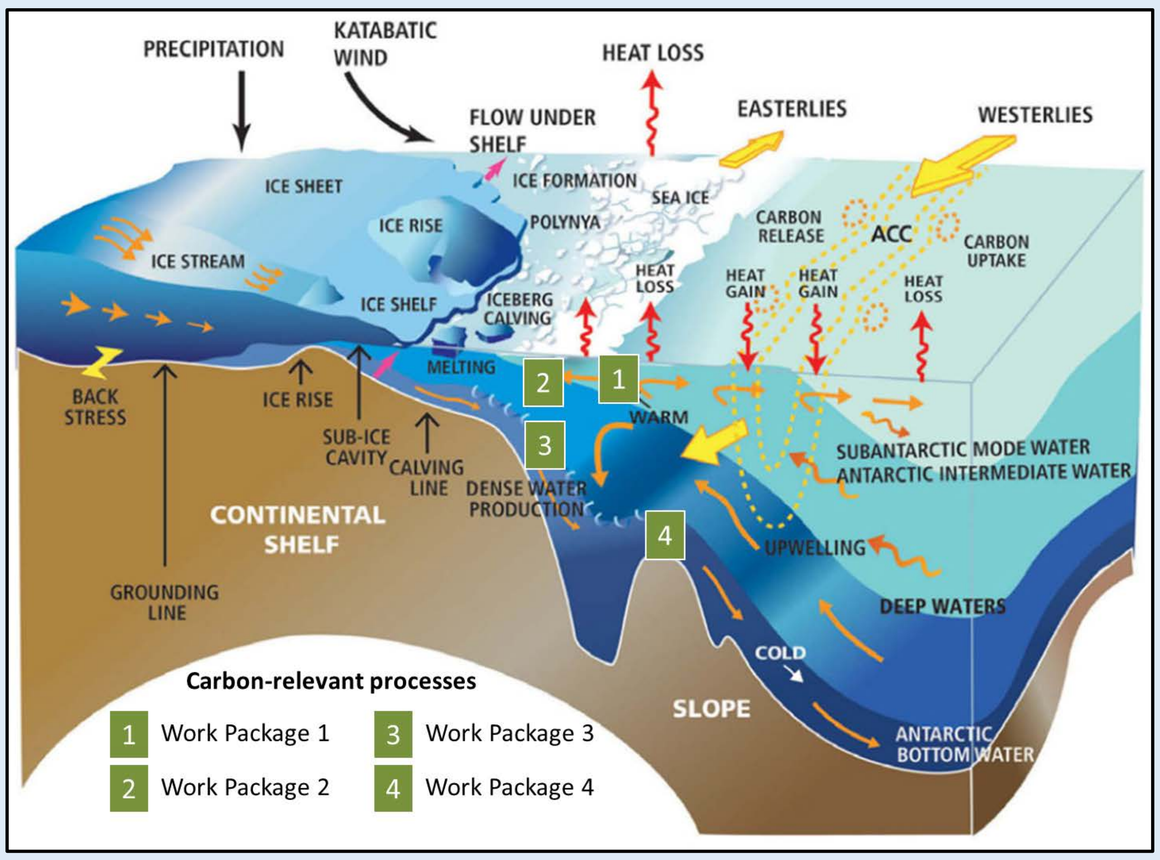
PICCOLO Workpackage 2

Biological processes affecting carbon cycling in surface waters

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.



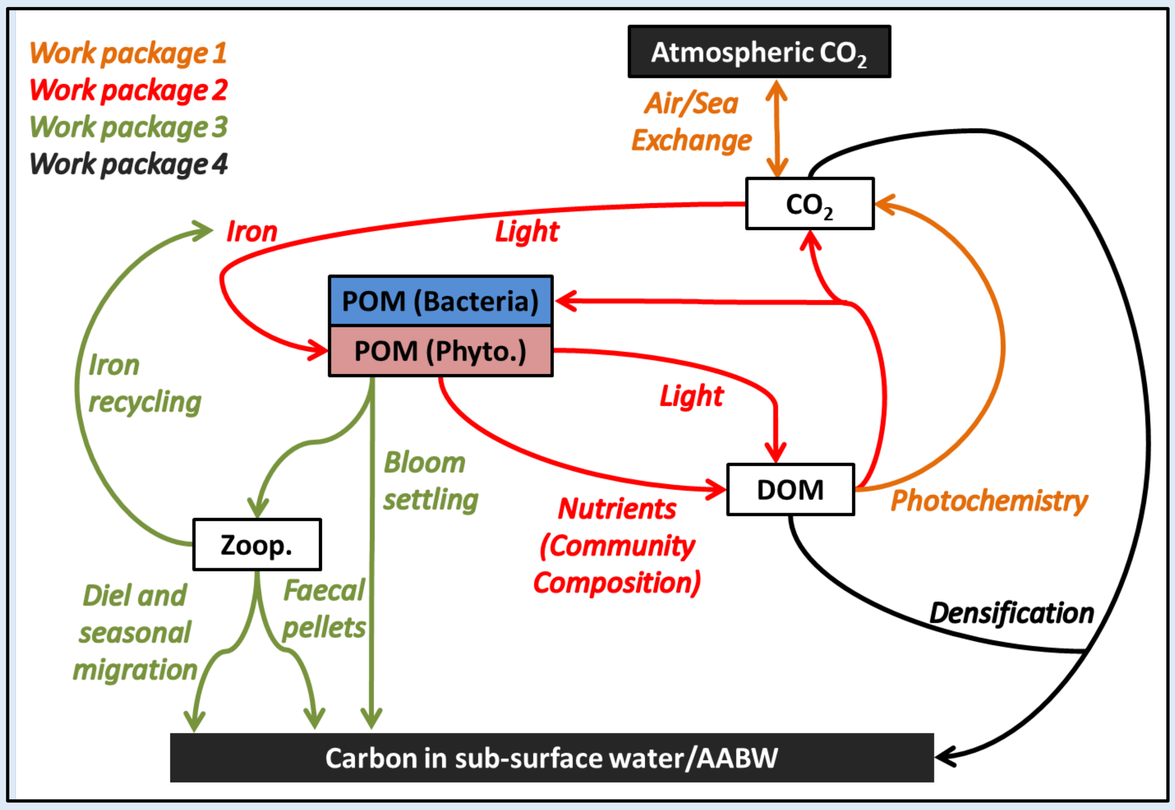
Workpackage 2 quantifies the contribution of phytoplankton and bacterial processes to the uptake, transformation and remineralisation of carbon, and determines the constraints on production and respiration imposed by iron and light.

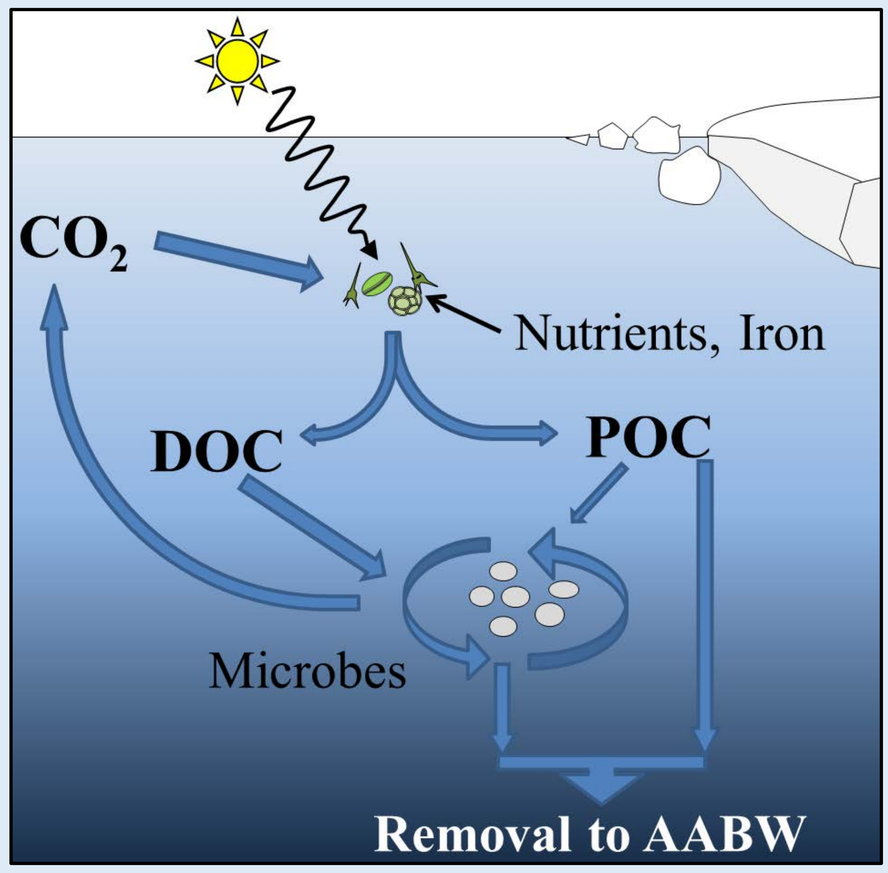
Hypothesis 1 Iron supply to surface waters controls the uptake of dissolved organic carbon (DOC) by phytoplankton in the photic zone

Hypothesis 2 Light is the most important factor determining excretion of dissolved organic carbon by phytoplankton

Hypothesis 3 Dissolved organic matter with a low carbon:nitrogen ratio promotes CO_2 production from DOC by bacterioplankton

Hypothesis 4 High biological activity during ice melt determines the magnitude of the ocean carbon sink





Deliverable 1 We will quantify primary production (production of particulate organic carbon, POC) and respiration (conversion of POC and DOC to CO_2) over wide spatial and seasonal scales, both in the Weddell Gyre and on the shelf, using fluorescence, particle backscatter (proxy for POC) and oxygen data from gliders, seals, Autosub and Biogeochemical Argo (BGC-Argo) together with satellite Earth Observation data

Deliverable 2 We will use relationships between primary production, DOC production and bacterial growth efficiency with estimates of primary production from BGC-Argo and from satellite and relationships between deep water DOC, POC and O_2 to derive the production of DOC and the attenuation of the DOC flux by respiration throughout the year and region.

Deliverable 3 We will determine DOC concentrations in Weddell Warm Deep Water (WDW), Winter Water (WW), summer surface water and Antarctic Bottom Water (AABW). We will combine the DOC concentrations in WW and summer surface water with volume flux estimates to determine the upper limit for DOC export from the surface and transport into AABW.

The Piccoliños:

Karen Heywood, Carol Robinson (carol.robinson@uea.ac.uk**)**, **Elena Garcia-Martín, Dorothee Bakker, Rob Hall** University of East Anglia
Tom Bell, Ming Yang, Jo Dixon, **Vassilis Kitidis, Ruth Airs**, **Giorgio Dall'Olmo**, **Malcolm Woodward, Glen Tarran, Claire Widdicombe, Elaine Fileman, Angus Atkinson, Robert Brewin, Peter Land, Sévrine Sailley** Plymouth Marine Laboratory
Sophie Fielding, Clara Manno, Ryan Saunders, Keith Nicholls British Antarctic Survey
Simon Ussher, **Angela Milne, Katrin Schmidt** University of Plymouth
Will Homoky Oxford University
Lars Boehme, Mike Fedak University of St. Andrews
Plus project partners from Alfred Wegener Institute, University of Miami, UK Met Office, Caltech, Scripps Institution of Oceanography, VIMS, MBARI, NOC, University of Genoa, UPMC, University of Tromsø, University of Bologna, Old Dominion University, and the Australian ACE CRC

University of East Anglia | PML Plymouth Marine Laboratory | British Antarctic Survey, Natural Environment Research Council | University of Plymouth | University of St Andrews | University of Oxford