

THE OCEAN'S BIOLOGICAL CARBON PUMP AS PART OF THE GLOBAL CARBON CYCLE

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Photo: NOAA

ASLO

Outline

- **Introduction:** Ocean's Carbon Pump as part of the Global Carbon Cycle
- **The Carbon Pumps**
- **Phytoplankton, Primary and Export Production**
- **Excursion I:** Instrumentation: Quantifying Particle Flux
- **Excursion II:** Particle Sinking and Degradation
- **Excursion III:** The Biological Carbon Pump on Geological Time Scales

Explanatory notes can be found under each slide, or in the accompanying notes document.

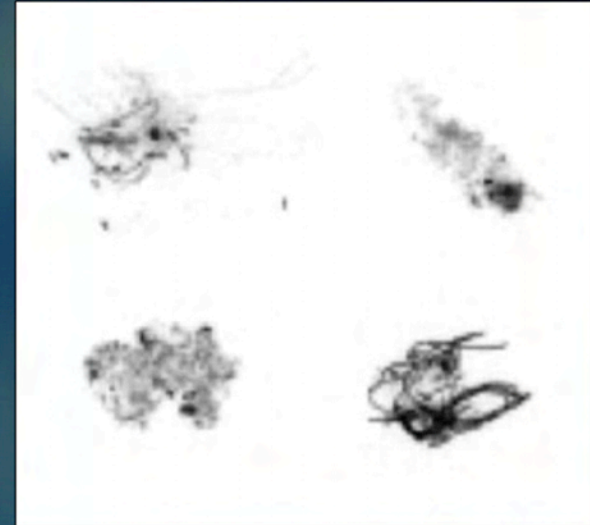
Excursion I: Instrumentation: Quantifying Particle Flux In Situ Cameras

20

Flux = concentration x sinking velocity

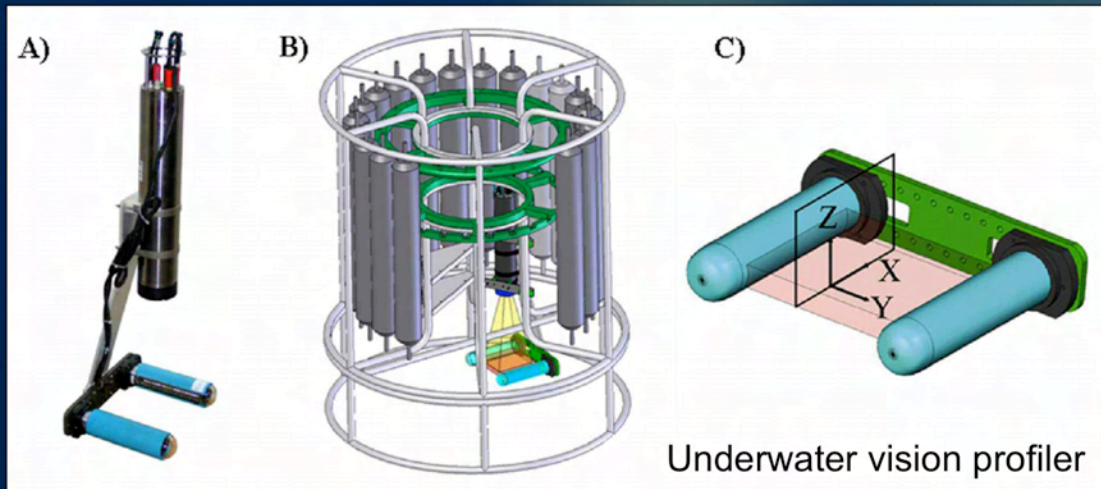
In situ cameras measure:

- **Concentrations**
- **Size-distributions**



Picheral et al. 2010

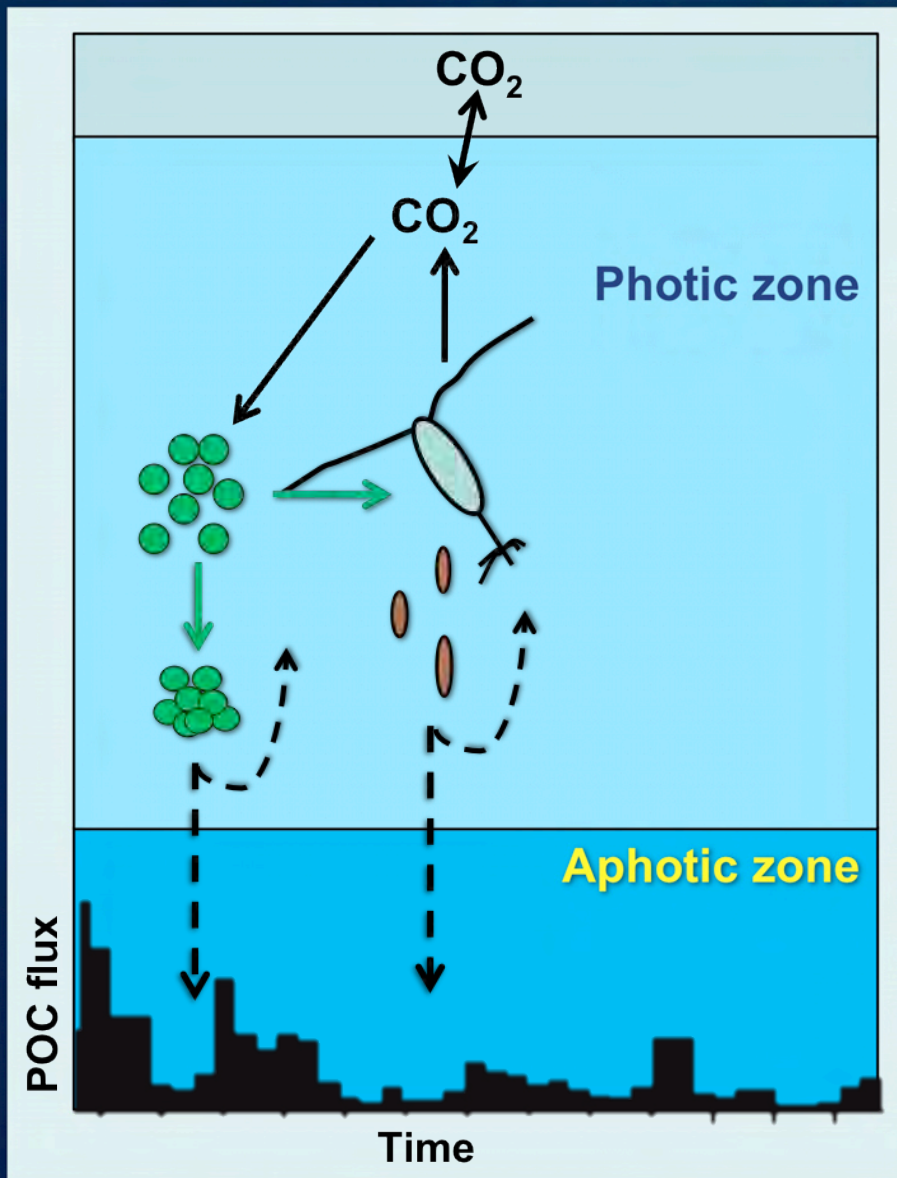
**Records in a volume
of a few L**



Underwater vision profiler

Picheral et al. 2010

Excursion II: Particle Sinking and Degradation



- CO_2 is fixed by phytoplankton
- Form settling aggregates:
Marine snow
Fecal pellets
- Vertical flux:
Determined by degradation and sinking velocity of the aggregates
- What controls variations in the vertical flux over time?

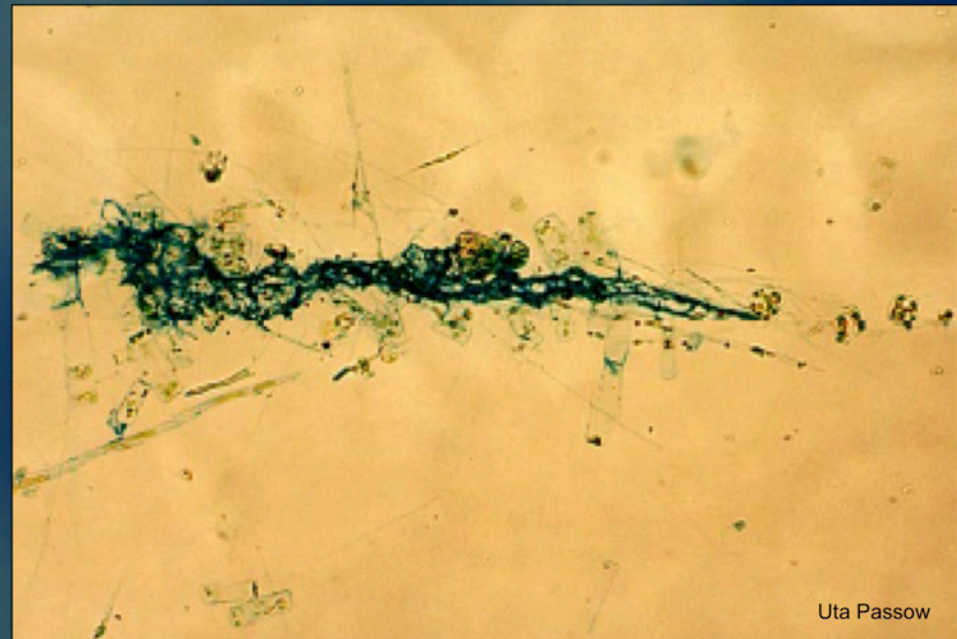
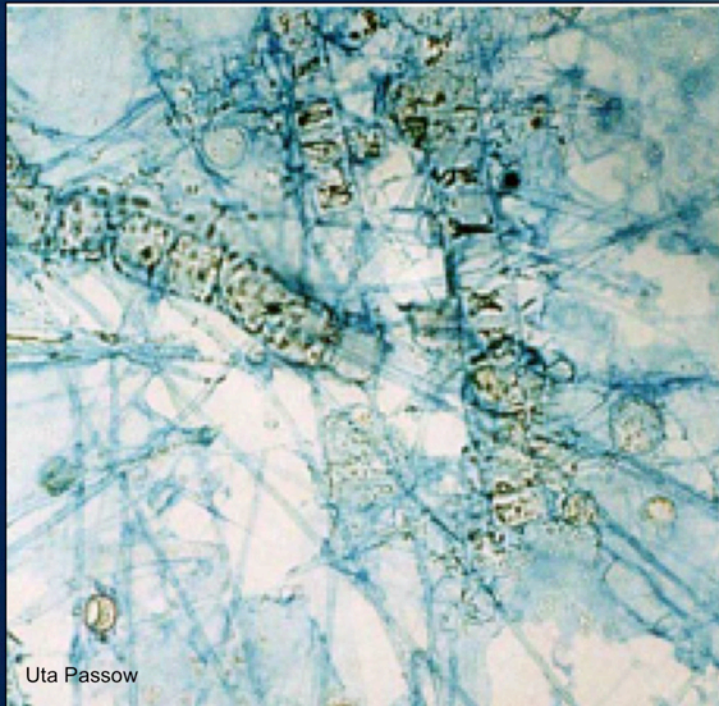
Sinking velocity or degradation?

Excursion II: Particle Sinking and Degradation

The Glue of Marine Snow

Role of TEP – Transparent Exopolymer Particles

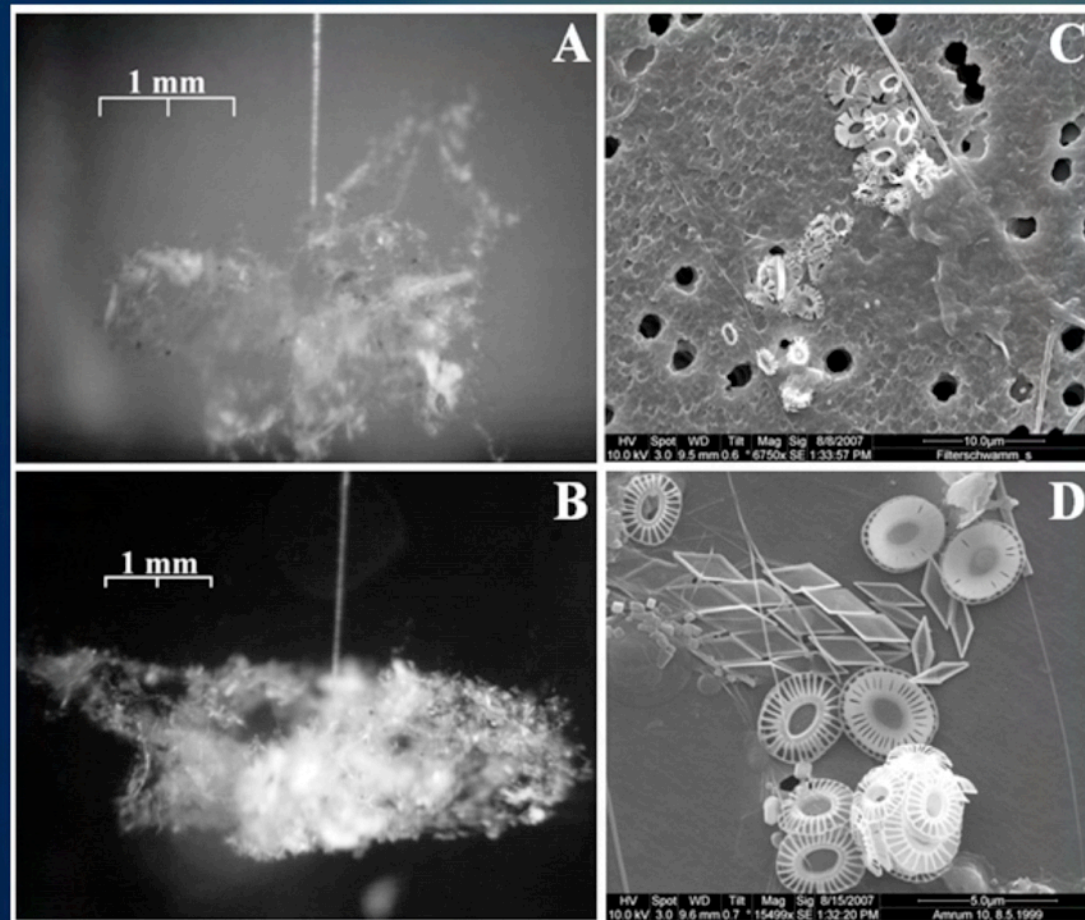
- The “glue” of marine snow
- The matrix of marine snow



Excursion II: Particle Sinking and Degradation

Sinking Particles: Marine Snow

Coagulated marine snow are typically formed by diatoms but often contain other particles which can add ballast; i.e. calcium carbonate from coccolithophores or terrigenous material such as dust and clay



Iversen et al. 2010