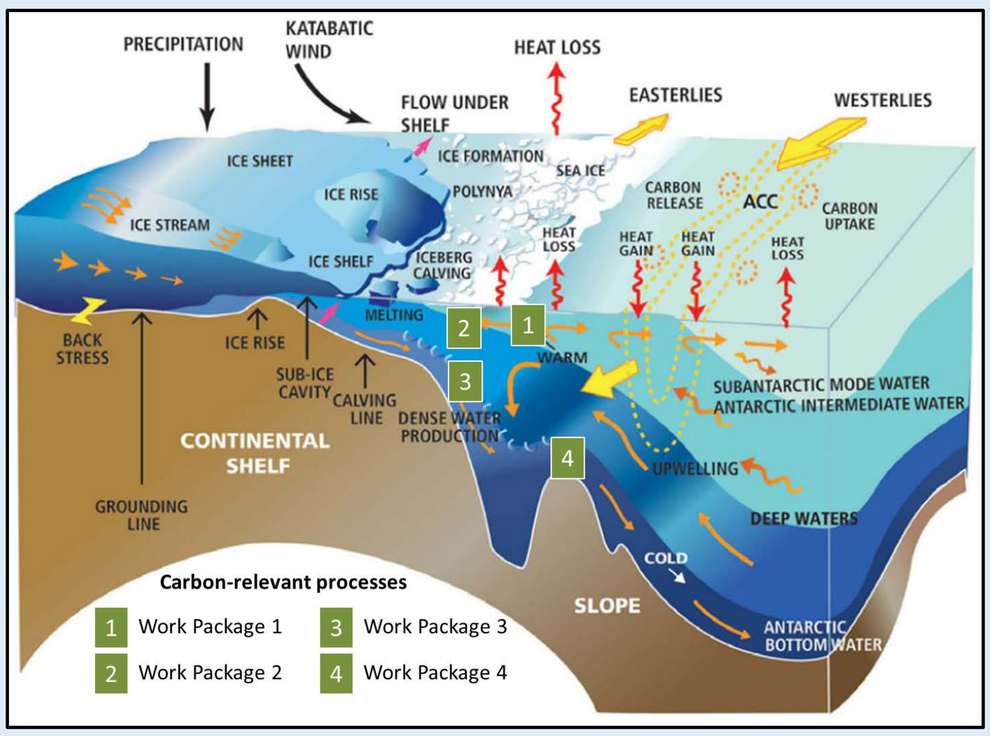
PICCOLO Workpackage 4

Carbon sequestration into the deep ocean

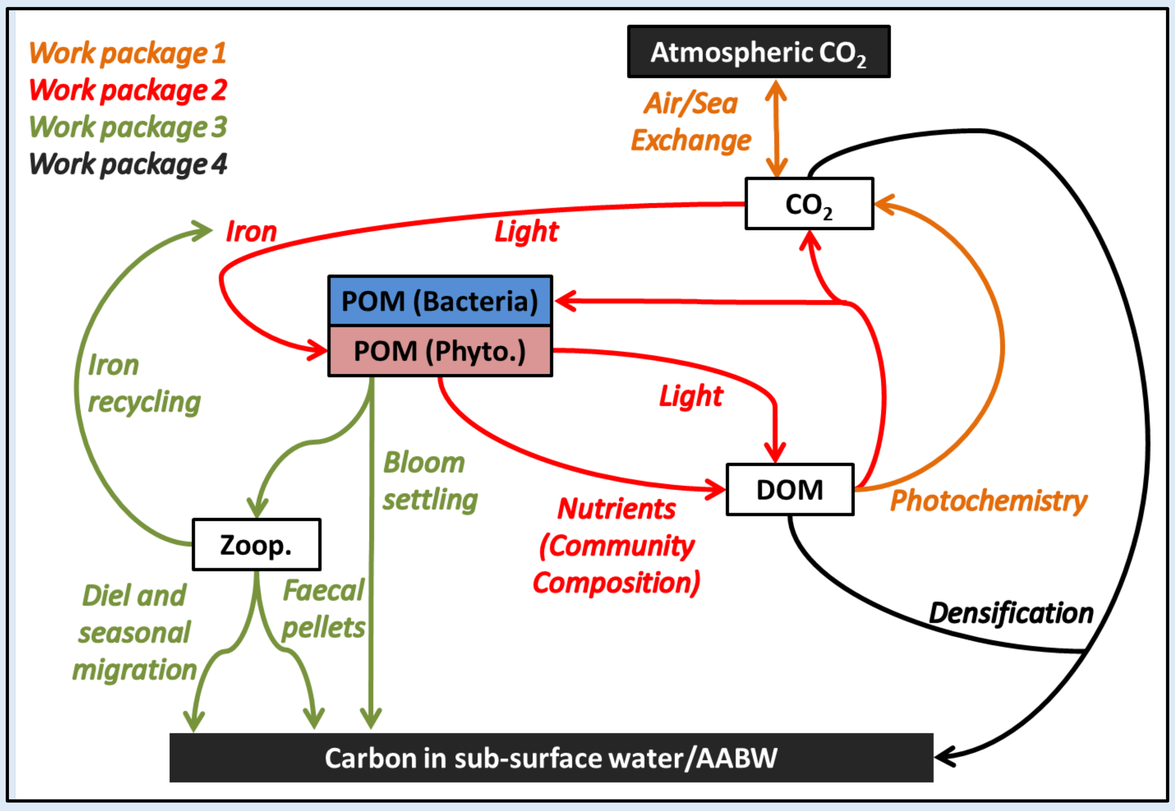
PICCOLO is a RoSES project designed to define, quantify and provide mechanistic understanding of the key processes controlling the rate of carbon uptake in the lower limb of the Southern Ocean overturning circulation.

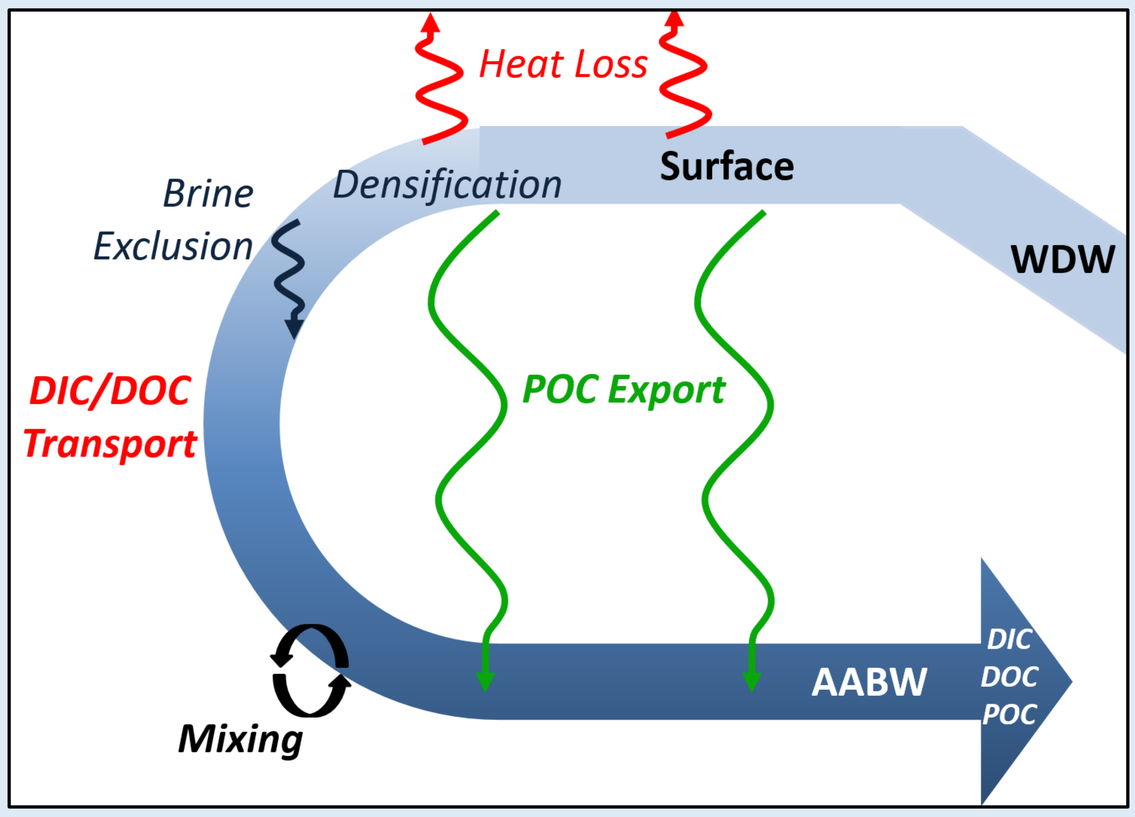


Workpackage 4 will test hypothesised mechanisms for export of dense water across the Antarctic slope and associated Slope Current. Its spatial and temporal variability will be investigated. We will quantify air-sea heat fluxes and measure the heat and freshwater budgets of a polynya on the continental shelf in the western Weddell Sea. We will quantify stratification processes year-round, and identify any shortcomings in Earth System models.

Hypothesis 1 Dense water carbon export off shelf is controlled by the position of the Antarctic Slope Front with respect to the shelf break

Hypothesis 2 Densification in coastal polynyas is dominated by local brine rejection.





Deliverable 1 We will derive volume fluxes of water and its carbon content across the shelf break and in the dense outflow along the continental slope for comparison with ORCHESTRA estimates.

Deliverable 2 We will derive monthly maps on depth and density surfaces of temperature, salinity, dissolved oxygen and pH from seal tags and Autosub Long Range, for use in workpackages 1-3.

Deliverable 3 We will map turbulent mixing from gliders and characterise mechanisms leading to dense outflow for parameterisation in models that are too coarse to resolve processes like internal waves, tides, density currents and topographically-controlled flow through canyons.

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