



## Trait-based modelling of multi-trophic diel vertical migrations and active carbon transport

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Title: Trait-based modelling of multi-trophic diel vertical migrations and active carbon transport

Abstract:

Diel Vertical Migration (DVM) is a key feature of pelagic and mesopelagic ecosystems, mainly driven by predator-prey interactions along a time-varying vertical gradient of light. The migration pattern of each organism is intrinsically linked to the patterns of its conspecifics, its prey and its predators, through feedbacks that are hard to understand—but important to consider. DVM is not only important for trophic interactions, but also for the biogeochemistry of the world's oceans. Organisms preying at the surface and migrating vertically actively bring carbon to depth, accelerating the rate of the biological pump, and directly connecting surface production with the mesopelagic ecosystem.

Using game theoretic principles, we present a trait-based mechanistic model to infer the DVM patterns of different classes of pelagic organisms simultaneously, shedding light on the direct effects that different trophic levels can have on each other. Based on key traits each population (size, feeding mode), the model is parametrized very simply allowing testing different community assemblages and environmental conditions. The model is then used to estimate the active carbon transport mediated by DVM.

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