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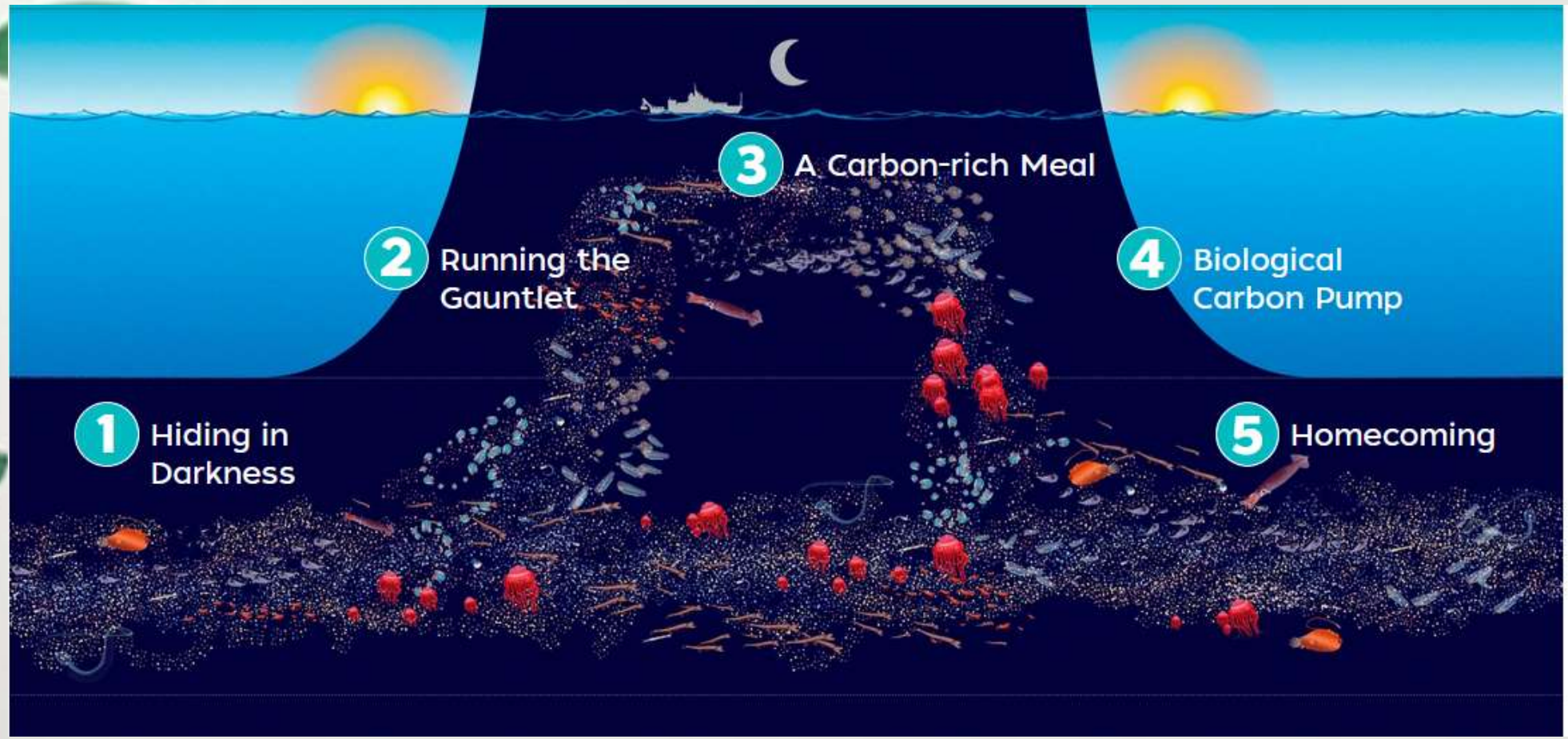
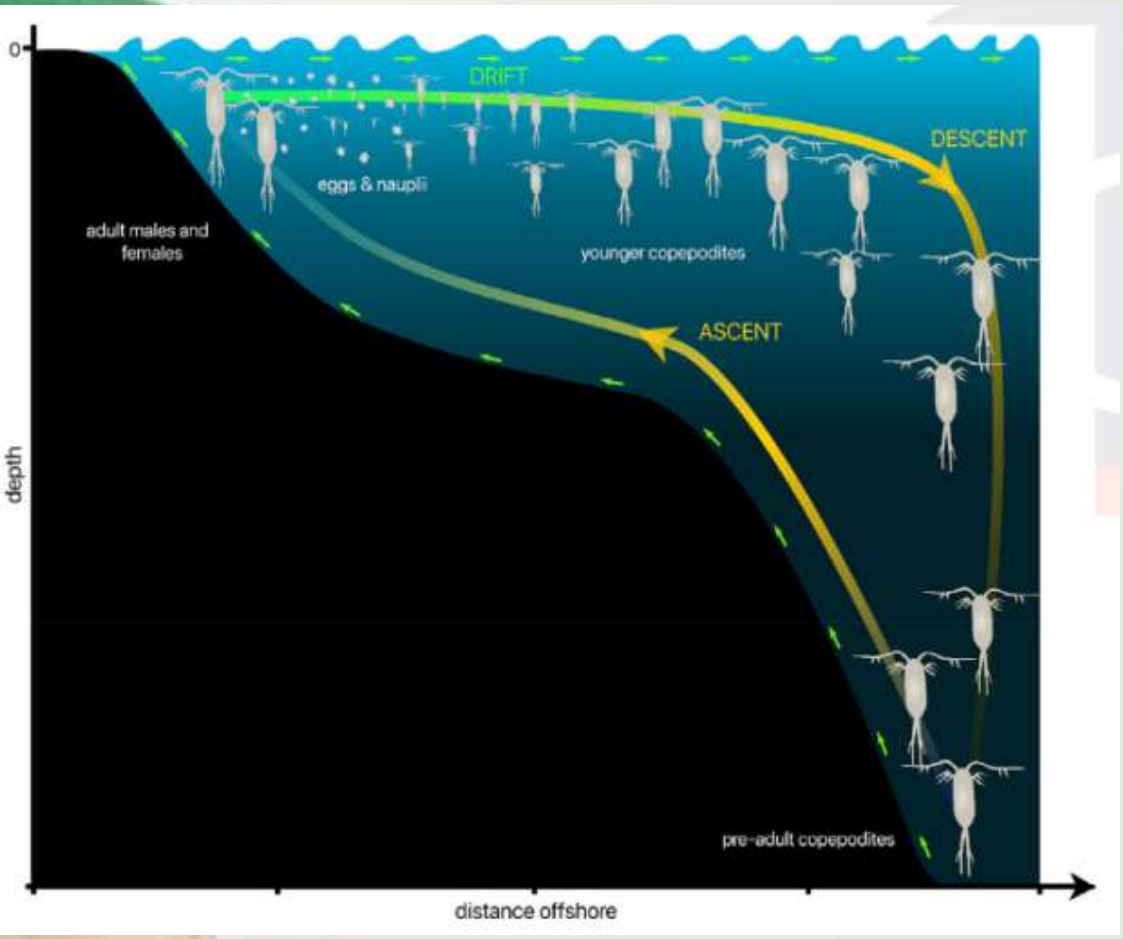
Diel Vertical Migration:

A Key Player in Carbon Sequestration



Why in News?



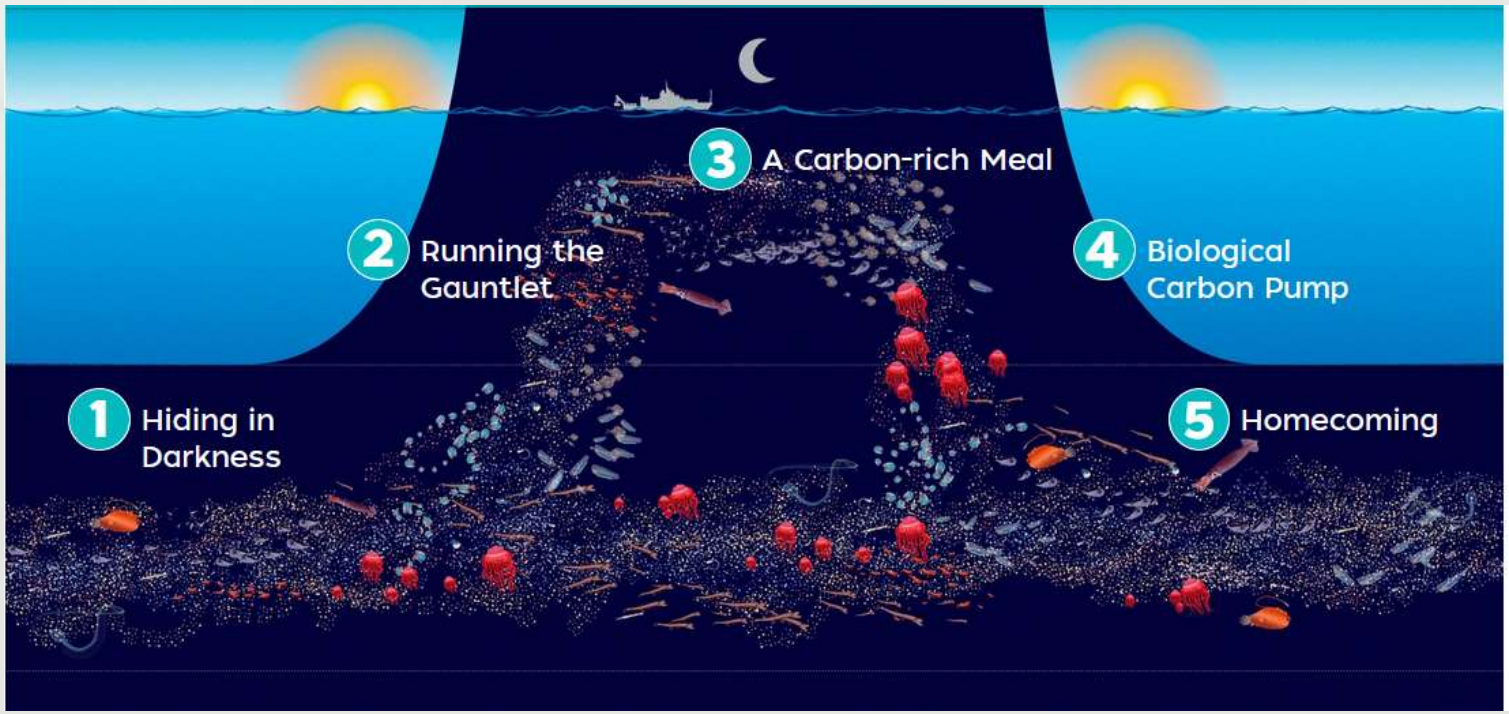
Diel Vertical Migration (DVM) has garnered attention for its involvement in carbon sequestration.

Deep-sea creatures, ascend at night for nourishment and safety.

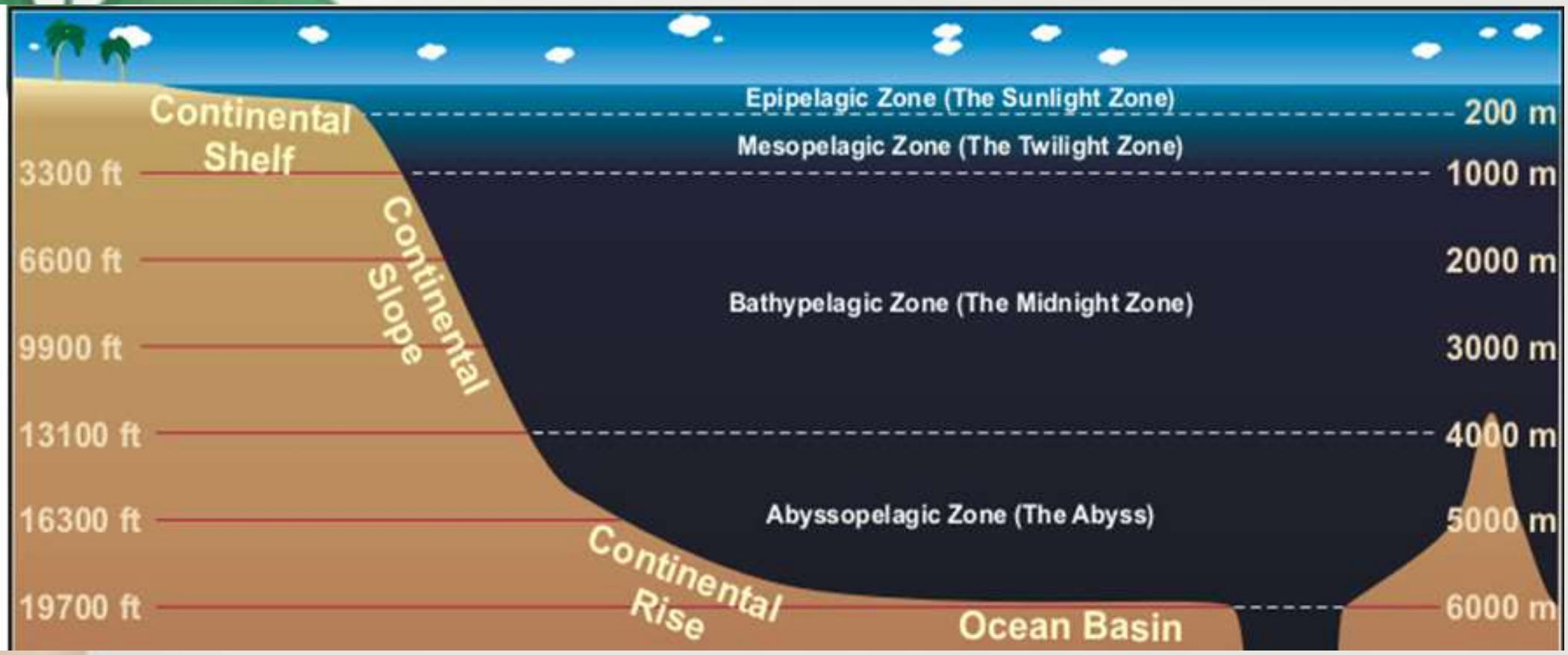
This synchronized journey significantly influences Earth's Carbon Cycle.

What is Diel Vertical Migration (DVM)?

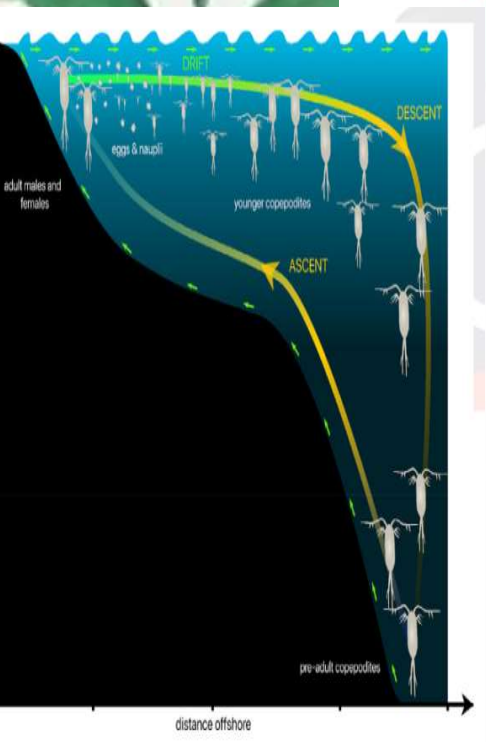
- Every day, billions and billions of animals, mostly zooplankton (e.g., smallish animals, including fish, various shrimp, and jellies), migrate up and down in the ocean all over the planet.
- This movement is referred to as Diel Vertical Migration.
- Diel means that it occurs on a daily, 24-hour cycle.
- This pattern helps these organisms find food while avoiding predators, showcasing a strategic survival tactic.

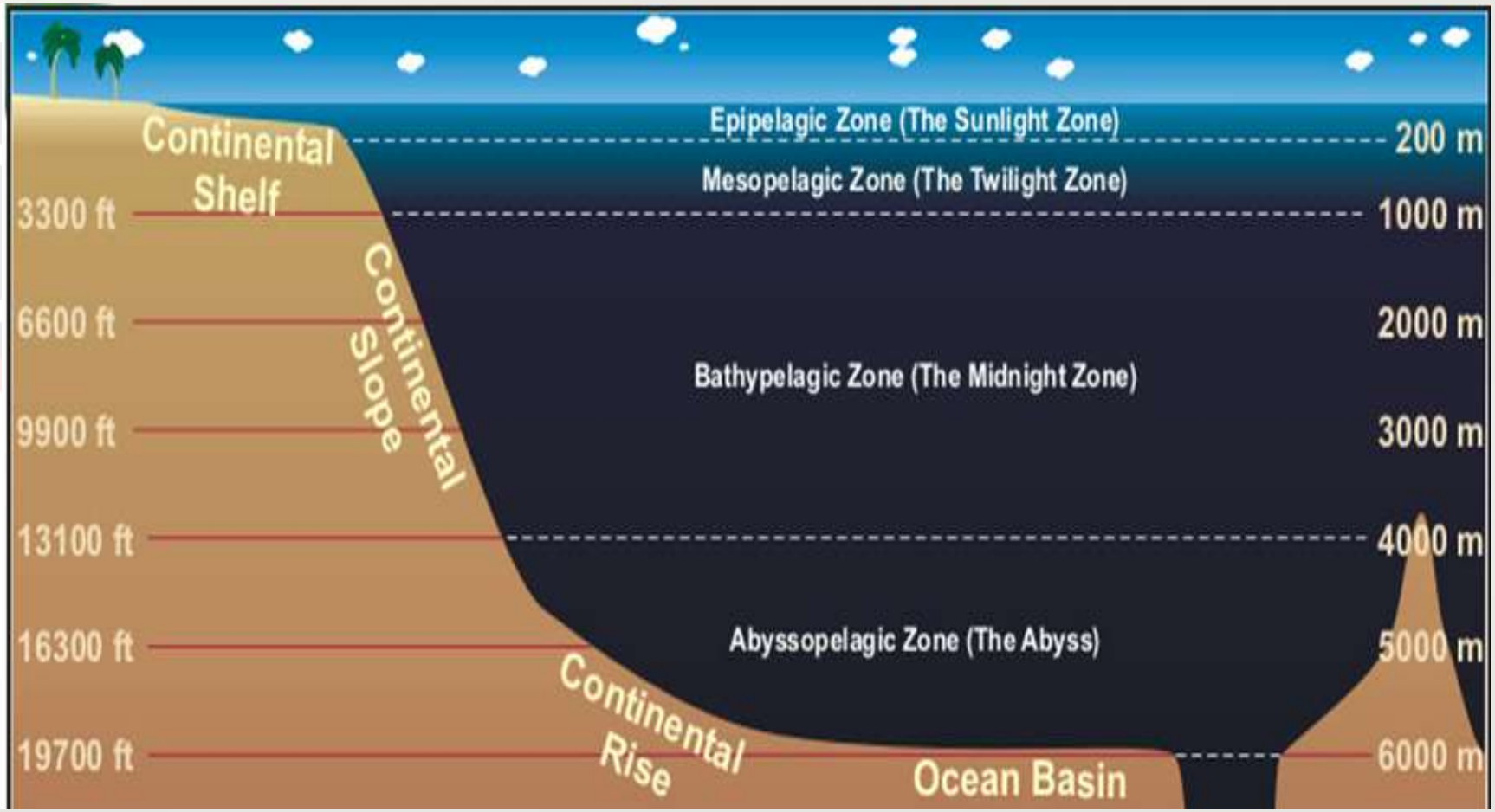


Layers of Oceans: The surface layer of the open ocean is between 0 and 200 m deep. In this layer, there is enough light for phytoplankton to grow. The middle layer of the open ocean is between 200 and 1,000 m deep. Light rapidly declines in this layer and it is often called the "twilight zone."



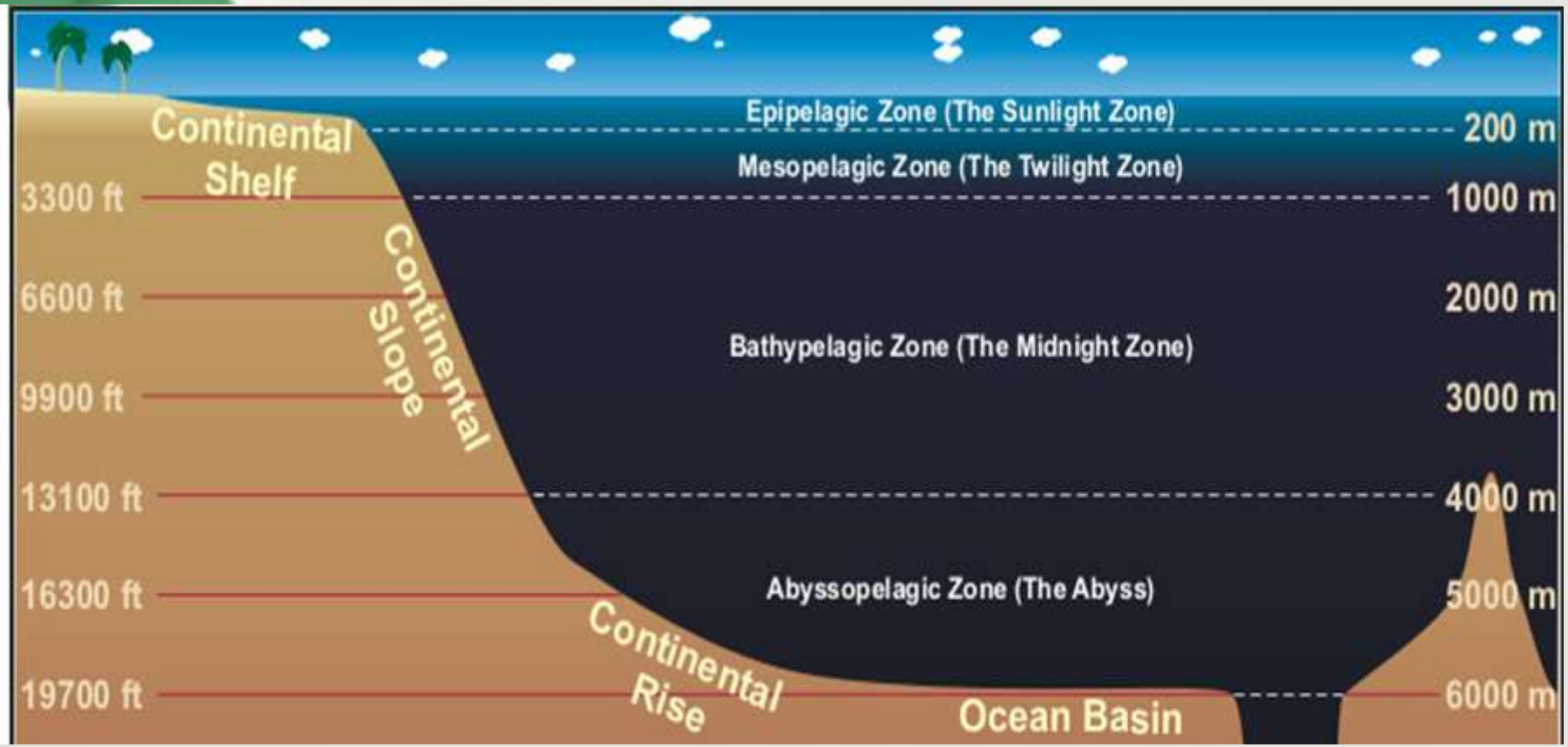
- At dusk, organisms from the mesopelagic layer (Deeper Layer or Twilight Zone) rise to the safety of the epipelagic zone (Upper Layer), capitalising on darkness to feed on microscopic phytoplankton while evading diurnal predators.

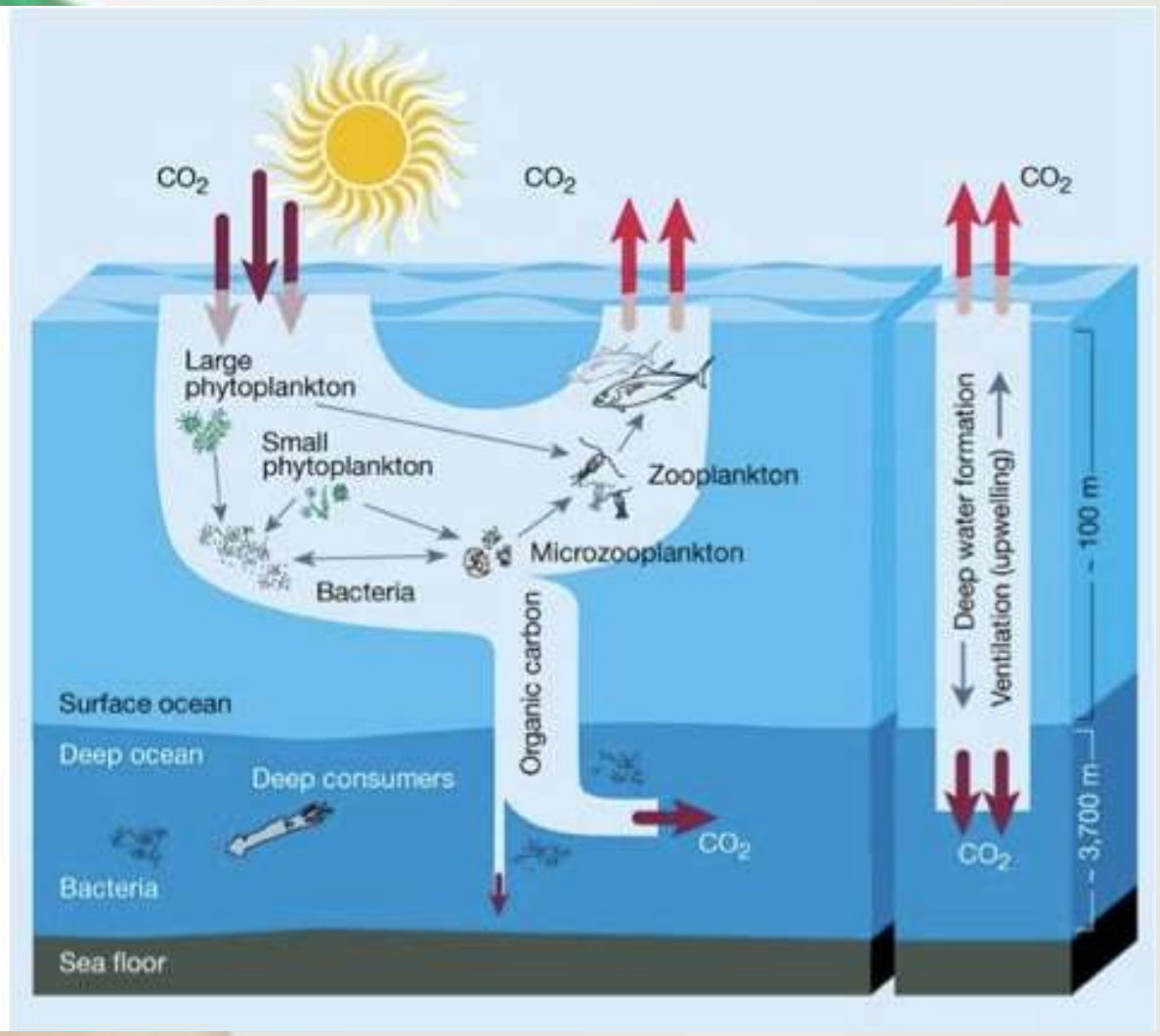




- This synchronized migration, finely attuned to natural light cycles, stands as the planet's largest biomass migration, occurring daily across all oceans

- This journey of zooplankton between epipelagic and mesopelagic layer, almost 1000m is quite impressive, especially for creatures of the size of zooplanktons.





- **Diel Vertical Migration** plays a **pivotal role in sequestering carbon**, a process vital for **regulating the earth's climate.**

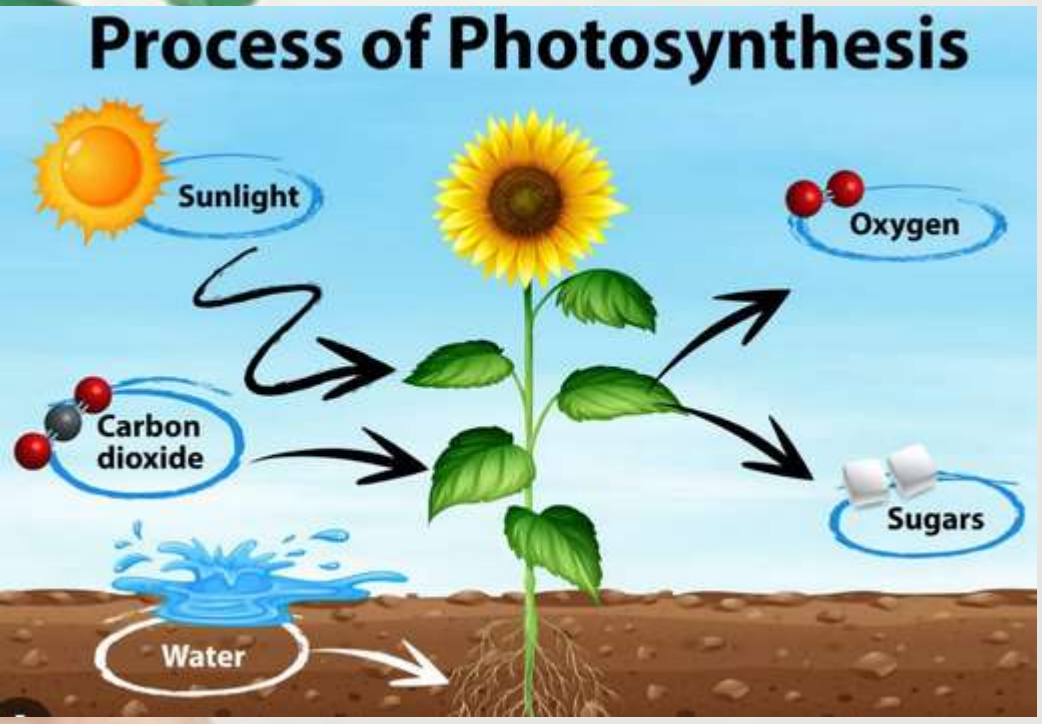
Animals dwelling **in the mesopelagic layer** actively **remove substantial amounts of carbon from** the **upper ocean** as they **feed on surface-dwelling plankton.**

When these organisms **return to deeper waters**, they **carry carbon with them.**

In the twilight zone, certain **migratory species contribute to the food chain by passing on the carbon they eat to their predators.**

The **predators' carbon-rich waste sinks** to the **ocean floor,** which **remains locked for centuries**.

Types of Carbon Sequestration

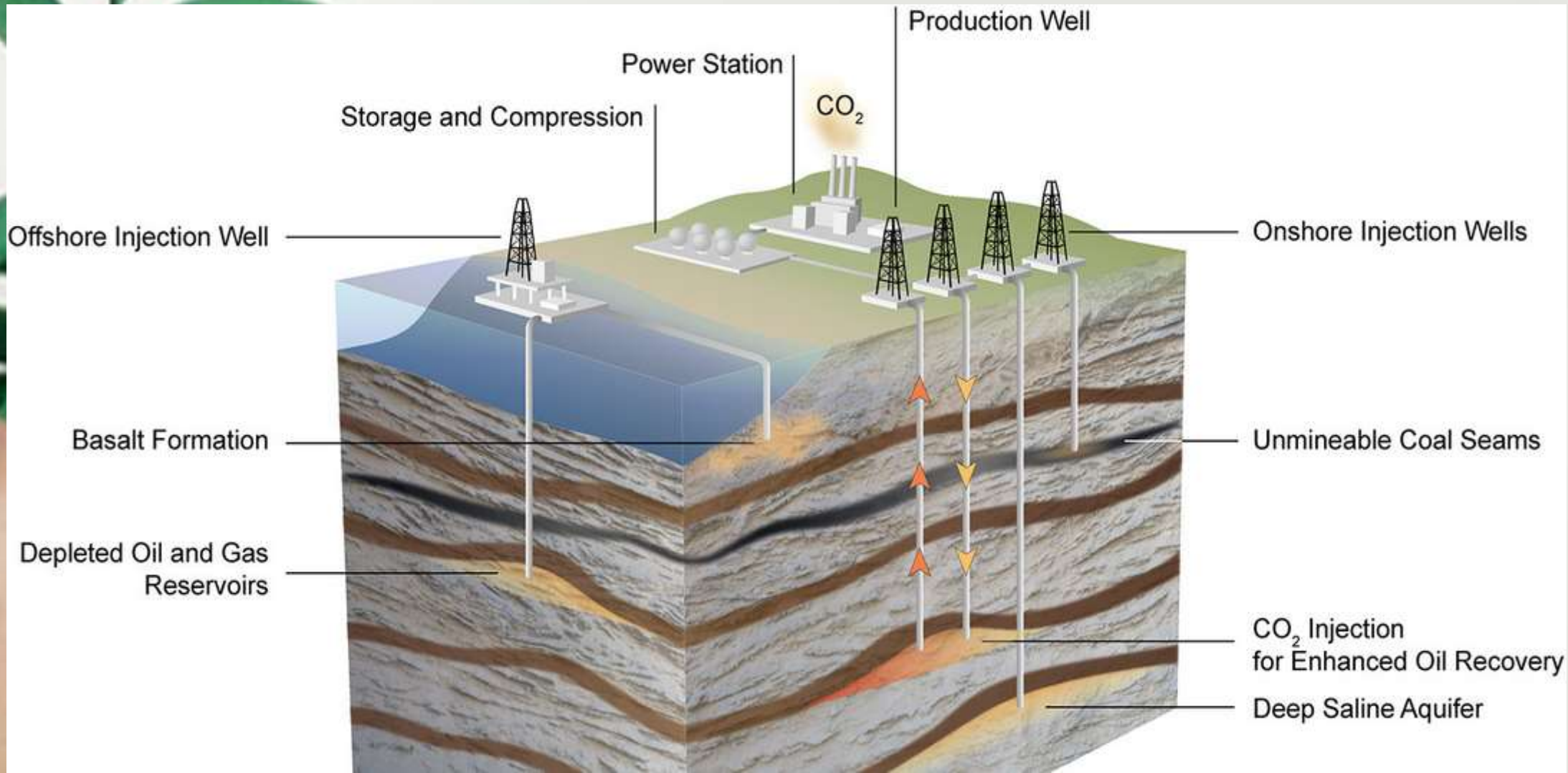


Terrestrial Carbon Sequestration:

This process involves the absorption of CO_2 from the atmosphere by trees and plants via photosynthesis, storing carbon in soils and various forms of biomass (such as tree trunks, branches, foliage and roots).

Geological sequestration of CO2

CO2 can be stored in oil reservoirs, gas reservoirs, unmineable coal seams, saline formations and shale formations rich in organic content.

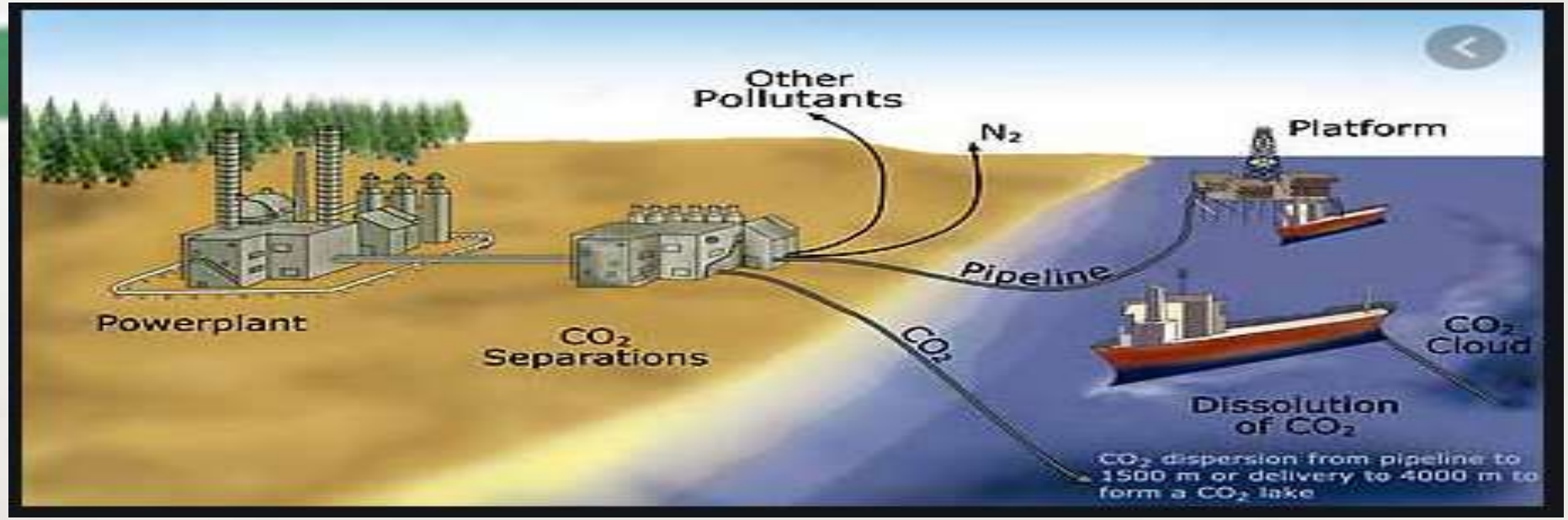


Ocean Carbon Sequestration: Oceans play a significant role in absorbing, releasing and storing considerable amounts of CO2 from the atmosphere. This occurs through two methods:

- **Injecting CO2 into the deep ocean.**
- **Iron fertilization**

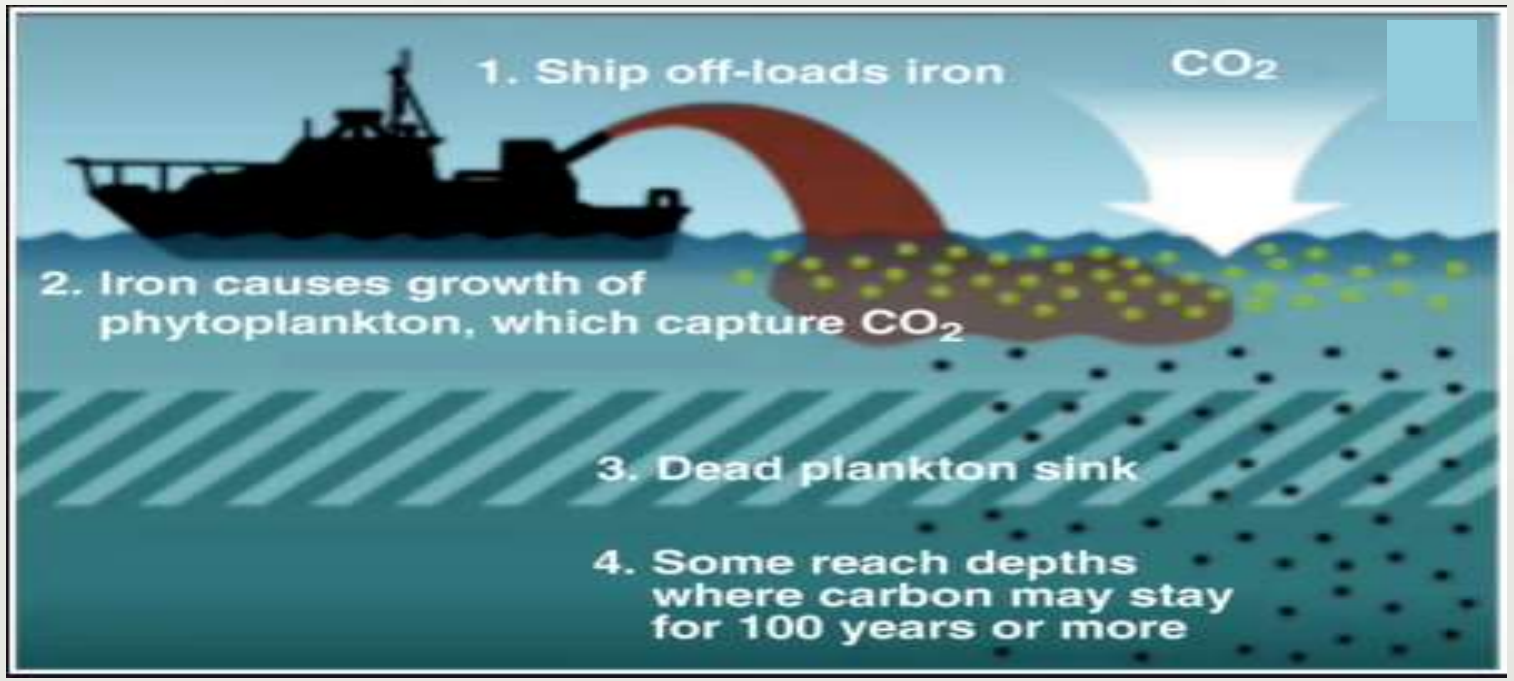
Ocean sequestration (blue carbon)

1. Direct injection



2. Ocean fertilization

- Iron fertilization involves adding iron to parts of the ocean that are low on this nutrient.
- Iron acts as a kind of "spark" for phytoplankton, tiny plant-like organisms in the ocean.
- When these phytoplankton get the iron they need, they grow and multiply, using up carbon dioxide from the atmosphere during photosynthesis.



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