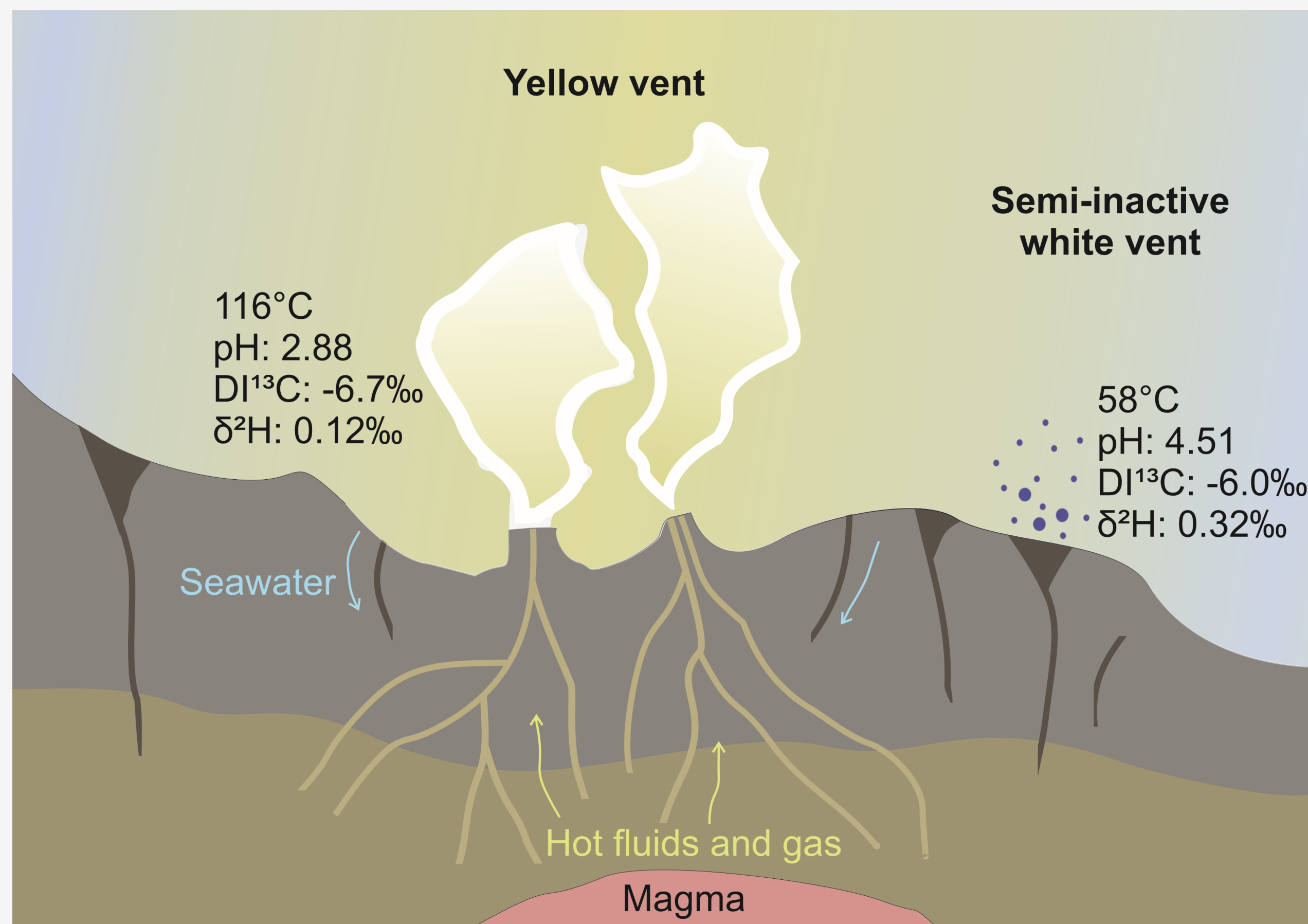
Exceptionally opposing trends in carbon and hydrogen isotope fractionation of chemoautotrophic sulfur-oxidizing bacteria

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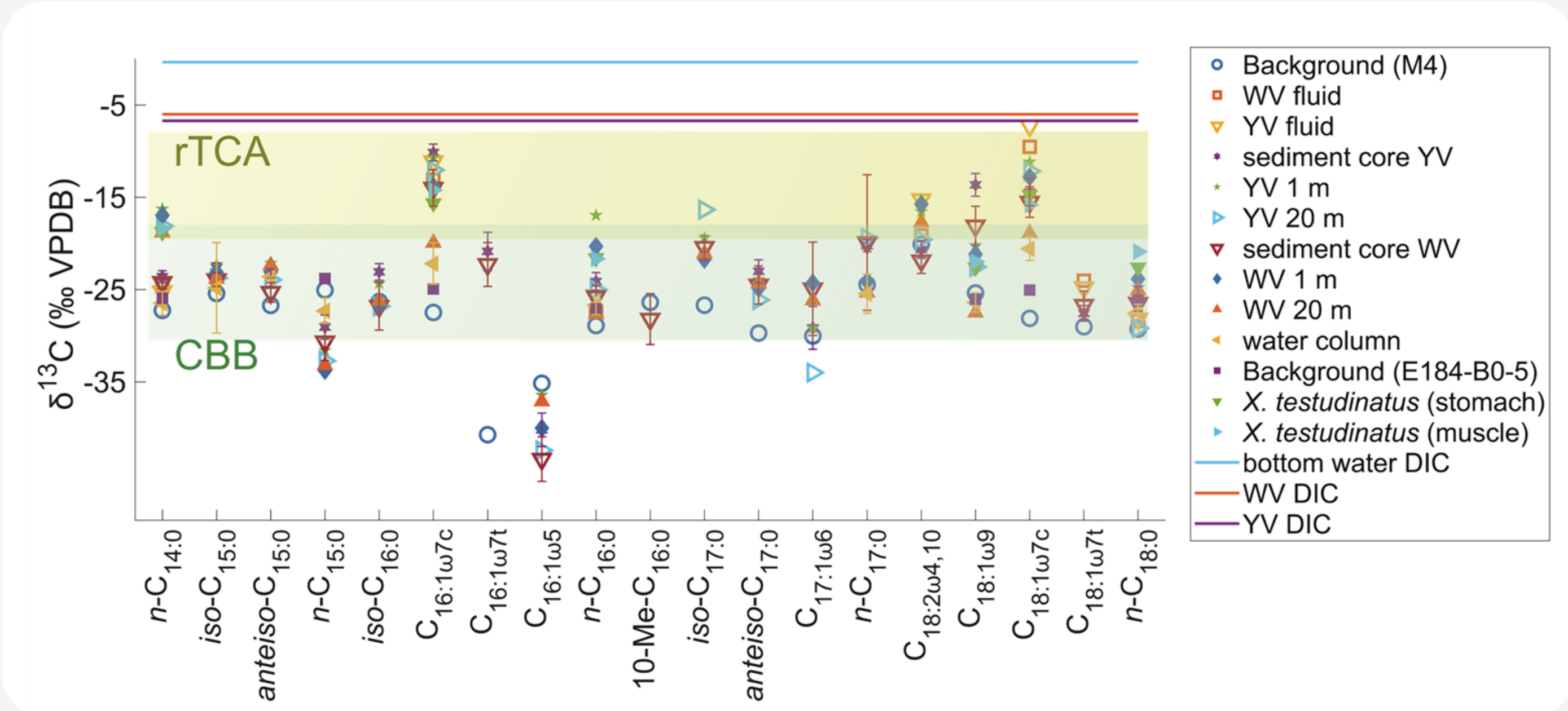
Exploring the metabolic adaptations of sulfur-oxidizing chemoautotrophs in hydrothermal vent ecosystems provides insights into the mechanisms that could have supported life on early Earth.

We examine the distribution of ¹³C and ²H content of lipid-derived fatty acids in shallow hydrothermal systems.

Two hydrothermal systems off Kueishantao (Taiwan, 10 m water depth) are the focus of this study: one white vent and one yellow vent which differ in pH, temperature, and fluid fluxes.



Campylobacteria (sulfur-oxidizers) produce mostly C_{16:1} and C_{18:1} fatty acids and use the reductive tricarboxylic acid cycle (rTCA) for carbon fixation. Carbon fixation using rTCA is more energy-efficient and discriminates less against ¹³C.

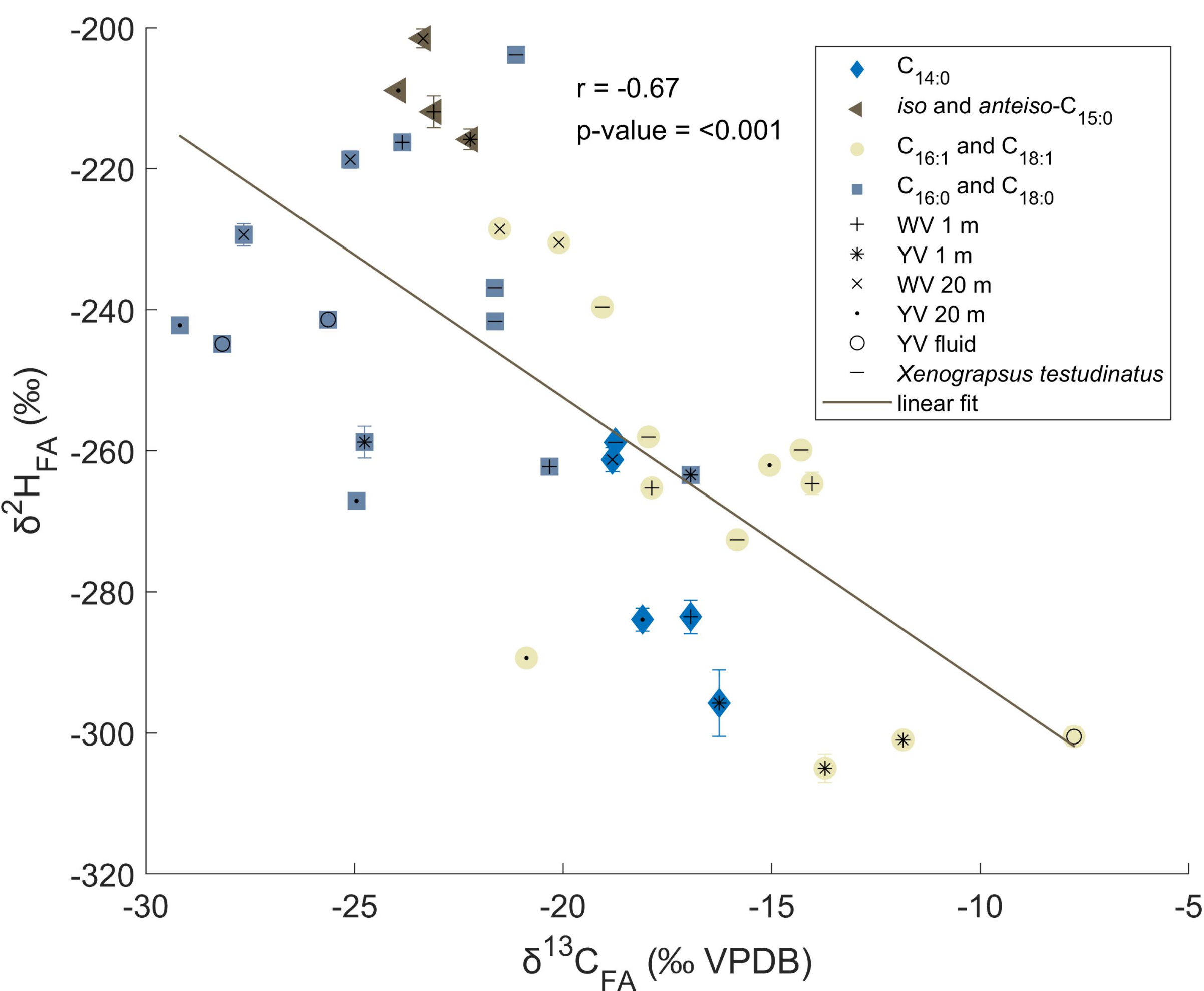


First insights into the carbon isotope fractionation of Campylobacteria in extreme environments:

Maak, J. M., Lin, Y.-S., Schefuß, E., Aepfler, R. F., Liu, L.-L., Elvert, M., and Böhning, S. I.: The energy-efficient reductive tricarboxylic acid cycle drives carbon uptake and transfer to higher trophic levels within the Kueishantao shallow-water hydrothermal system, EGU sphere [preprint], <https://doi.org/10.5194/egusphere-2024-1356>, 2024.

Extreme hydrogen isotope fractionation of **-300‰** is accompanied by carbon isotope fractionation of **-1‰**

Biomass originating from Campylobacteria is enriched in ¹³C and depleted in ²H



Combined analyses of ²H and ¹³C enable us to identify chemoautotrophy (²H) and adaptation mechanisms to harsh environments (¹³C). This approach allows us to identify similar metabolic signatures in paleoenvironmental samples, enhancing our understanding of ancient ecosystems.

Next step: combining environmental data with culture experiments of *Sulfurimonas* (Campylobacteria) under high temperature and low pH conditions

Do you have any questions about my work?



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