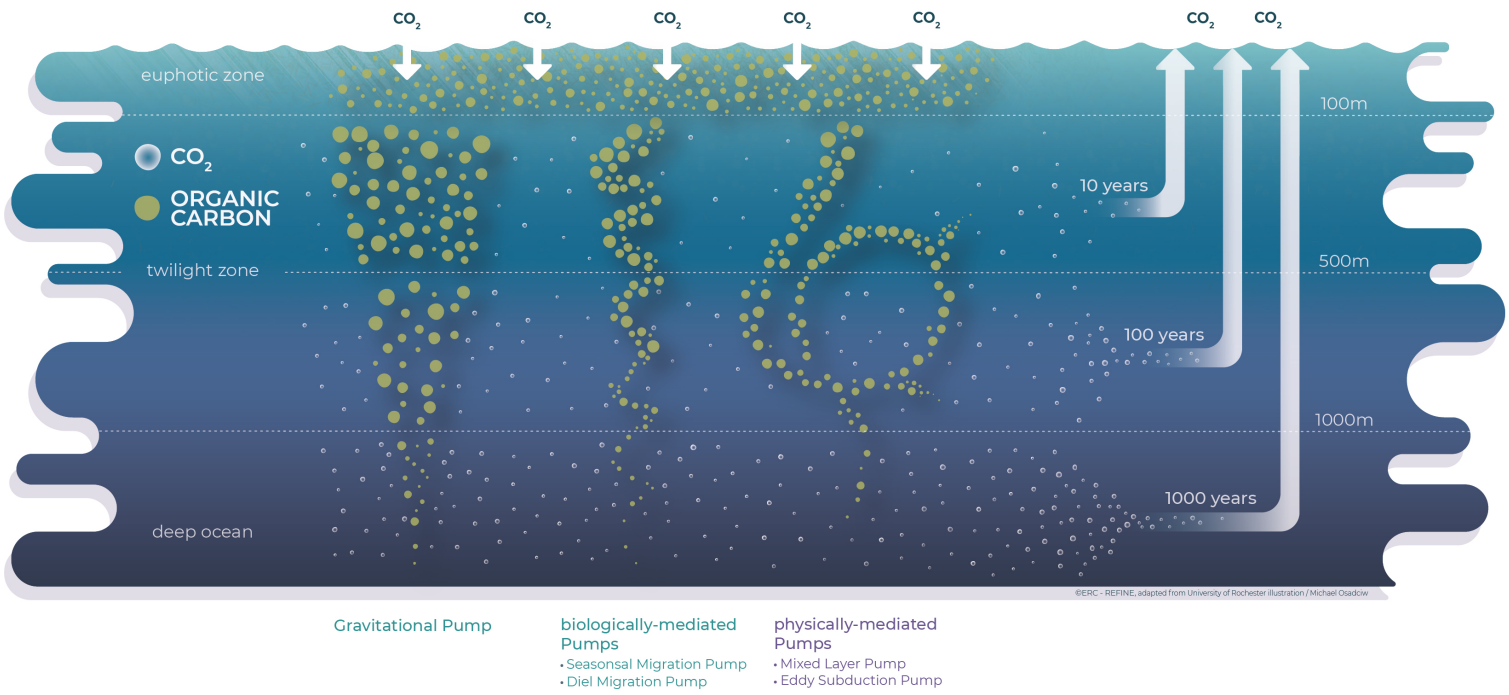
SYNTHESIS



Gravitational Pump

biologically-mediated Pumps
- Seasonsal Migration Pump
- Diel Migration Pump

physically-mediated Pumps
- Mixed Layer Pump
- Eddy Subduction Pump

Joint pump action and the oceanic biogeochemical cycle of carbon.

At the ocean surface, photosynthesis allows the production of organic carbon from its inorganic form CO_2.
All five pumps will then join forces to deliver this organic material at various depths of the TZ and below. In the course of this delivery, the organic carbon will progressively return to its mineral phase CO_2 due to bacterial remineralization. The intensity of this CO_2 release essentially depends on the balance between the velocity at which organic carbon is vertically transported, and the strength of bacterial remineralization.

Ultimately, all pumps contribute to an increasing gradient of CO_2 from the surface to depth. This major process has always existed and worked to significantly reduce CO2 from the atmosphere. What is now critical to understand is :

At which specific oceanic layers does the back-release of CO_2 operate, and how do the various pumps contribute to this ? Indeed, the deeper this release occurs, the longer CO_2 will be stored away from contact with the atmosphere.

How will climate change and its resulting evolving constraints on oceanic environment (stratification, nutrient availability, light, temperature) impact the biological and physical processes underlying these pumps ?

REFINE aims to help answer these questions.