Documenting and tracking offshore ecosystem dynamics: baselines, impacts, and recovery

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TechSurge → Advancing Oil Spill Technology: Beyond the Horizon

ECOGIG
Gulf Ecosystem Research

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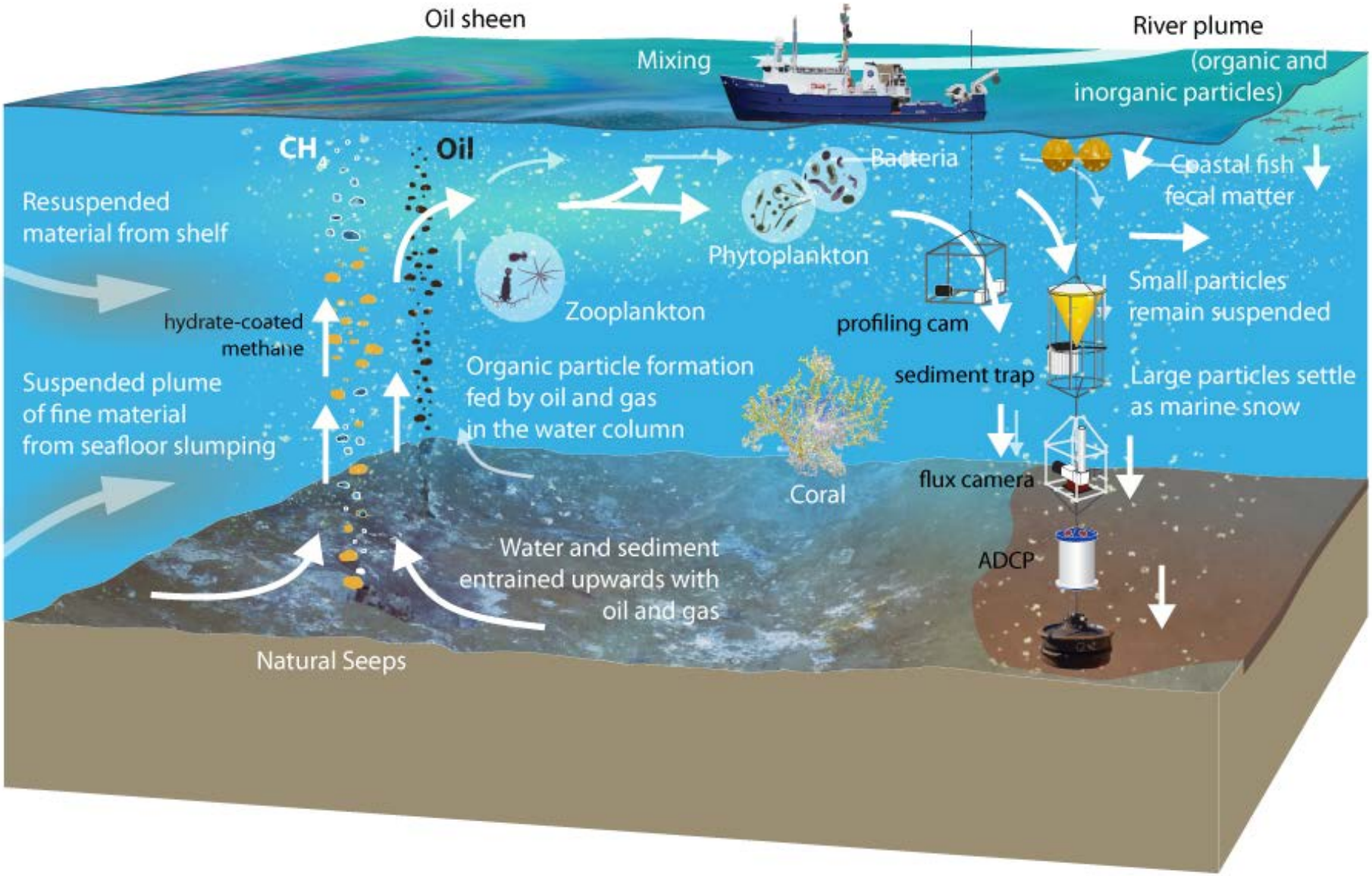
GULF OF MEXICO RESEARCH INITIATIVE

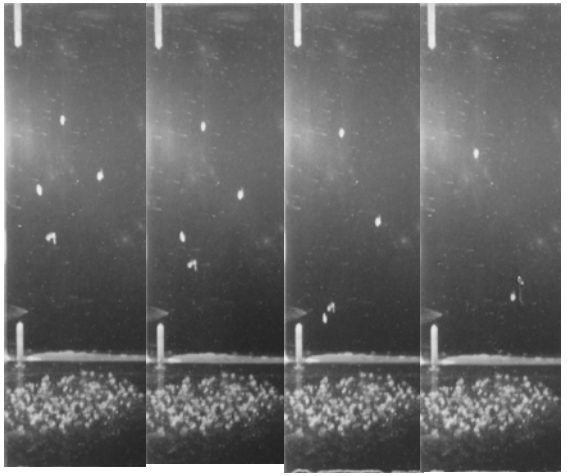
Hydrocarbon processing at natural seeps



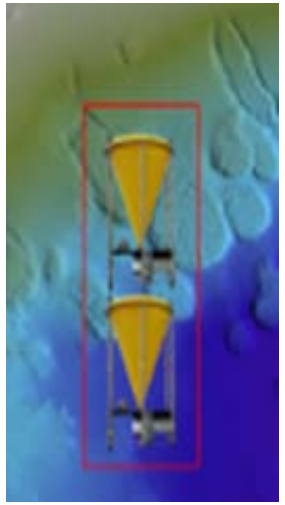
Tracking Oil Fate

- Oil settled to seafloor as organic aggregates (marine snow)

  ➔ easily re-suspended, mobilized and re-introduced into the water column via physical perturbation



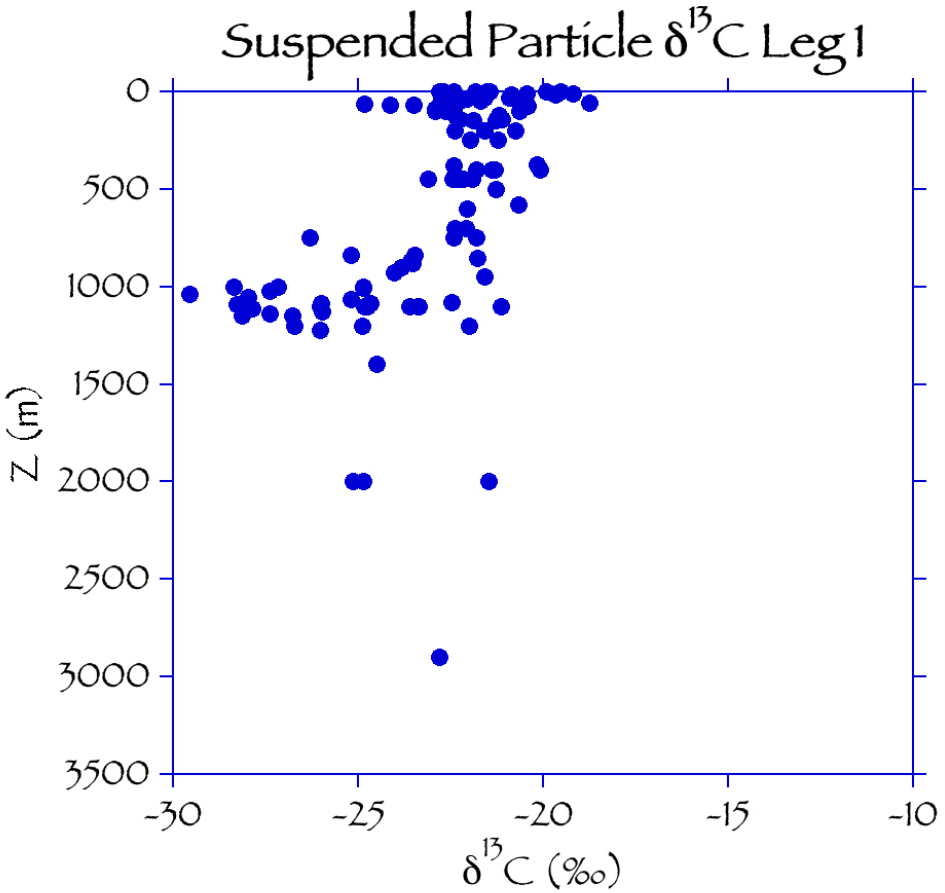
- Monitoring includes:
  - Camera equipped traps to measure the flux and sinking speed of aggregates
  - Time series sediment traps to monitor magnitude and timing of sinking particles and re-suspension events



Passow, Diercks, Asper

Tracking Oil Assimilation

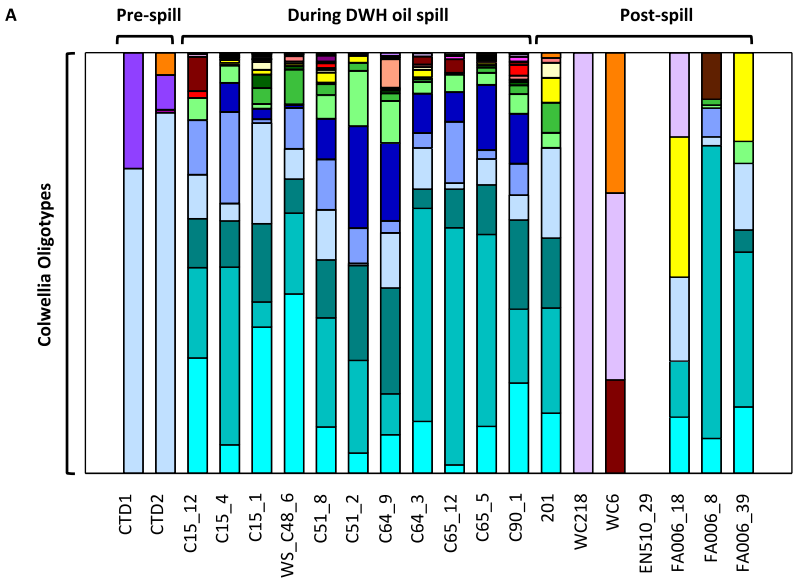
Sept. 2010 Particle $\delta^{13}C$ (^{14}C confirmed petrocarbon influence)



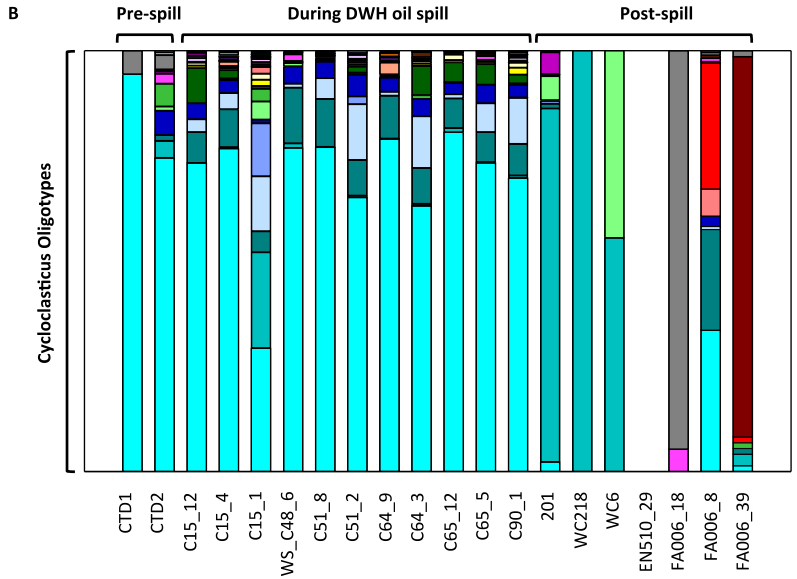
Fernandez et al. 2017, Limnology & Oceanography

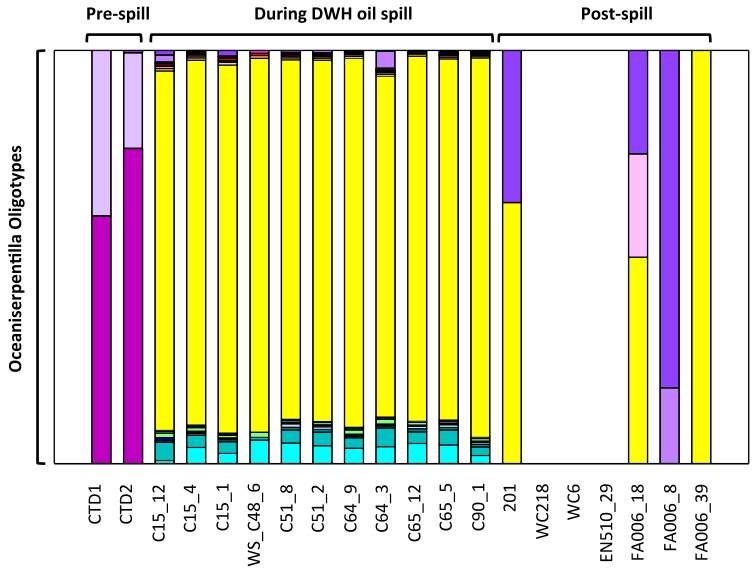
Montoya, Chanton

Tracking the Microbial Response



- **Oligotyping** used to resolve closely related taxa at the sub-OTU level
- *Oligotypes present in impacted samples distinct from those at natural seeps*
- **Previously unrecognized diversity of** *Oceanoserpentilla*, *Cycloclasticus*, and *Colwellia* points to *changing ecological niches that selected for specifically adapted ecotypes*

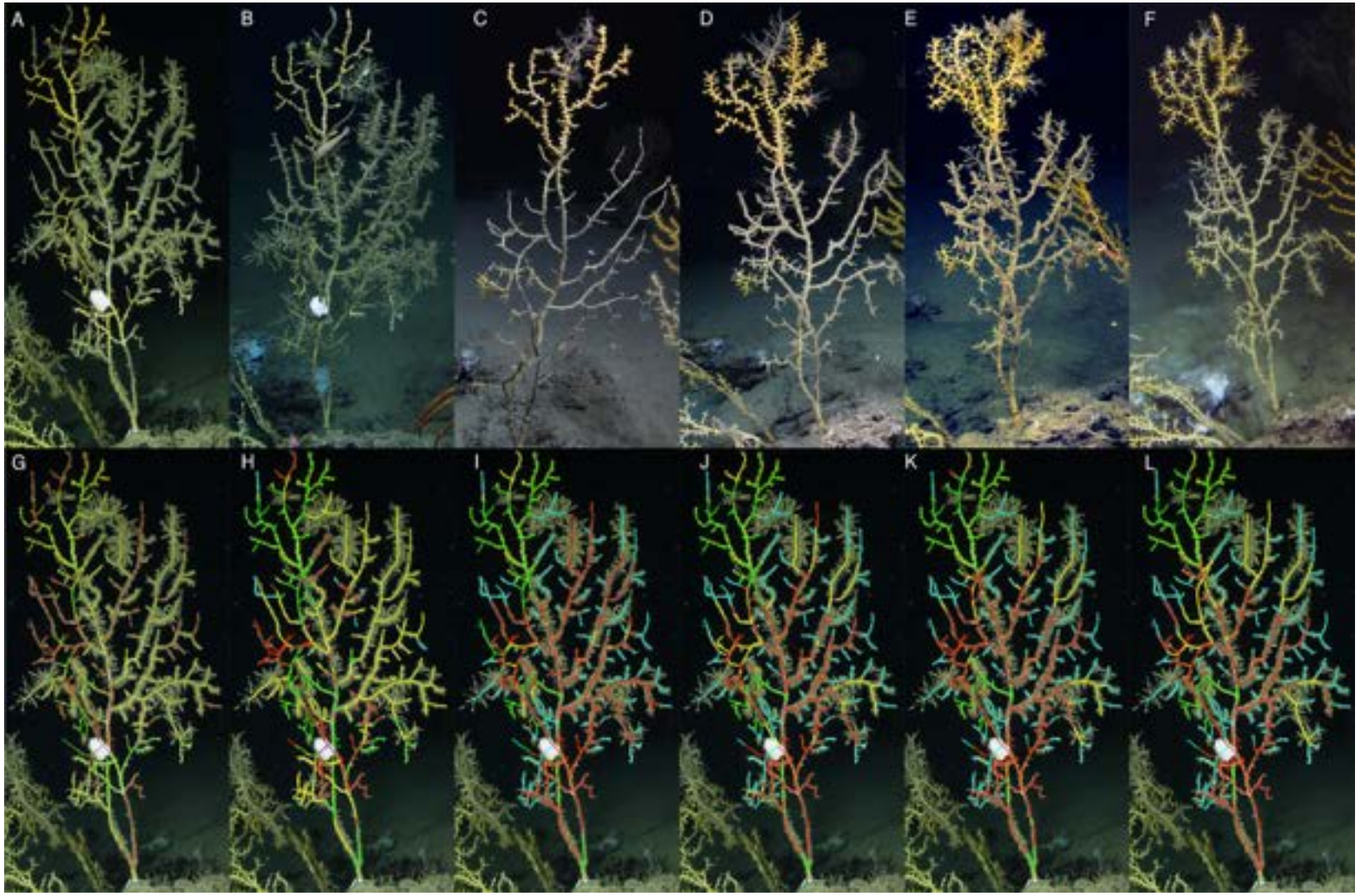




Kleindienst et al., 2016, The ISME Journal

Seafloor impacts – cold water coral monitoring

2011 2012 2013 2014 2015 2016



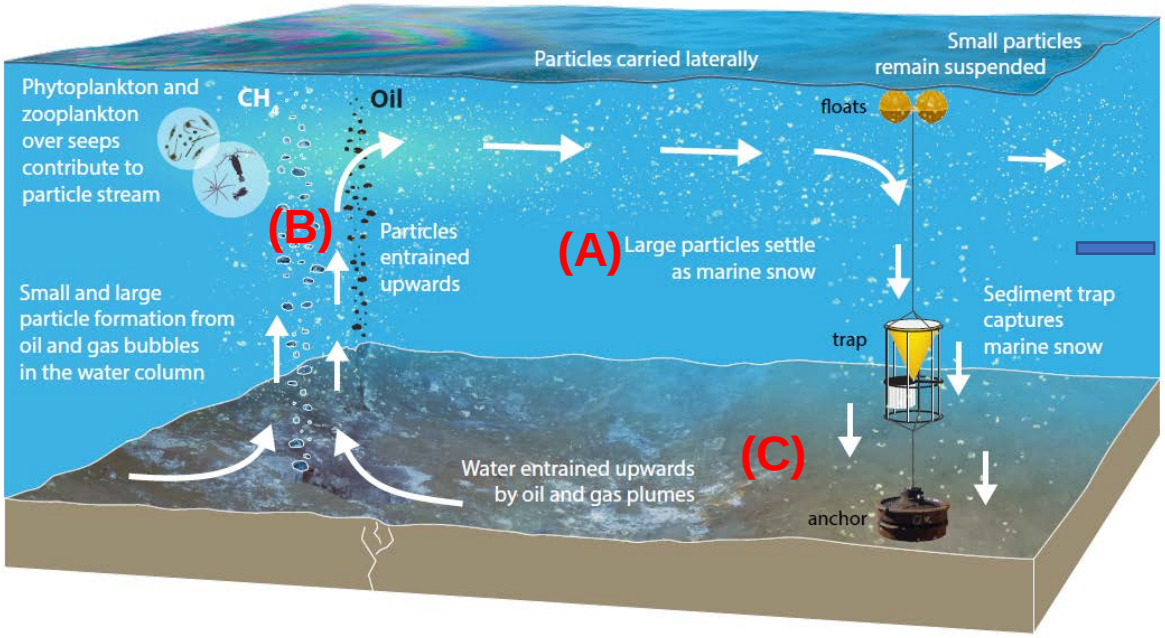
Fisher, Baums, Girard, Vohse

The Challenge

•variability over vertical depth **(A)** PLUS localized inputs of hydrocarbons **(B)** that spatial and temporally discrete features

•anthropogenic and natural factors are drivers

•tightly coupled benthic-pelagic system **(C)**



Requires

- spatial & temporal studies
- in situ instruments, incl. new applications of drones, gliders and osmotically-fueled biological and chemical sensors
- more realistic "fate" studies