

Organic Carbon in Sediments

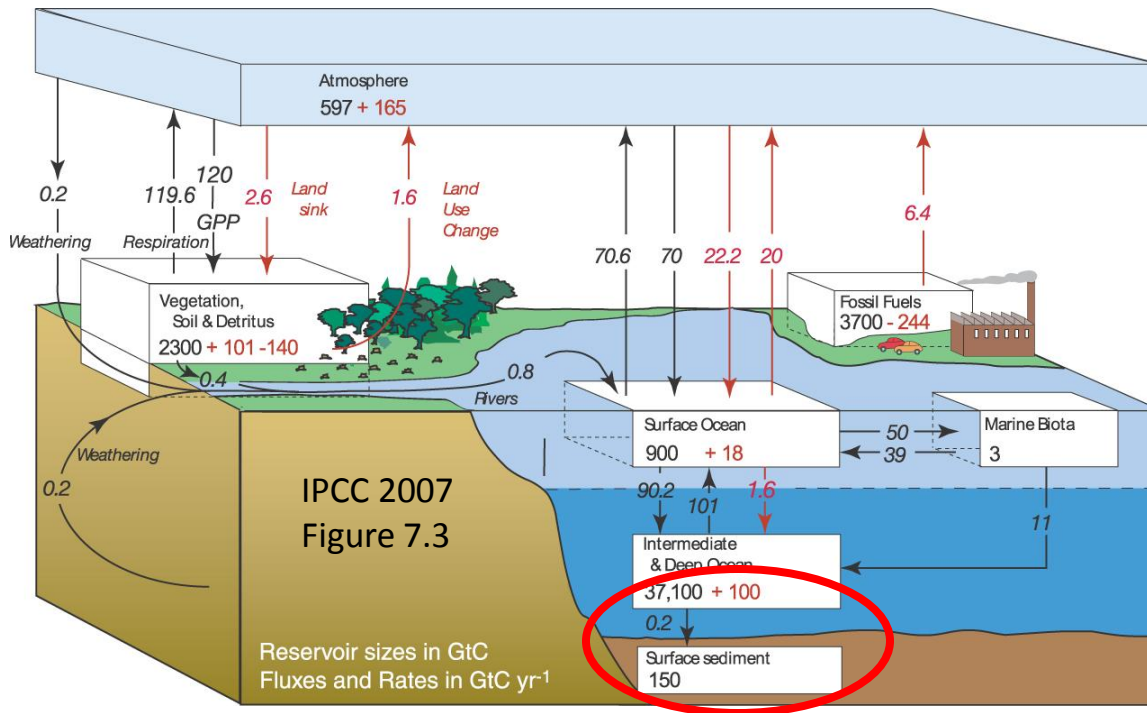
Why should we be interested ?

Emerging conceptual models



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Why we might NOT be interested



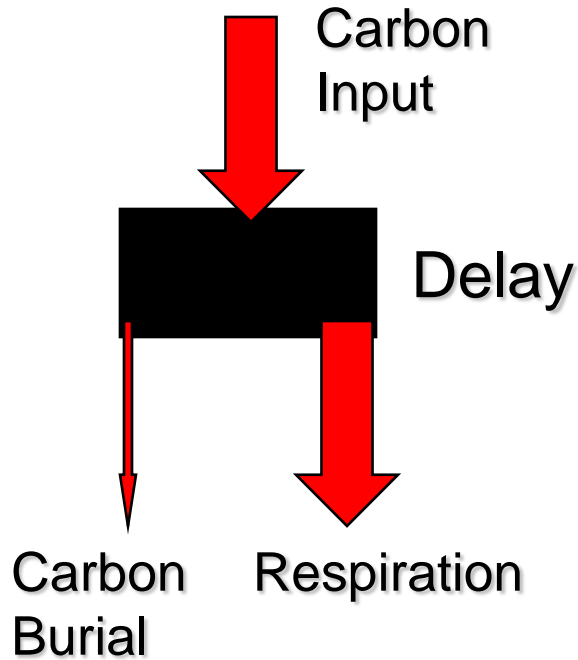
- No relevance for storage anthropogenic carbon
- Burial of organic carbon in marine sediments is small flux

Why we should be interested in Organic Carbon (OC) at seafloor

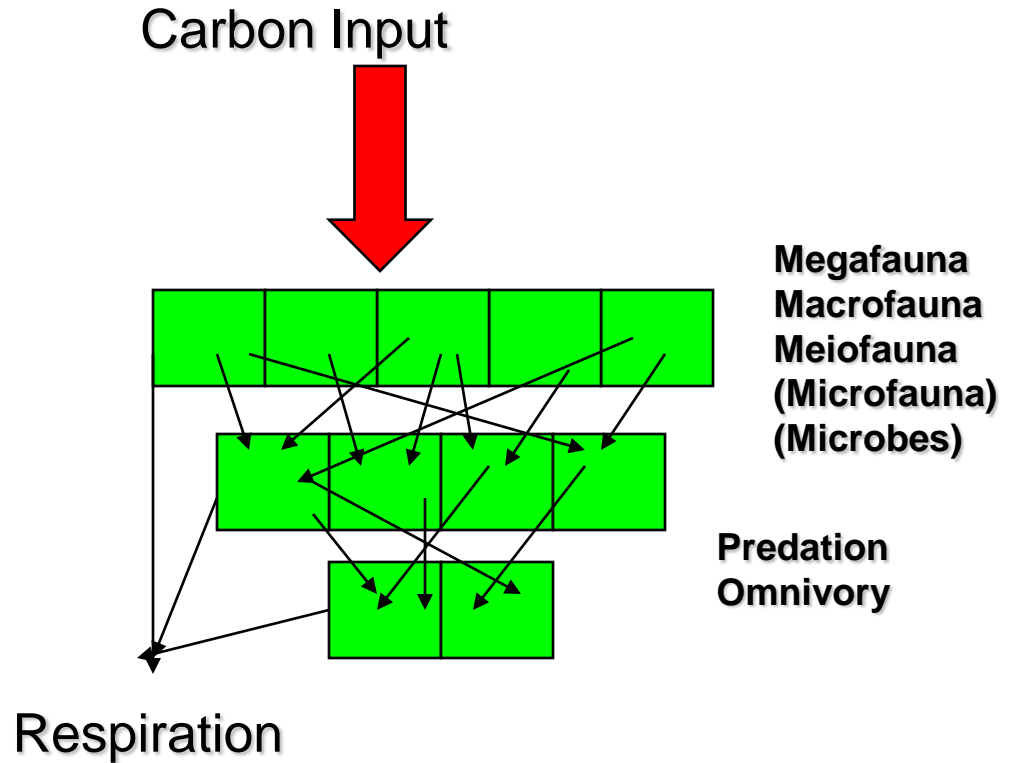
- OC buried represents transfer of carbon from rapidly recycling biosphere to geosphere
 - Governs atmospheric oxygen on geological time scales
 - Provides resources to deep biosphere (10-30% of living biomass on Earth)
- OC provides an excellent archive for paleoceanography and paleoclimatology
- OC is efficiently recycled (>90%), guaranteeing recycling of essential nutrients
- OC is food resource for benthic life (Archaea, Bacteria, Protists, Meiofauna, Macrofauna..)

Traditional Approaches

Biogeochemist



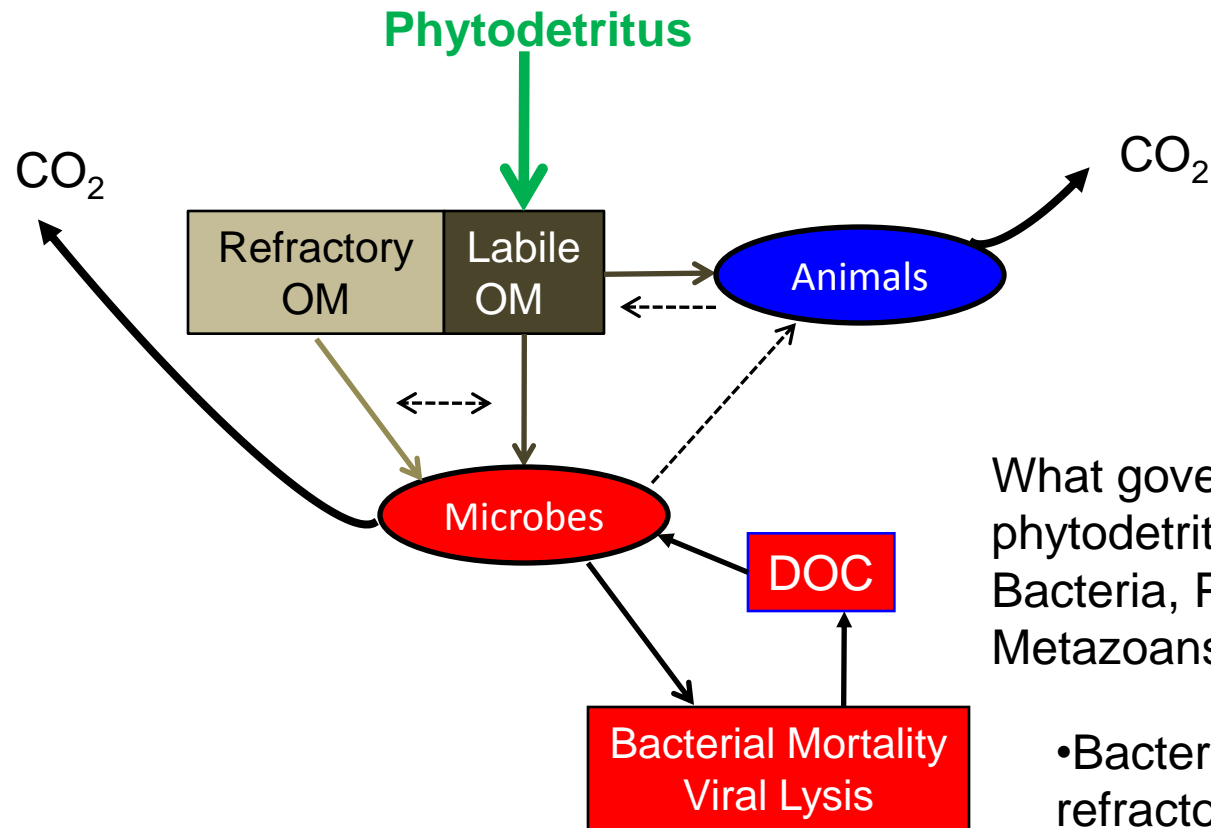
Ecologist



Key Findings from Last Decade

- Seasonality at seafloor (time-lapse photography, time-series and experimental blooms)
- Direct competition for phytodetritus among bacteria, foraminifera and animals (^{13}C tracer)
- Bacterial mortality and viruses are linked
- Quality/degradability of OC involves biological, physical and chemical aspects
- Accumulated evidence for an oxygen effect on OC preservation; both on quality and quantity

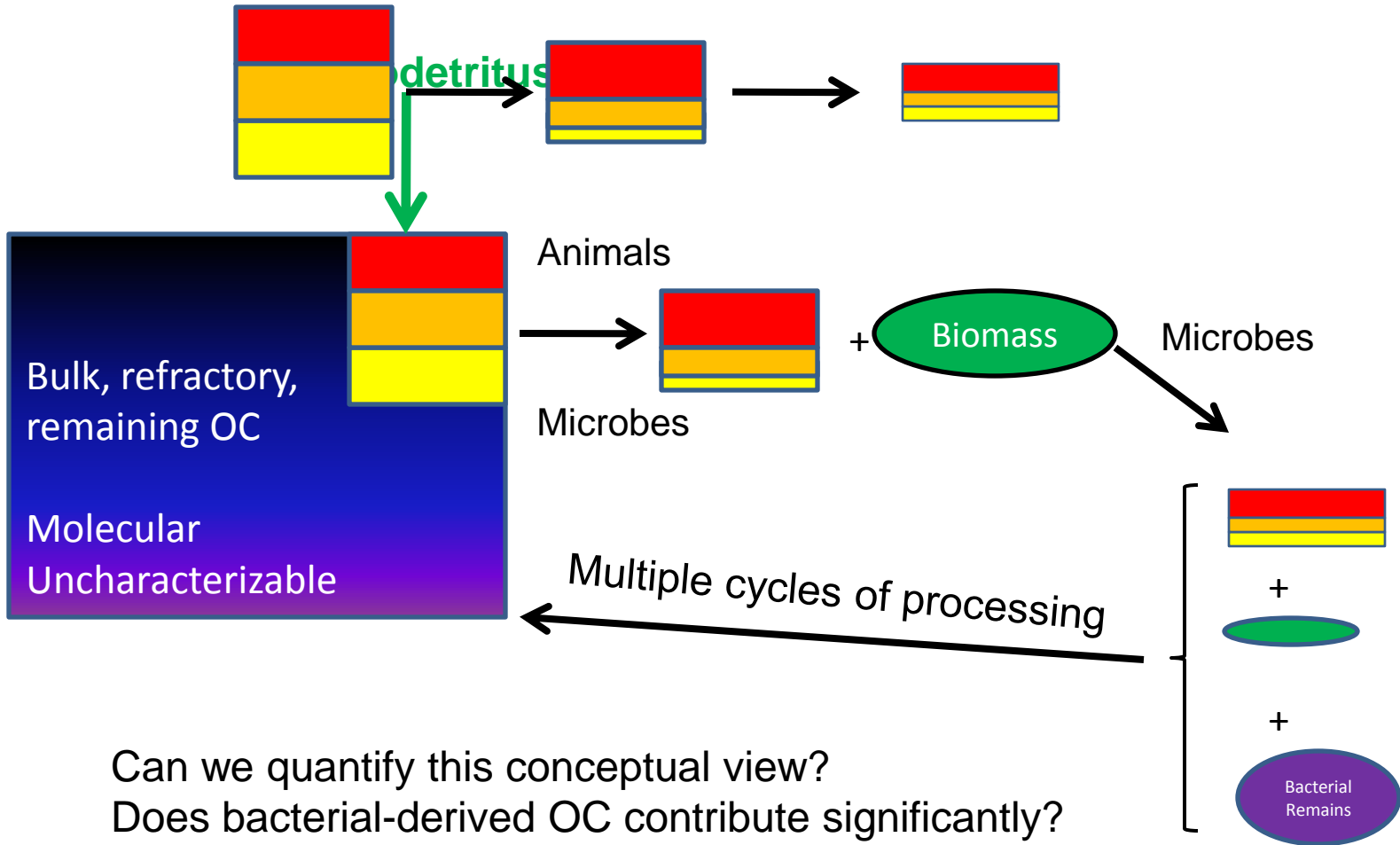
A New View on Benthic Food webs



What governs partitioning of phytodetritus among Archaea, Bacteria, Protozoans and Metazoans?

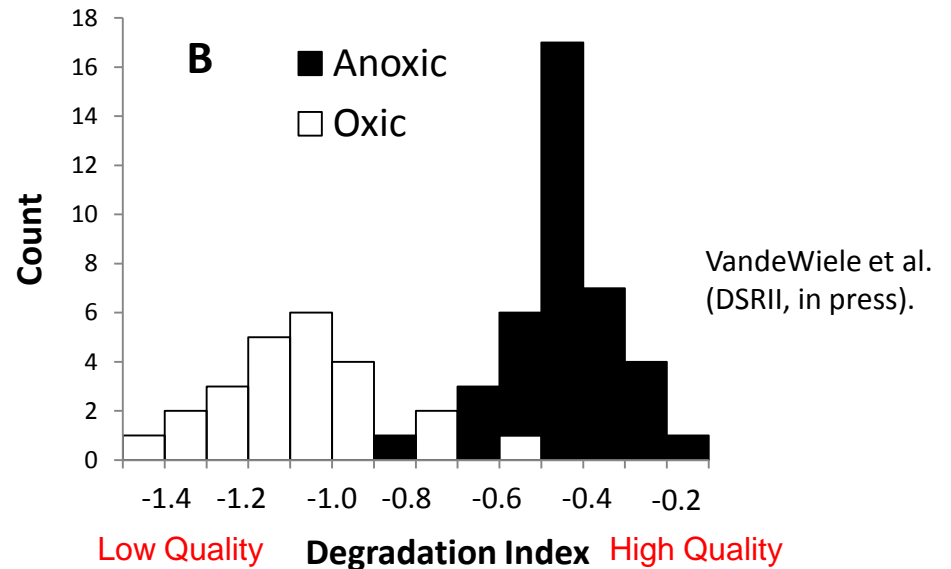
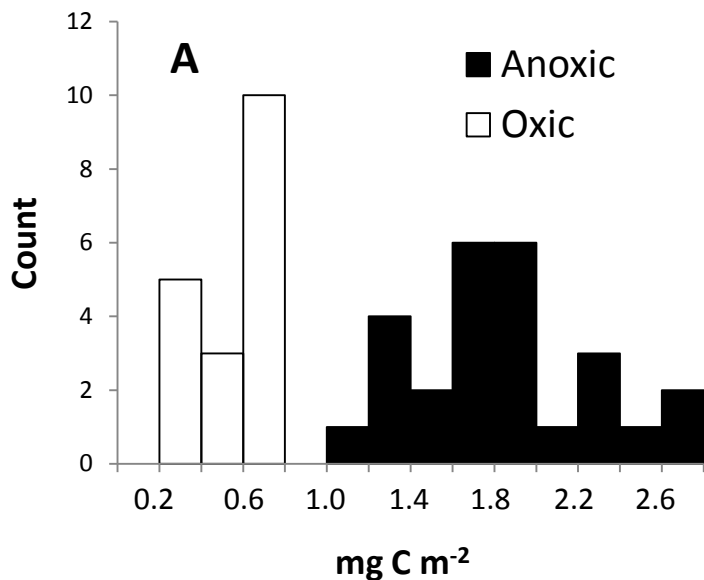
- Bacteria profit from refractory and labile carbon
- Bacteria are involved in recycling loop: dead-end
- Little transfer from bacteria to animals
- Co-metabolism?

OC degradation



Can we quantify this conceptual view?
Does bacterial-derived OC contribute significantly?
What is the role of oxygen?

Anoxia: more carbon and of better quality

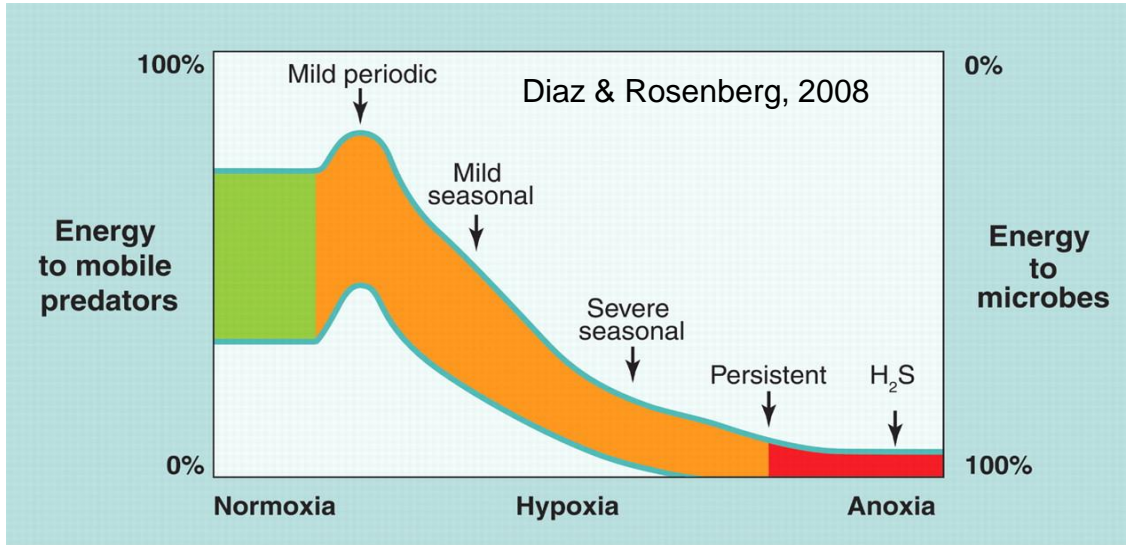


Organic carbon in Oxygen Minimum Zone of Indian Ocean

Mechanism for Oxygen Effect

- Direct effects:
 - chemistry and enzymes
 - Physiology, growth efficiency
- Indirect effects via fauna
 - Bioturbation (animals mix sediment, co-metabolism, etc)
 - Bio-irrigation (animals enlarge aerobic zone of sediments)
 - Alternating conditions

Consequences Hypoxia



Ecosystem scale
Energy use

