

Mesopelagic iron-carbon co-limitation alters ocean iron and carbon cycling

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Iron limits primary productivity in approximately a third of the surface ocean [1]. Recent evidence has also pointed to a potential role for iron availability in restricting microbial activity in the sub-surface mesopelagic ocean [2]. However, direct experimental evidence of sub-surface microbial iron limitation is scarce and the regional-global scale consequences of mesopelagic iron limitation remain unclear. We present results from a series of nutrient amendment experiments throughout the upper 500m of the water column in the South-East Pacific sub-Antarctic. Single additions of either labile dissolved organic carbon or dissolved iron alone resulted in no significant changes in measured microbial activity. However, the addition of both carbon and iron together consistently resulted in substantial (>10 fold) increases in leucine uptake and proliferation of specific copiotrophic bacterial taxa (*Alteromonadales*). Experiments using a global-scale biogeochemical model capable of reproducing our observed upper-mesopelagic iron-carbon colimitation revealed that this process can result in deepening of both the iron and carbon remineralisation profiles and a reduced sensitivity of ocean carbon storage to increased Fe supply.

References

- [1] Browning and Moore (2023). *Nat. Comms.* 14 5014
- [2] Li et al., (2024). *Nature* 633, 823-827.