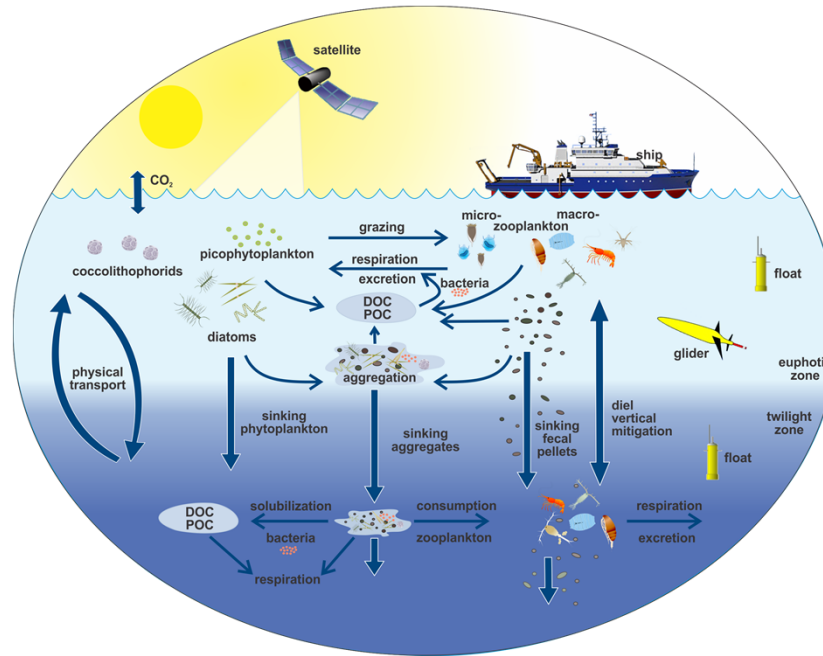# EXPORTS

EXport Processes in the Ocean from RemoTe Sensing

EXPORTS Writing Team: Mike Behrenfeld (OSU), Claudia Benitez-Nelson (USoCar), Emmanuel Boss (UMaine), Mark Brzezinski (UCSB), Ken Buesseler (WHOI), Adrian Burd (UGA), Craig Carlson (UCSB), Eric D'Asaro (UW), Scott Doney (WHOI), Mary Jane Perry (UMaine), Dave Siegel (UCSB), Rachel Stanley (WHOI), Deb Steinberg (VIMS)

http://cce.nasa.gov/cce/ocean.htm

What is EXPORTS?

A community-vetted science plan for a NASA field campaign
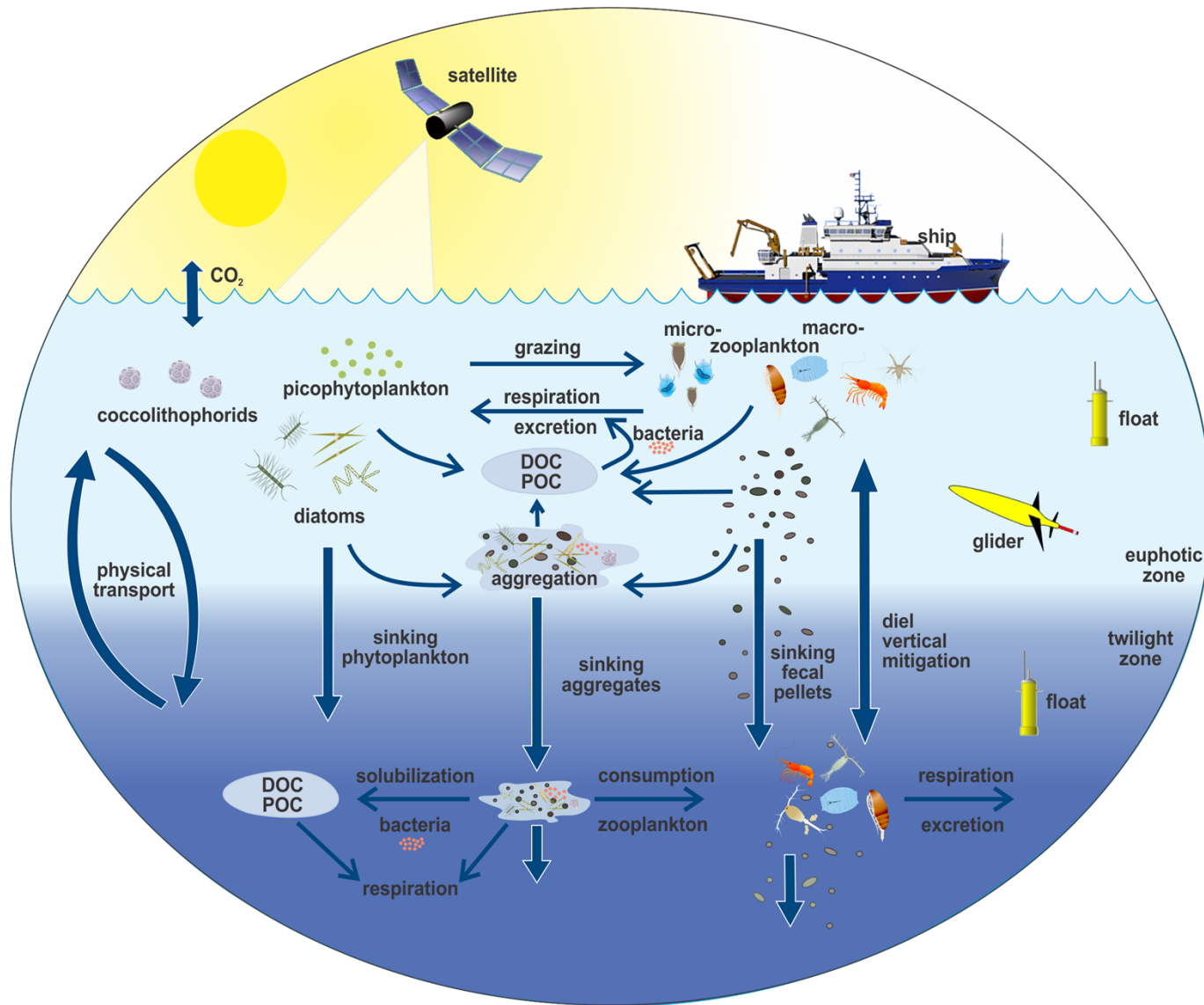
Predict the **state** of the biological carbon pump from satellite & other observations

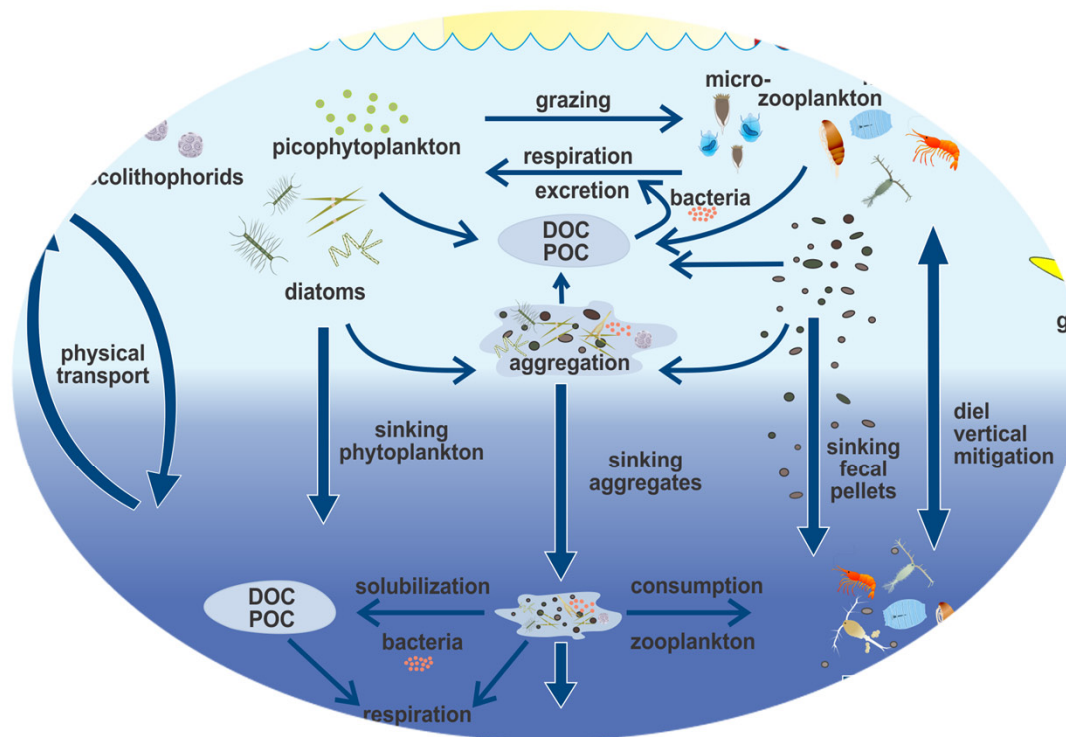EXPORTS plan in public comments until **Aug 25**
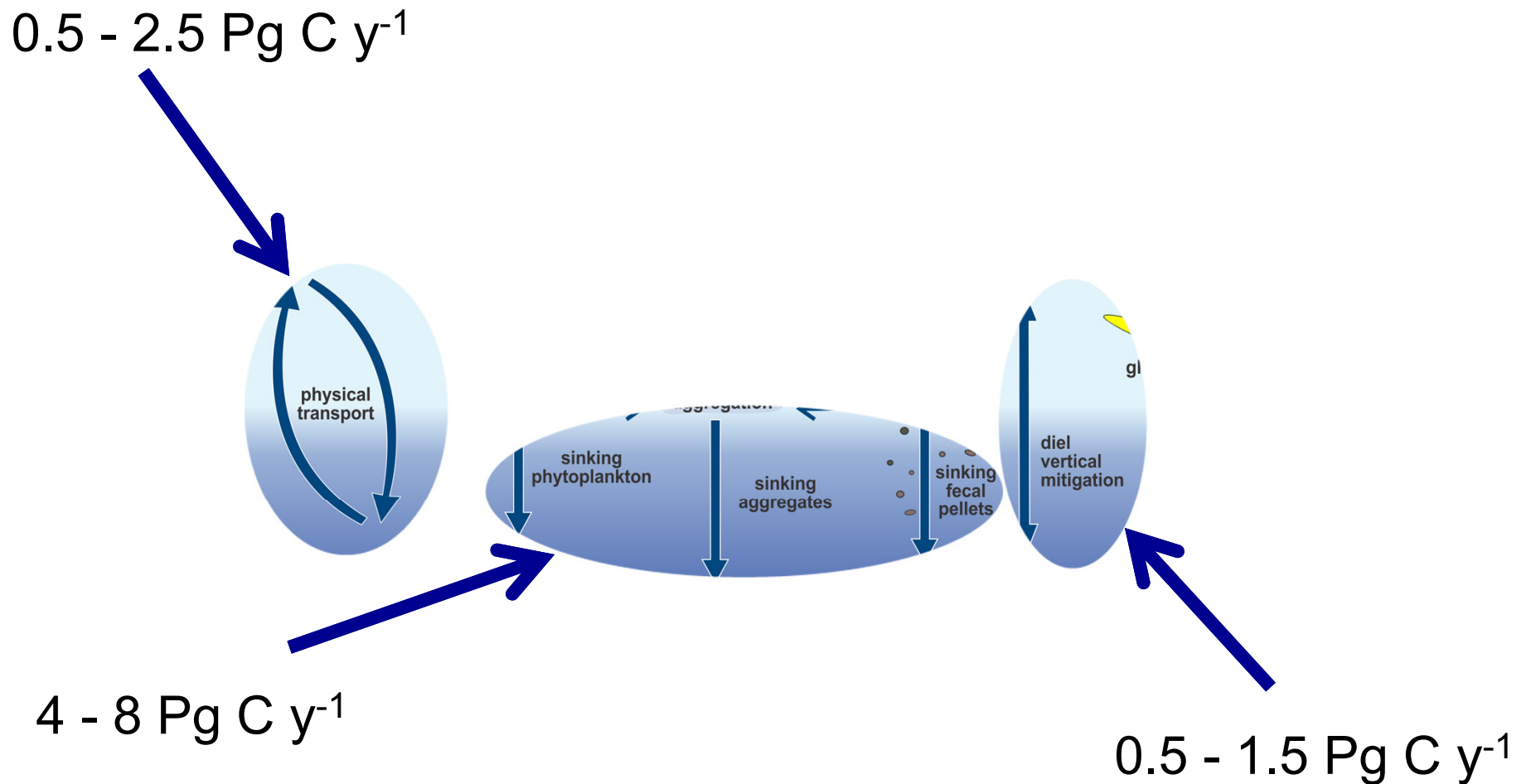http://cce.nasa.gov/cce/ocean.htm
Projected start date (if approved): 2017

Why EXPORTS?

# Why? Need to understand, quantify & predict how ecosystem processes transfer organic matter to depth

Why? Improve global estimates of carbon export from the euphotic zone (4 to >12 Pg C y^{-1})

0.5 - 2.5 Pg C y^{-1}

physical transport

sinking phytoplankton

sinking aggregates

sinking fecal pellets

diel vertical mitigation

4 - 8 Pg C y^{-1}

0.5 - 1.5 Pg C y^{-1}

Why? Need to quantify the attenuation of export below euphotic zone (the twilight zone)
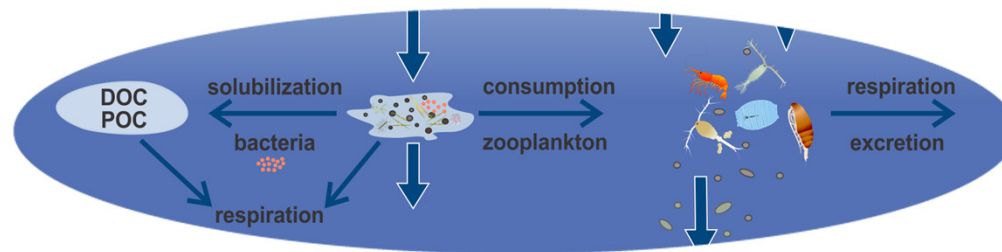
Why Now? Advances in remote sensing (& PACE!!) & autonomous tools make it time!

satellite

flo...
glider
eup...
z
twili...
zo...
...n
float
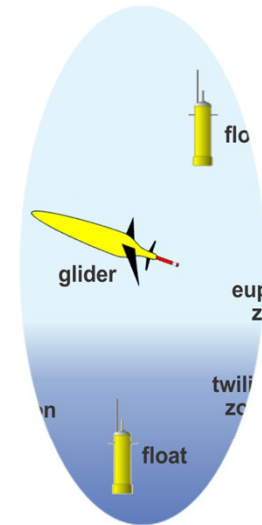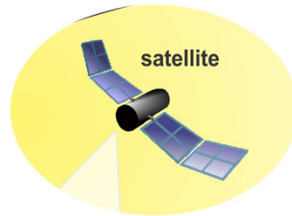
EXPORTS: Three Science Questions

How do upper ocean ecosystem characteristics determine the vertical transfer of organic matter from the well-lit surface ocean?

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

How can the knowledge gained be used to reduce uncertainties in contemporary & future estimates of the biological pump?
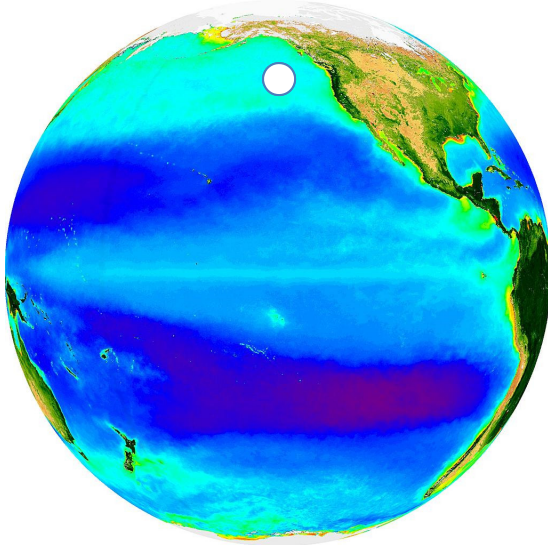
EXPORTS: Focus on Pathways

North Atlantic Bloom

Northeast Pacific Summer
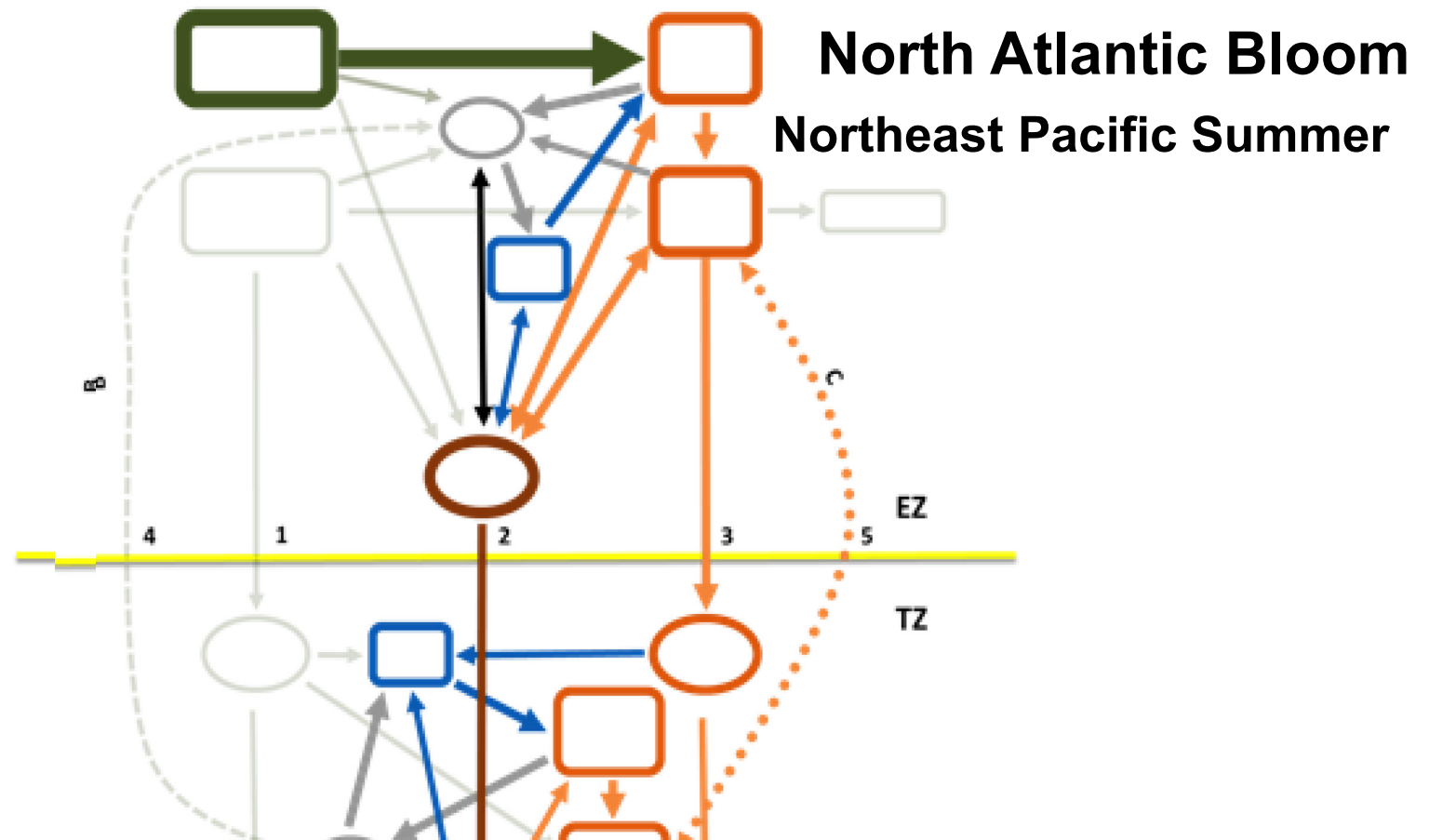
Goal: Predict the state of the biological pump given surface ecosystem characteristics

EXPORTS: Experimental Plan

Station P

North Atlantic

Spatial Ship

Lagrangian Ship
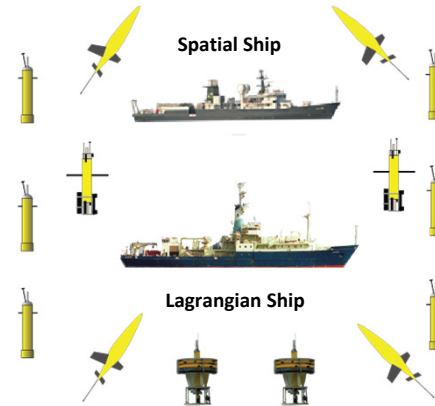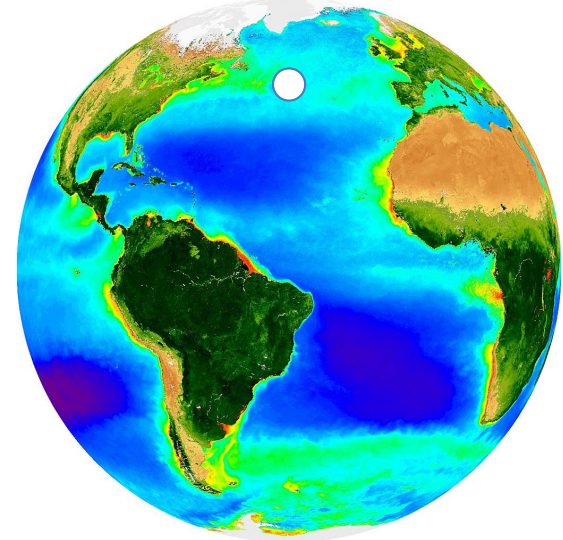
Cruise 1: April/May 30/45d
Cruise 2: Aug, 30d
Leverage: OOI node, LineP

Bloom: April/May 45 d
Non-bloom: Aug, 30d
Leverage: Internationals

Will collect ~8 states of the biological pump

Supplement by data mining existing results

EXPORTS: Experimental Plan

Water-following
follow instrumented mixed
layer float(s?)

Particle-Following
from production to trap
Measure C cycling fluxes
from 0 to 500 m (over 10 d)

Lagrangian Ship
Measure rates &
transformations

Spatial Ship
Submeso- & meso-scale
surveys (5-200 km)
Deploy short-term assets

Long Term Presence
Profiling Floats & Satellites
BioARGO, PSD & export proxy
Annual BGC budgeting
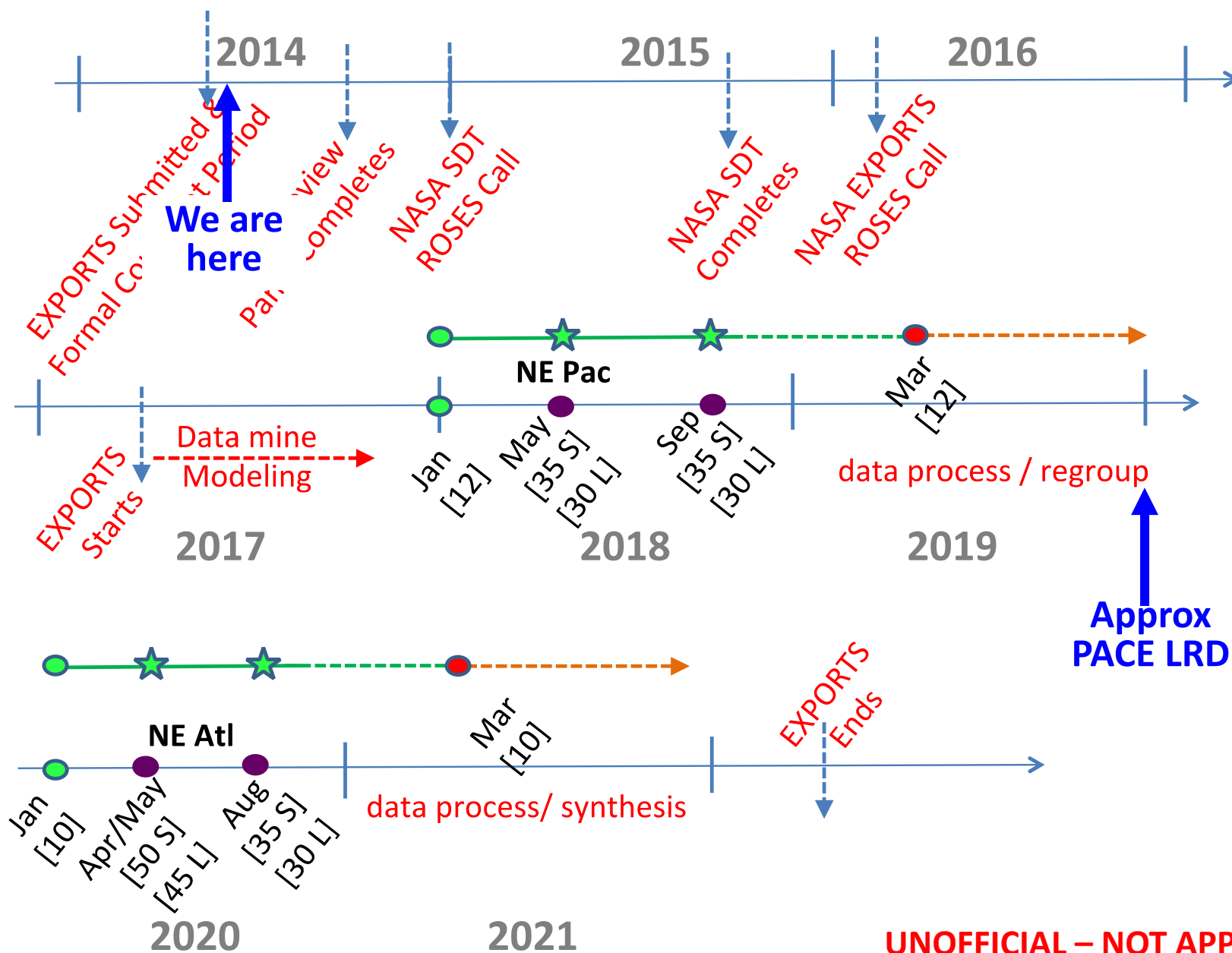O_2, NO_3, DOC, DIC, etc.

Optimize Spatial Sampling
Gliders surveying (5-100 km)
Bio-optical proxies
Satellite sampling
Ocean color & supporting info

EXPORTS: *Notional* Timeline

2014   2015   2016

EXPORTS Submitted &
Formal Co...

Pa... view
...mpletes

NASA SDT
ROSES Call

NASA SDT
Completes

NASA EXPORTS
ROSES Call

We are here

EXPORTS
Starts

Data mine
Modeling

2017

NE Pac

Jan [12]   May [35 S] [30 L]   Sep [35 S] [30 L]   Mar [12]

data process / regroup

2018   2019

Approx PACE LRD

NE Atl

Jan [10]   Apr/May [50 S] [45 L]   Aug [35 S] [30 L]   Mar [10]

data process/ synthesis

EXPORTS
Ends

2020   2021

UNOFFICIAL – NOT APPROVED!!!

EXPORTS: Next Steps

The EXPORTS Science plan is under public comment until **Aug 25 - http://cce.nasa.gov/cce/ocean.htm**

NASA will consider comments in a peer review panel to decide whether EXPORTS will be conducted

If selected: A Science Definition Team will be competed (end of this year?) to write the Implementation Plan & the EXPORTS field campaign would start 2017

Important: Every role in EXPORTS will be competed!!