



# EXport Processes in the Ocean from Remote Sensing – EXPORTS

## Status, Results from the First Cruise & Plans for the North Atlantic



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### Goal & Science Questions

EXPORTS's goal is to improve predictions of the export and fate of ocean NPP using satellite data and numerical models.

Q1: How do upper ocean ecosystems determine the flux of organic matter from the surface ocean?

Q2: What controls the efficiency of vertical transfer of organic matter below the well-lit surface ocean?

Q3: How can the knowledge gained be used to reduce uncertainties in contemporary & future estimates of the export and fates of NPP?.

### Overall Project Plans

**Two Phases:** Field campaign followed by modeling & synthesis phase

#### Focus on Pathways & Fates:

Controls on the 3 dominant export pathways - sinking, migration & advection

Assess BGC impacts & use BGC to constrain flux estimates

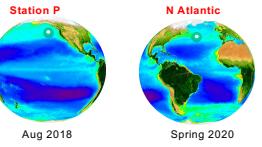
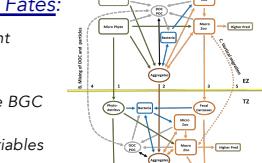
Link to remote sensing variables for satellite algorithms

#### Field Program:

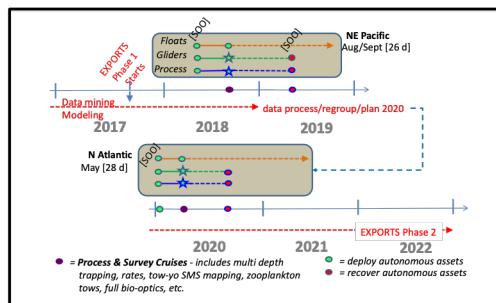
Two cruises: Station P and North Atlantic

Coordinated sampling with two ships & multiple AUVs

Dedicated data management team



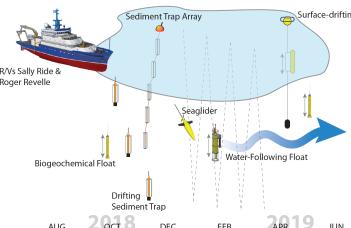
### Timeline



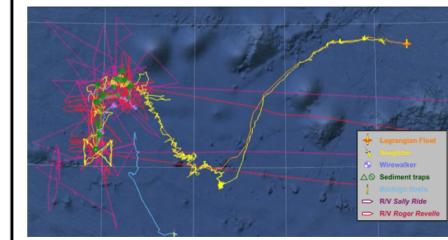
### The NE Pacific Cruise

#### Station P (50°N 145°W)

- Leverages Canada's Line P program, NOAA PMEL's Ocean Climate Mooring & Papa OOI global node
- Unique site with Fe-limitation for phytoplankton growth & low mesoscale energy
- R/V Revelle & R/V Sally Ride sailed August 9 & 10, 2018 with 27 days of sampling



#### EXPORTS NE Pacific Sampling Planview



### Ship-Based Sampling

#### Process Ship:

Focus on vertical fluxes & rates

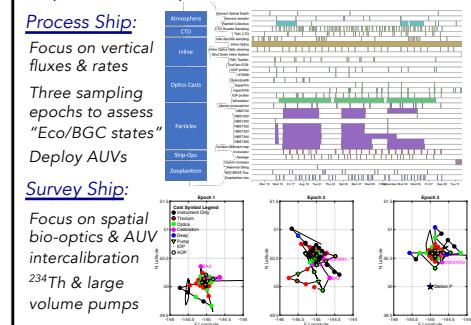
Three sampling epochs to assess "Eco/BGC states"

Deploy AUVs

#### Survey Ship:

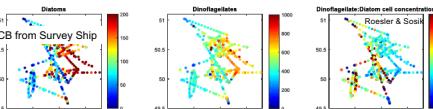
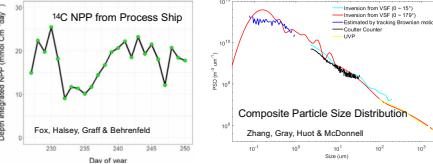
Focus on spatial bio-optics & AUV intercalibration

$^{234}\text{Th}$  & large volume pumps

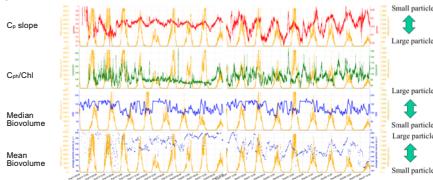


### NE Pacific Science Nuggets

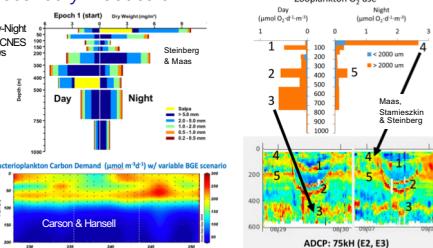
#### Primary Production & Producer Composition



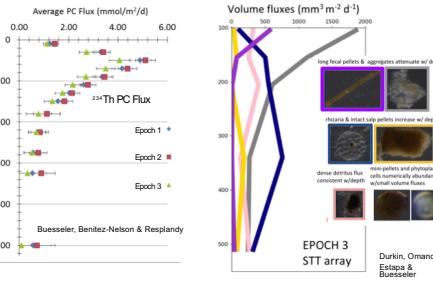
#### Optical Measures of Particulates



#### Secondary Producers

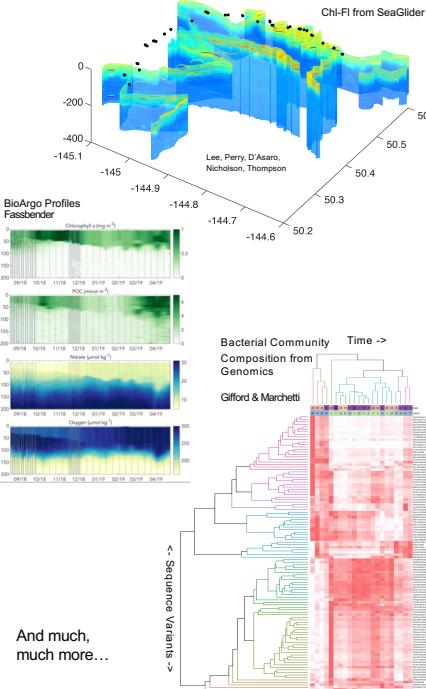


#### Export Flux & Pathways



### NE Pacific Science Nuggets

#### Variability in Time



### Next Steps

#### Goals & Plans for EXPORTS North Atlantic Cruise

- Contrasting endmember to 2018 NE Pacific cruise
- Big biomass & export signal & low flux attenuation
- High mesoscale & sub-mesoscale energy driving patchiness in biomass
- R/V's Atlantis & Armstrong on station for 28 days sailing April 2020 to ~50°N 30°W – Planning underway!!

#### Collaboration with WHOI OTZ Project

- Third ship focusing on higher trophic level processes & new tech - R/V Sarmiento de Gamboa

#### Phase 2 - EXPORTS Synthesis & Modeling

- NASA is planning to support Phase 2 for EXPORTS focusing on data synthesis & modeling

Want more?? - [www.oceanexports.org](http://www.oceanexports.org)