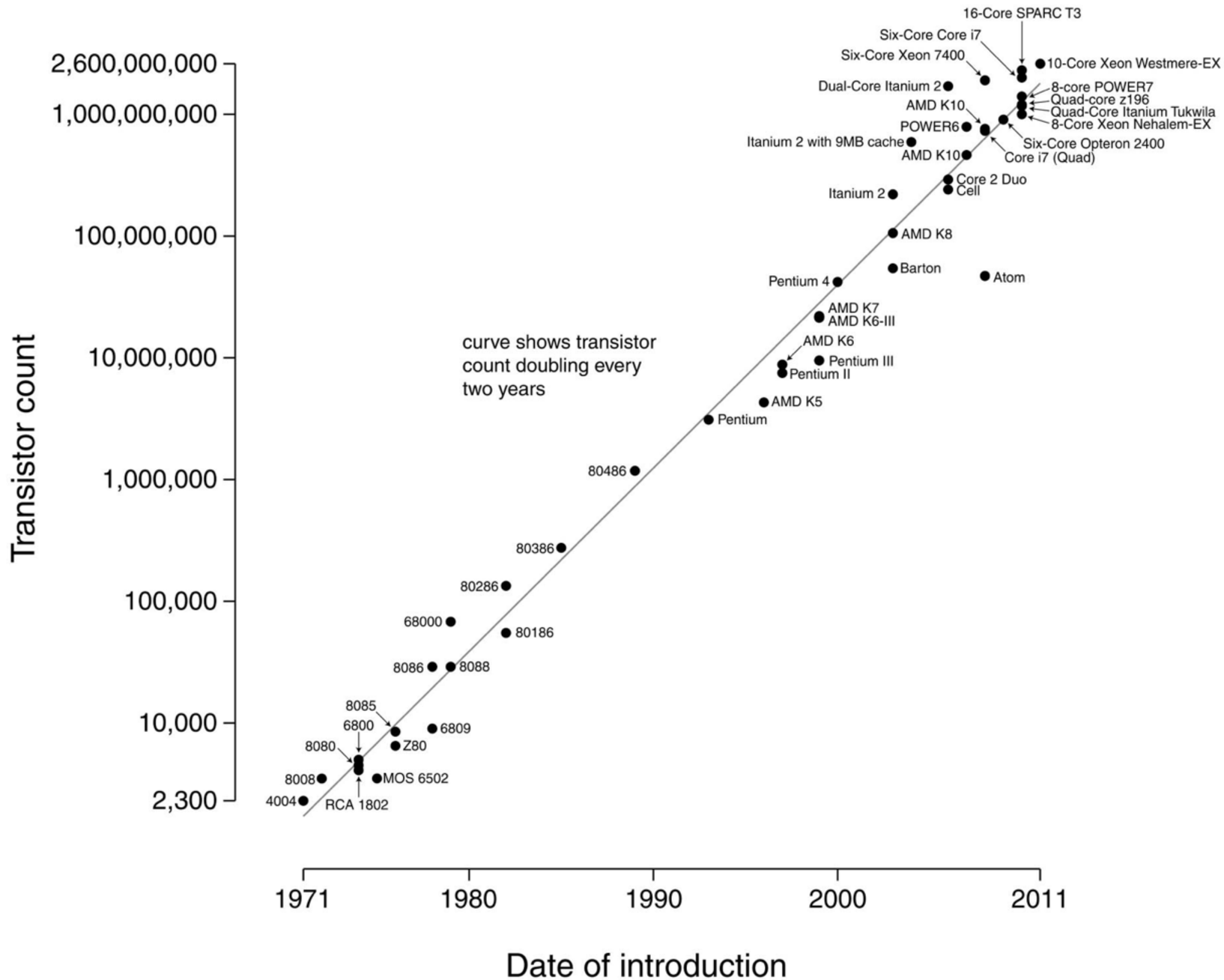

TOMORROW
www.sharkbait.co.uk/frontstories/front_images/tahitiDrollet.JPG

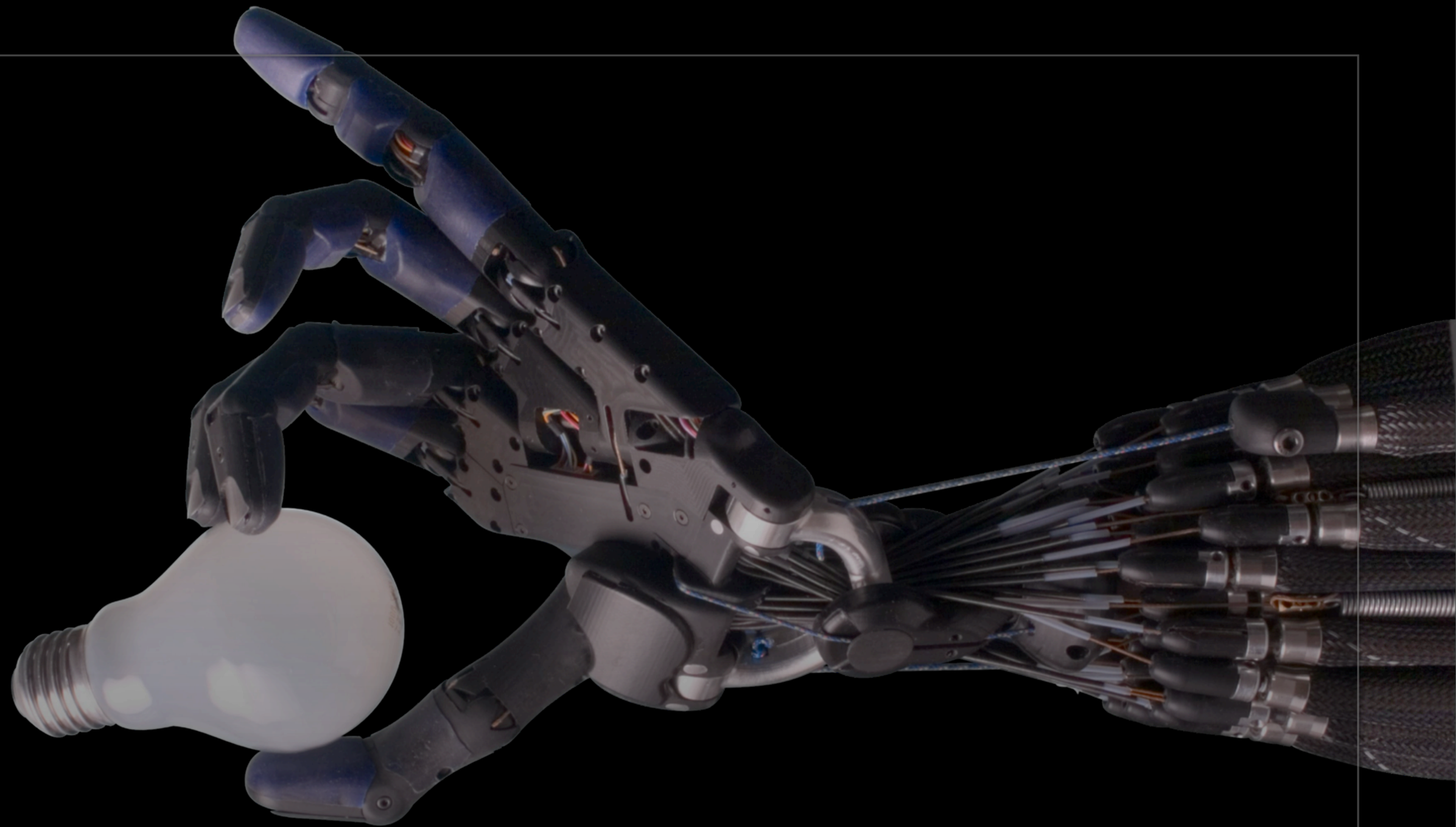
www.sharkbait.co.uk/frontstories/front_images/tahitiDrollet.JPG

www.sharkbait.co.uk/frontstories/front_images/tahitiDrollet.JPG


EMERGENT TECHNOLOGIES.....CONVERGING IN THE OCEANS
==> EXPONENTIALLY INCREASING CAPACITY TO WORK WITHIN !
www.sharkbait.co.uk/frontstories/front_images/tahitiDrollet.JPG

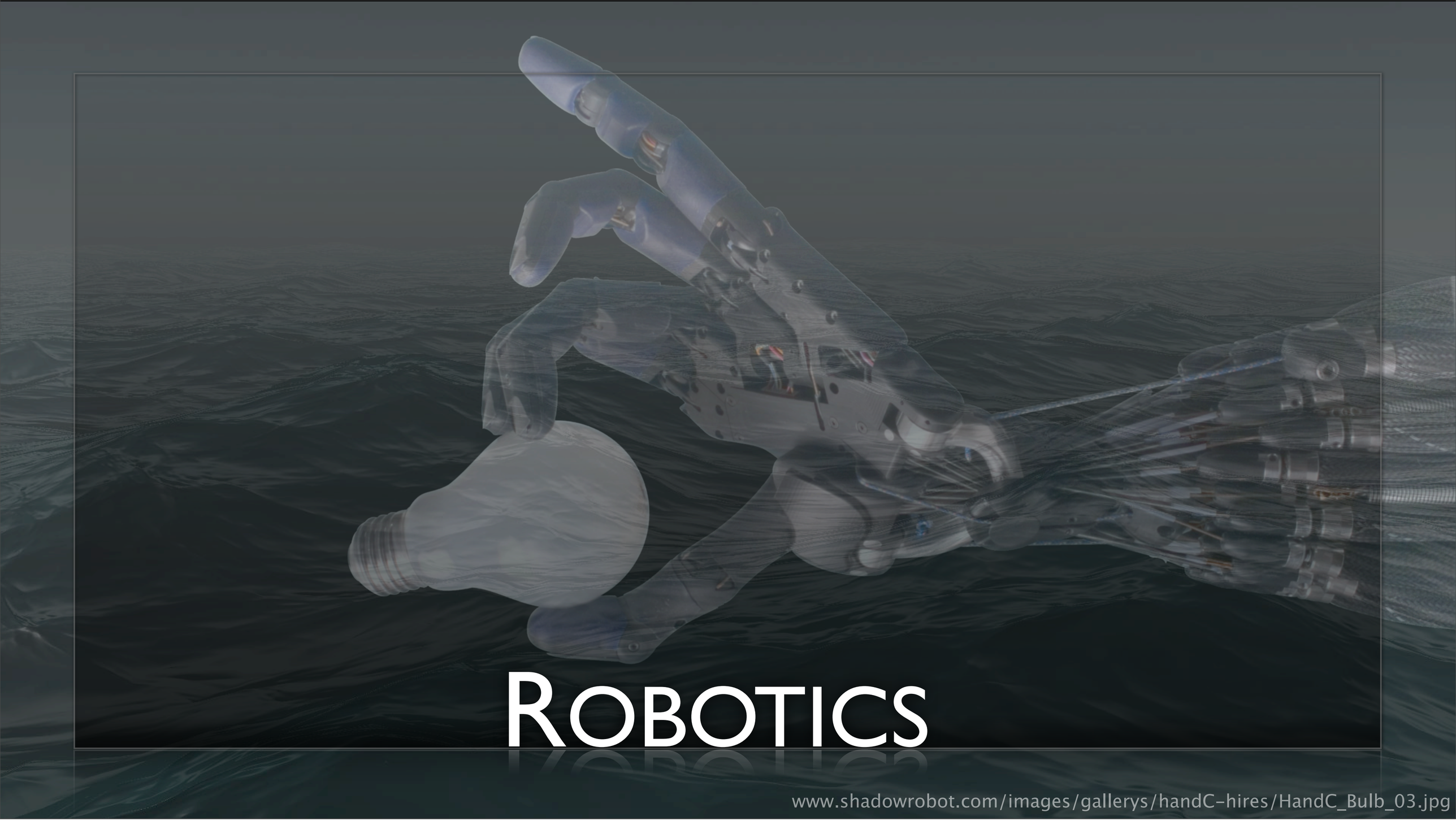
Microprocessor Transistor Counts 1971-2011 & Moore's Law





Robotics

www.shadowrobot.com/images/gallerys/handC-hires/HandC_Bulb_03.jpg



Robotics

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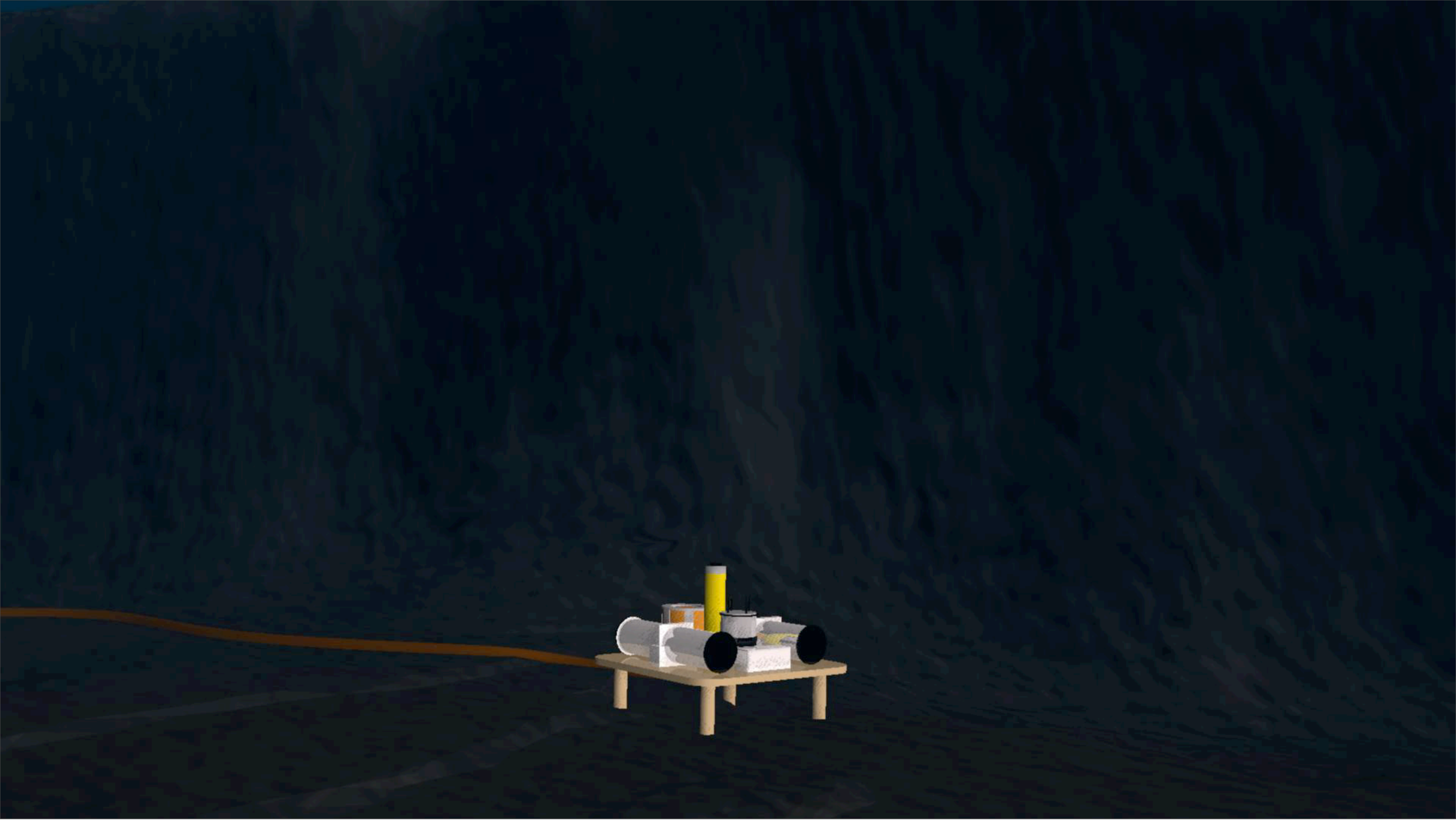
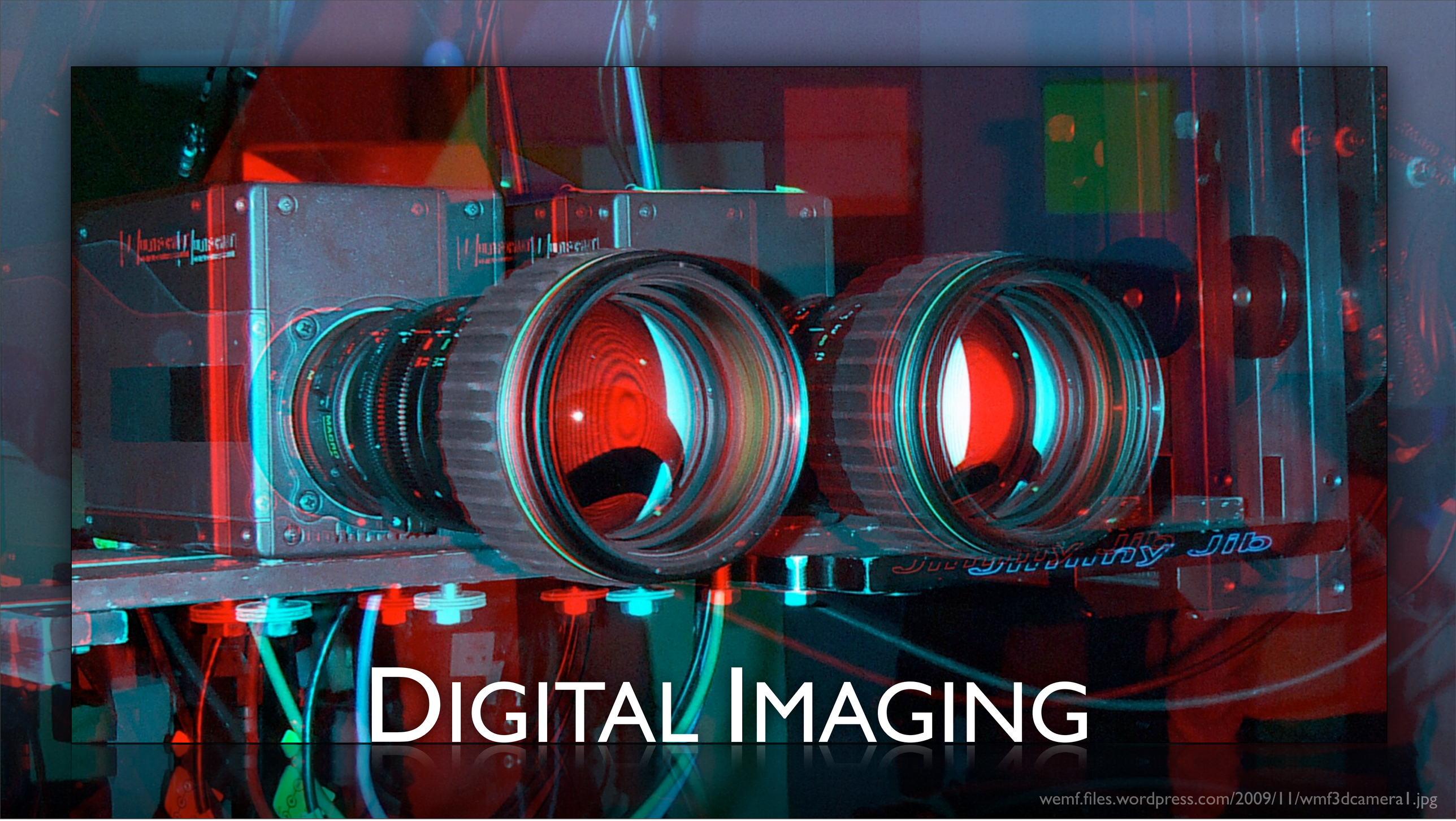
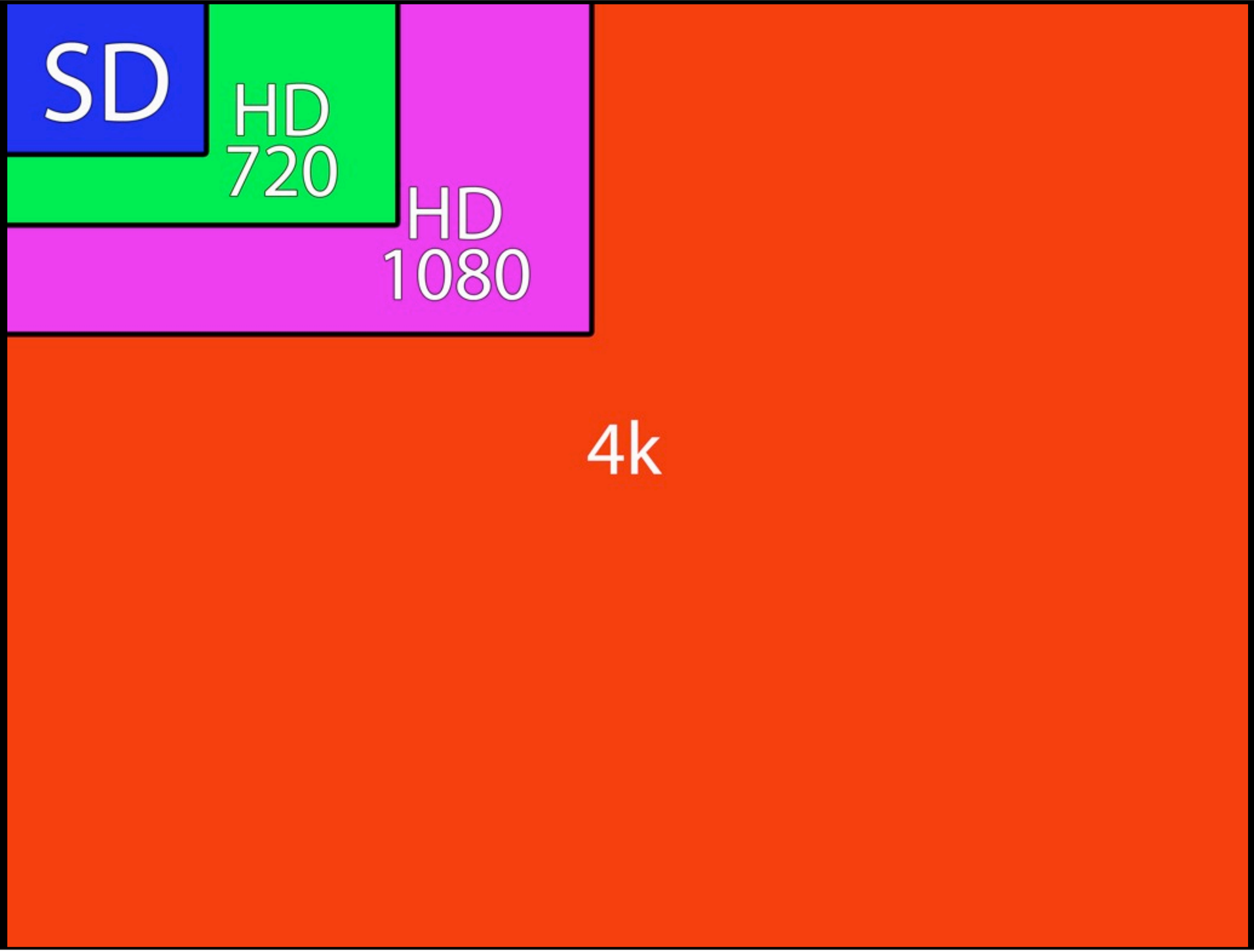
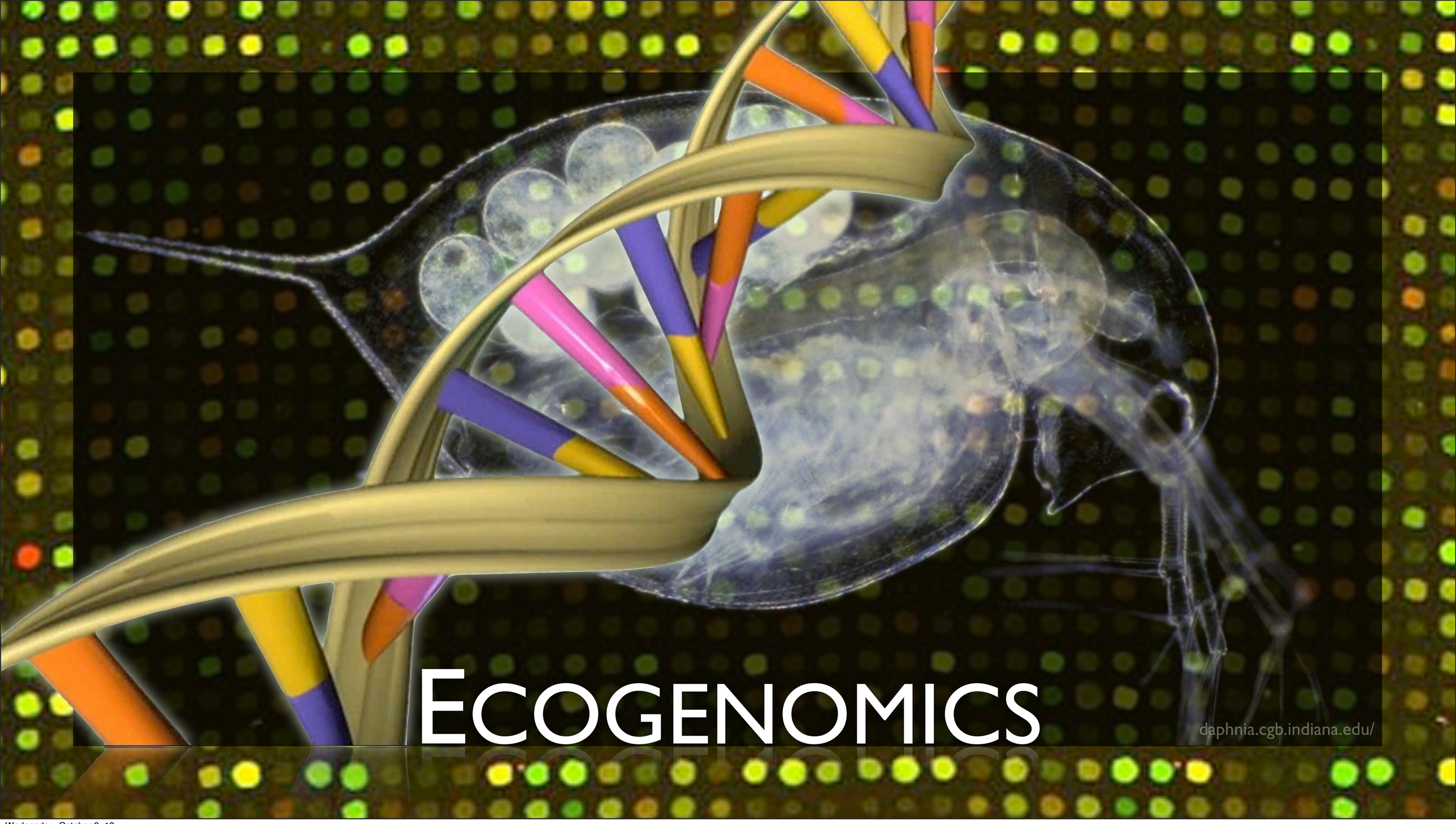


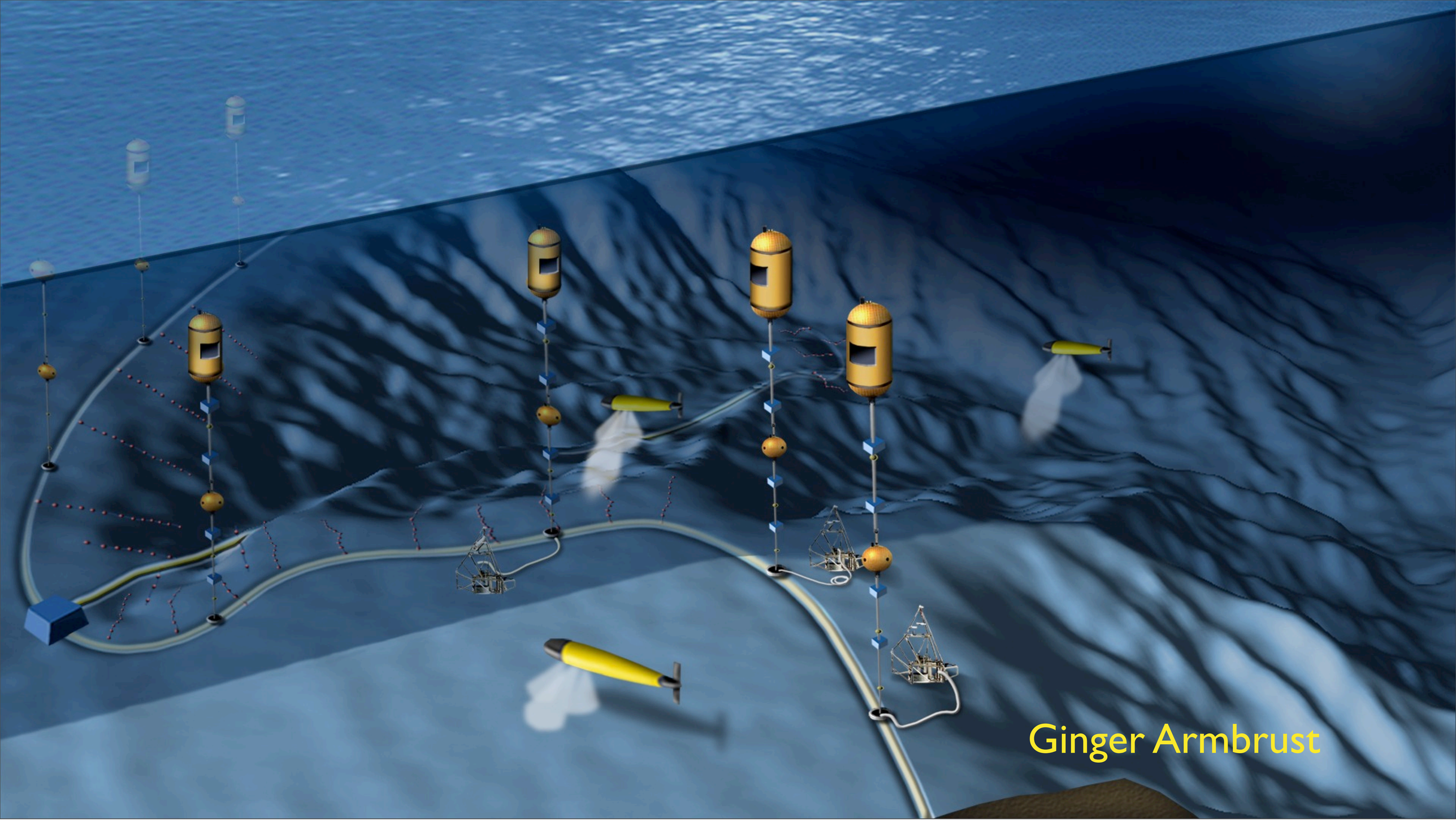


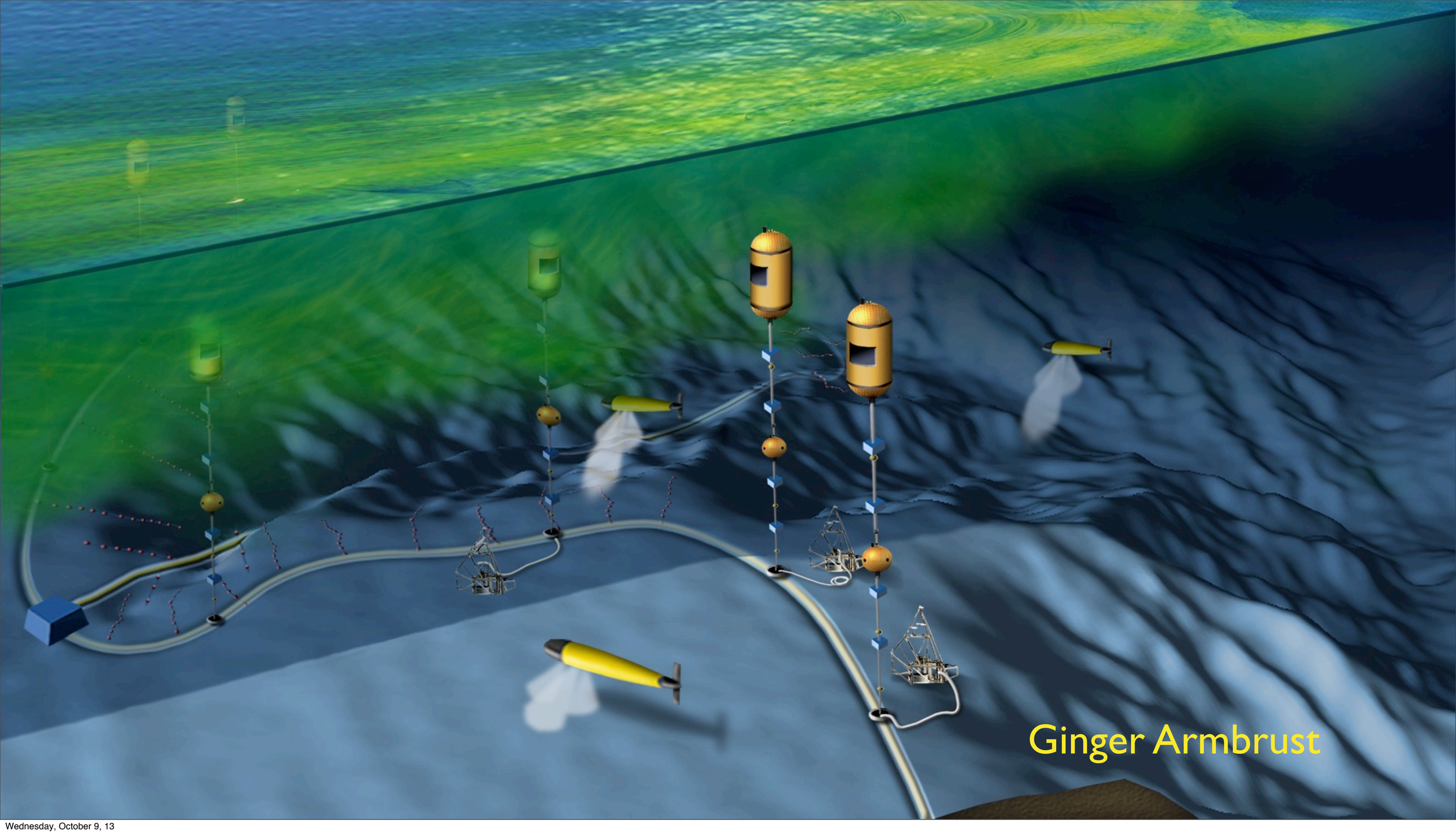
Digital Imaging

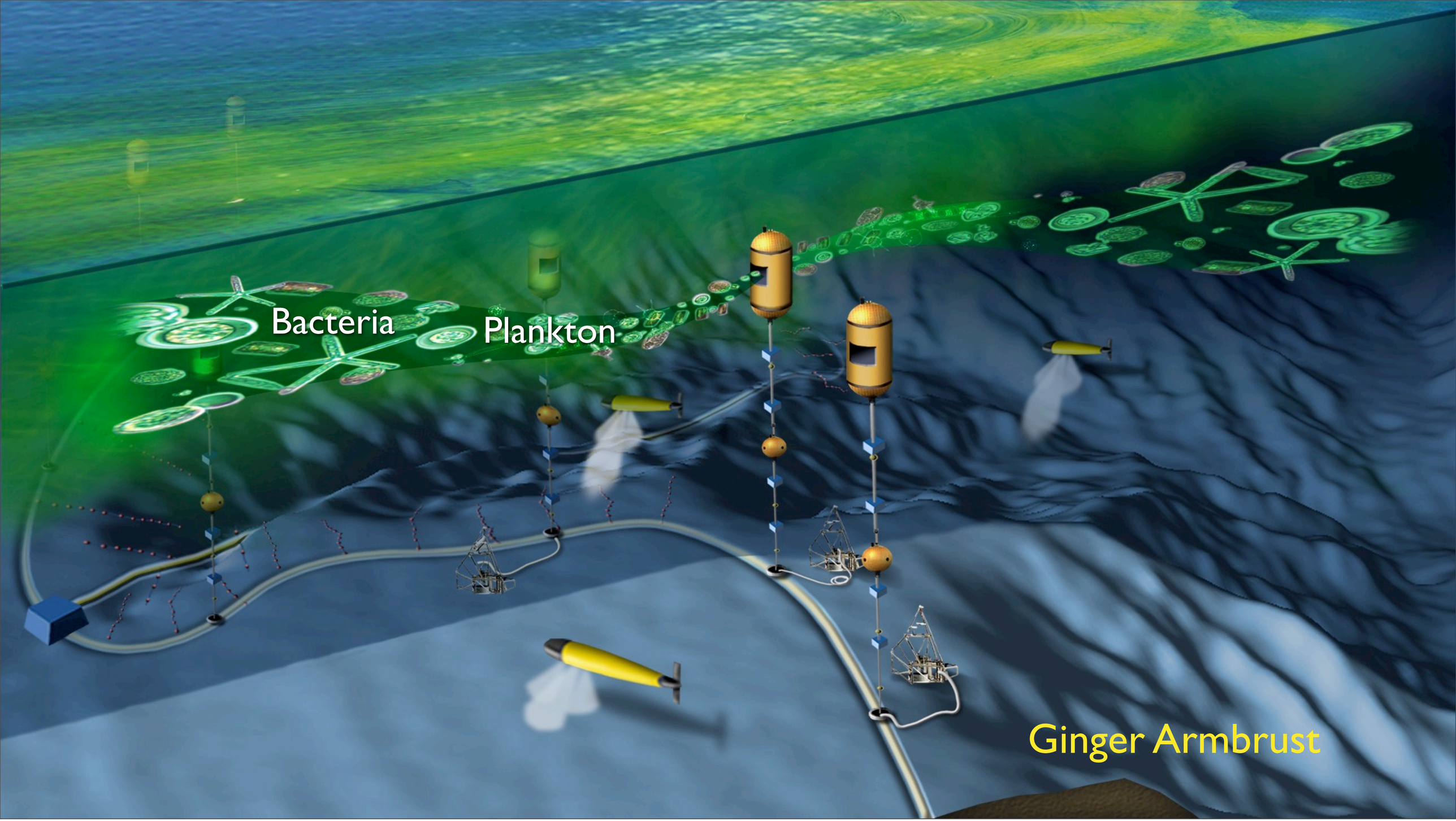
wemf.files.wordpress.com/2009/11/wmf3dcamera1.jpg

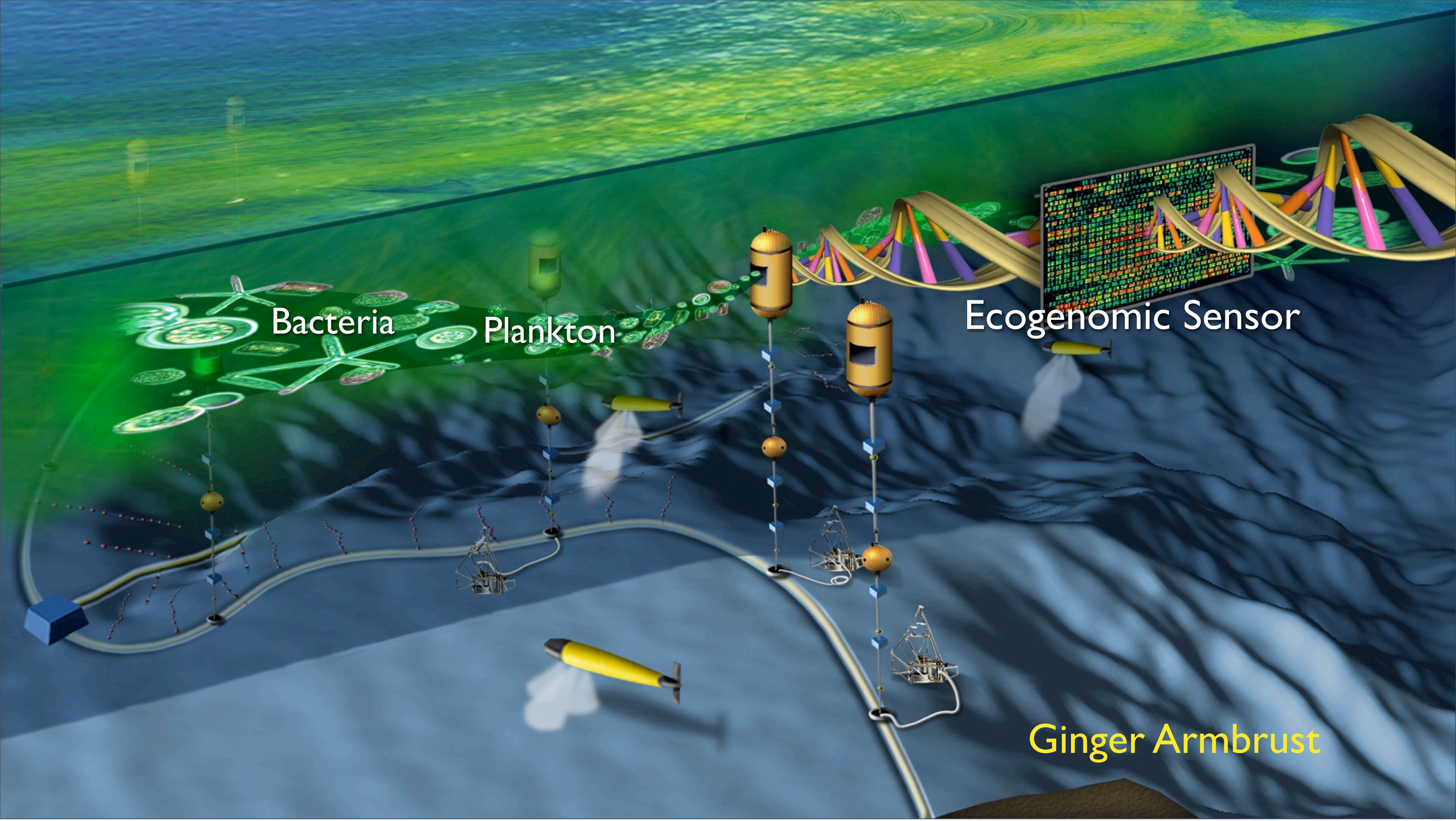

SD
HD
720
HD
1080
4k


ECOGENOMICS
daphnia.cgb.indiana.edu/


Ginger Armbrust


Ginger Armbrust

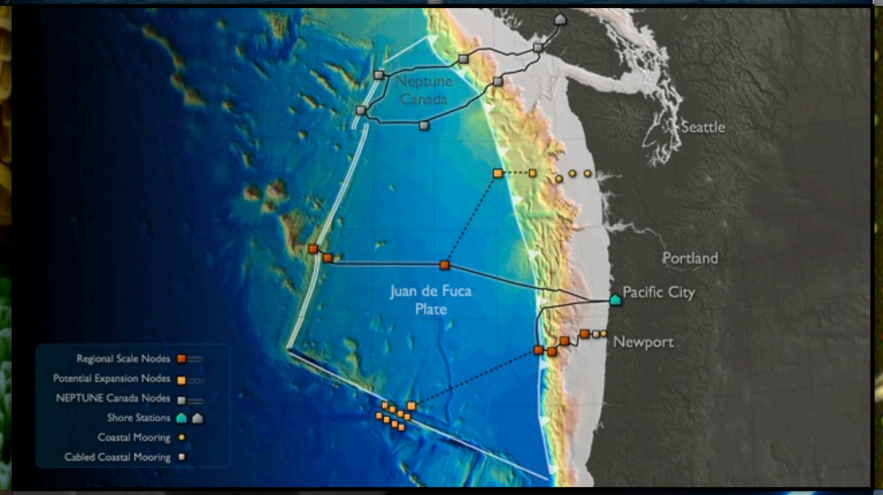

Bacteria
Plankton
Ginger Armbrust

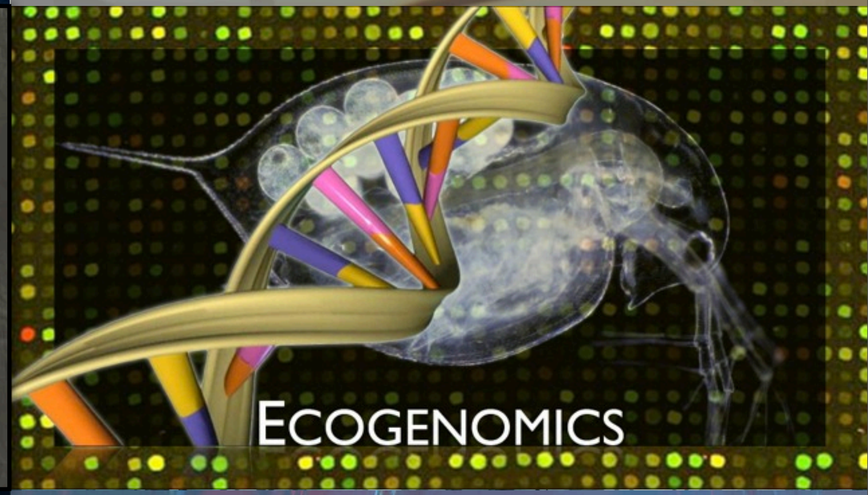

Bacteria
Plankton
Ecogenomic Sensor
Ginger Armbrust


POWER DELIVERY

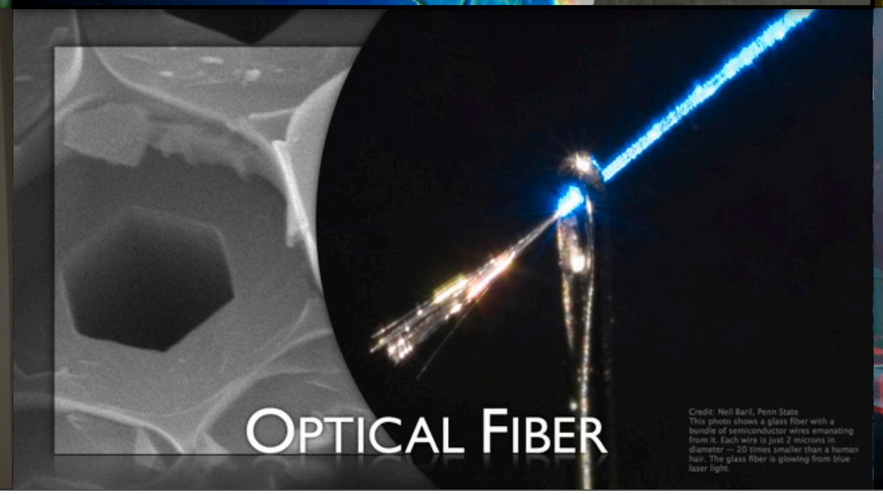

ROBOTICS


NANOTECH

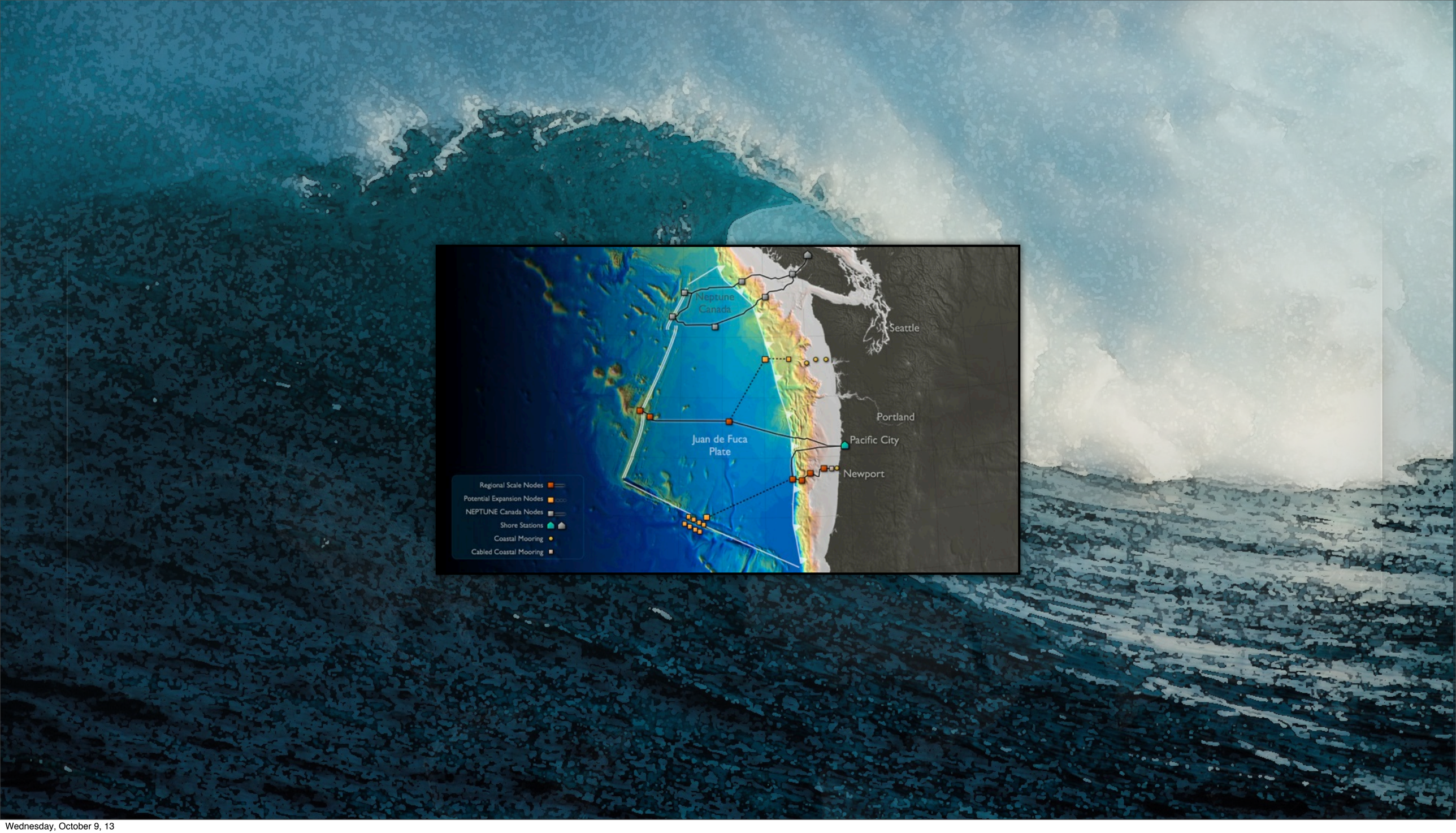

Neptune Canada
Seattle
Portland
Juan de Fuca Plate
Pacific City
Newport
Regional Scale Nodes
Potential Expansion Nodes
NEPTUNE Canada Nodes
Shore Stations
Coastal Mooring
Cabled Coastal Mooring

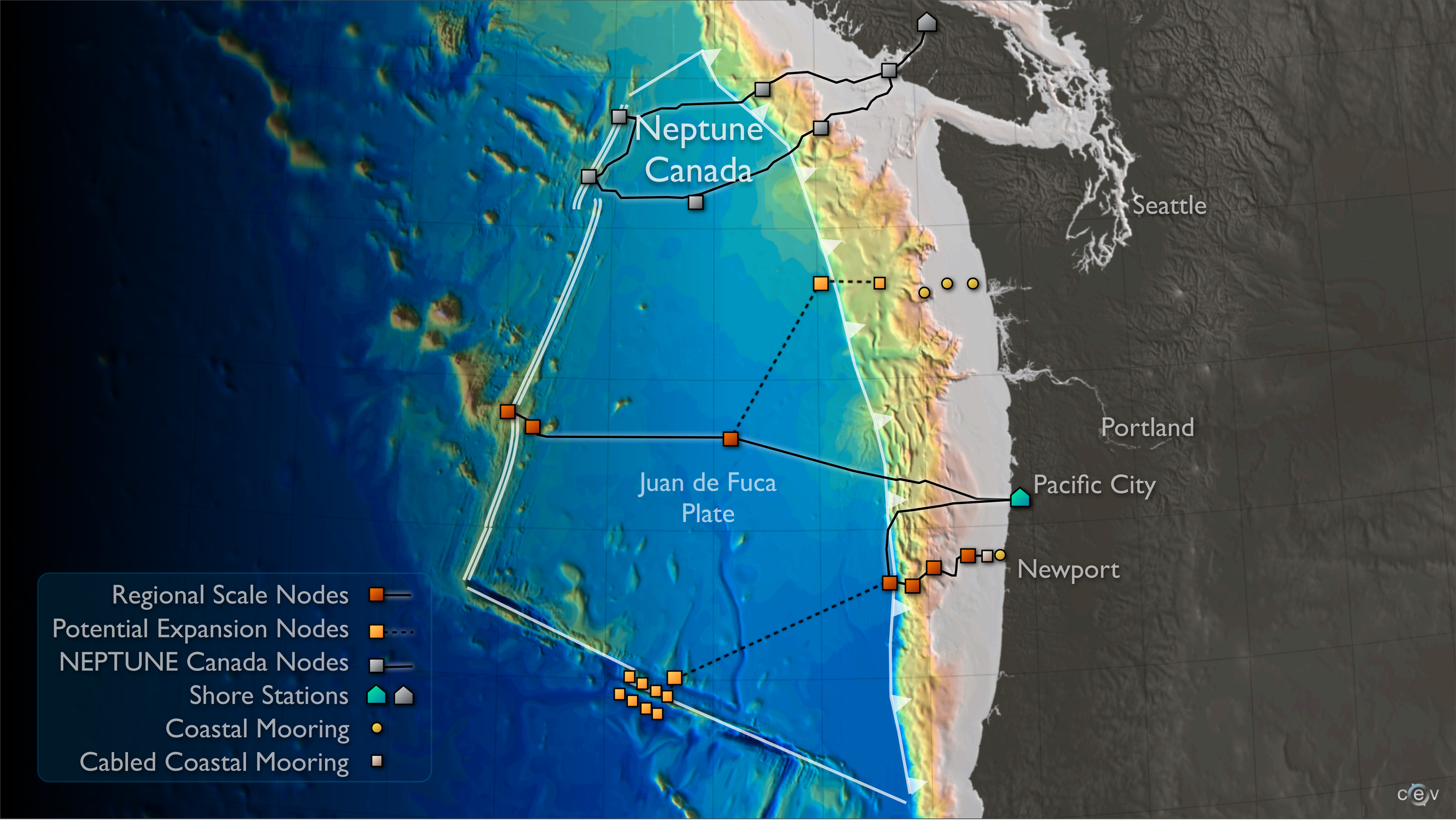

ECOGENOMICS


GRID/CLOUD COMPUTING

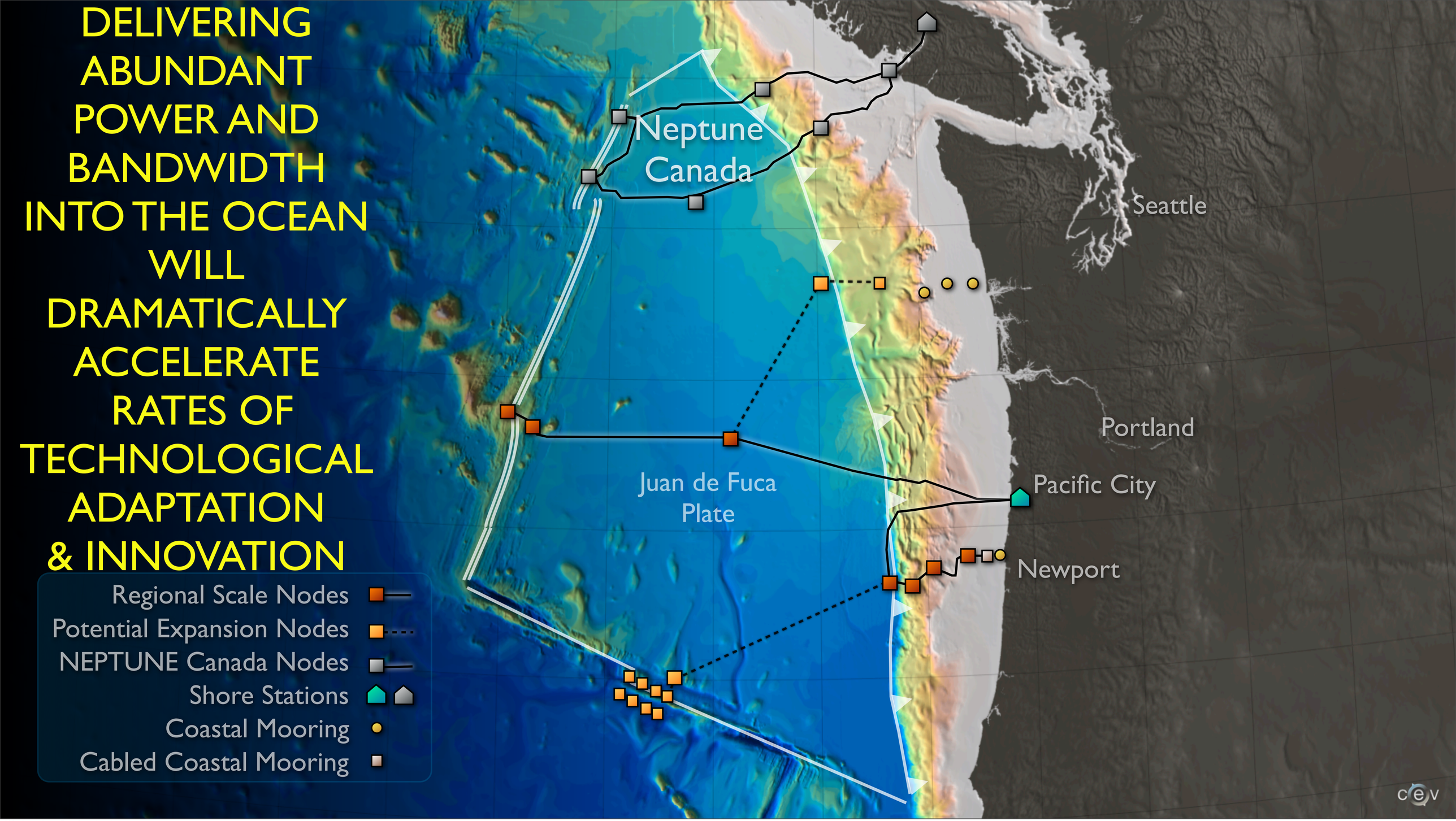

OPTICAL FIBER


DIGITAL IMAGING


Neptune Canada
Seattle
Portland
Pacific City
Newport
Juan de Fuca Plate
Regional Scale Nodes
Potential Expansion Nodes
NEPTUNE Canada Nodes
Shore Stations
Coastal Mooring
Cabled Coastal Mooring


Neptune Canada
Seattle
Portland
Pacific City
Newport
Juan de Fuca Plate
Regional Scale Nodes
Potential Expansion Nodes
NEPTUNE Canada Nodes
Shore Stations
Coastal Mooring
Cabled Coastal Mooring

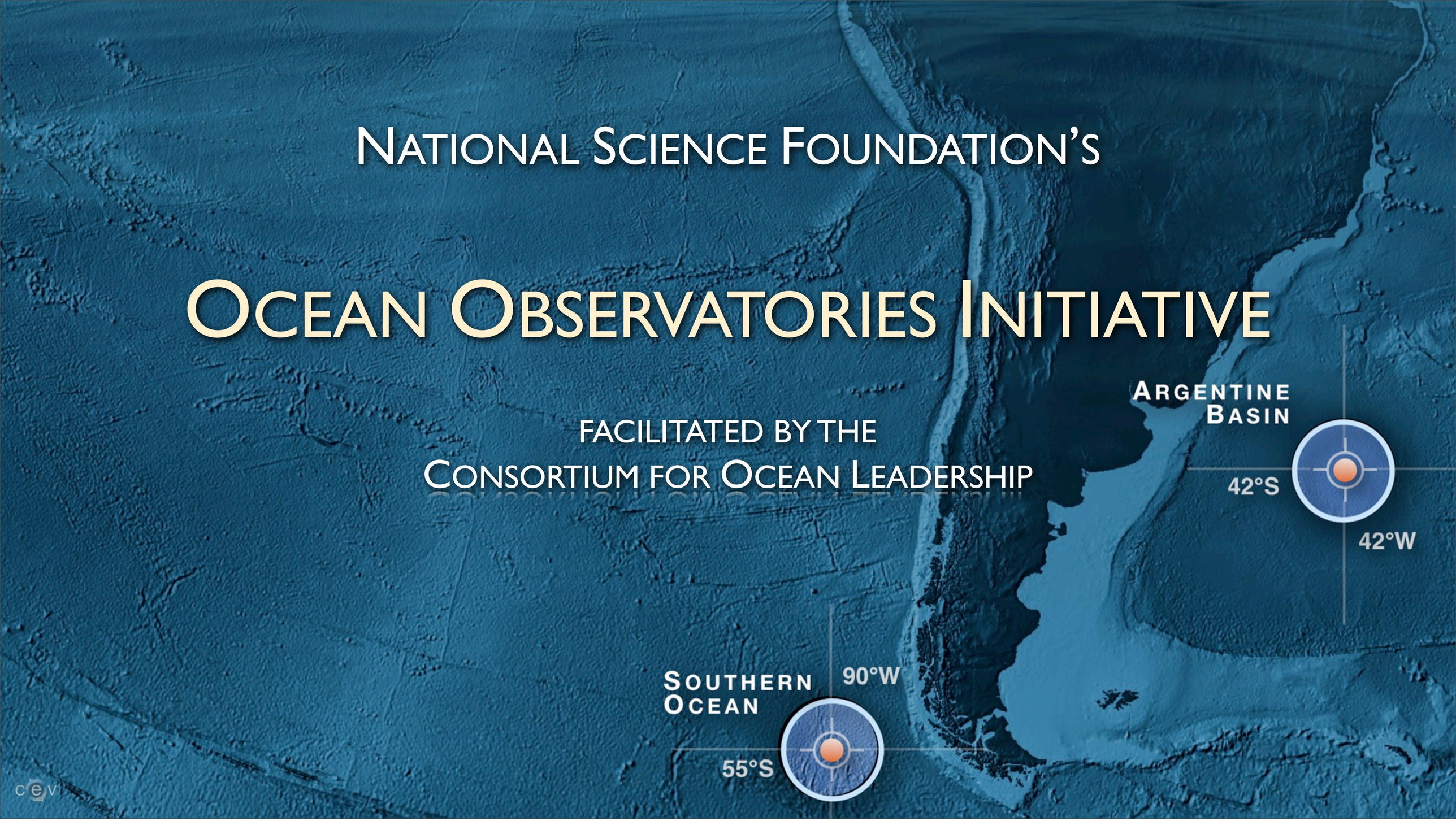
DELIVERING ABUNDANT POWER AND BANDWIDTH INTO THE OCEAN WILL DRAMATICALLY ACCELERATE RATES OF TECHNOLOGICAL ADAPTATION & INNOVATION

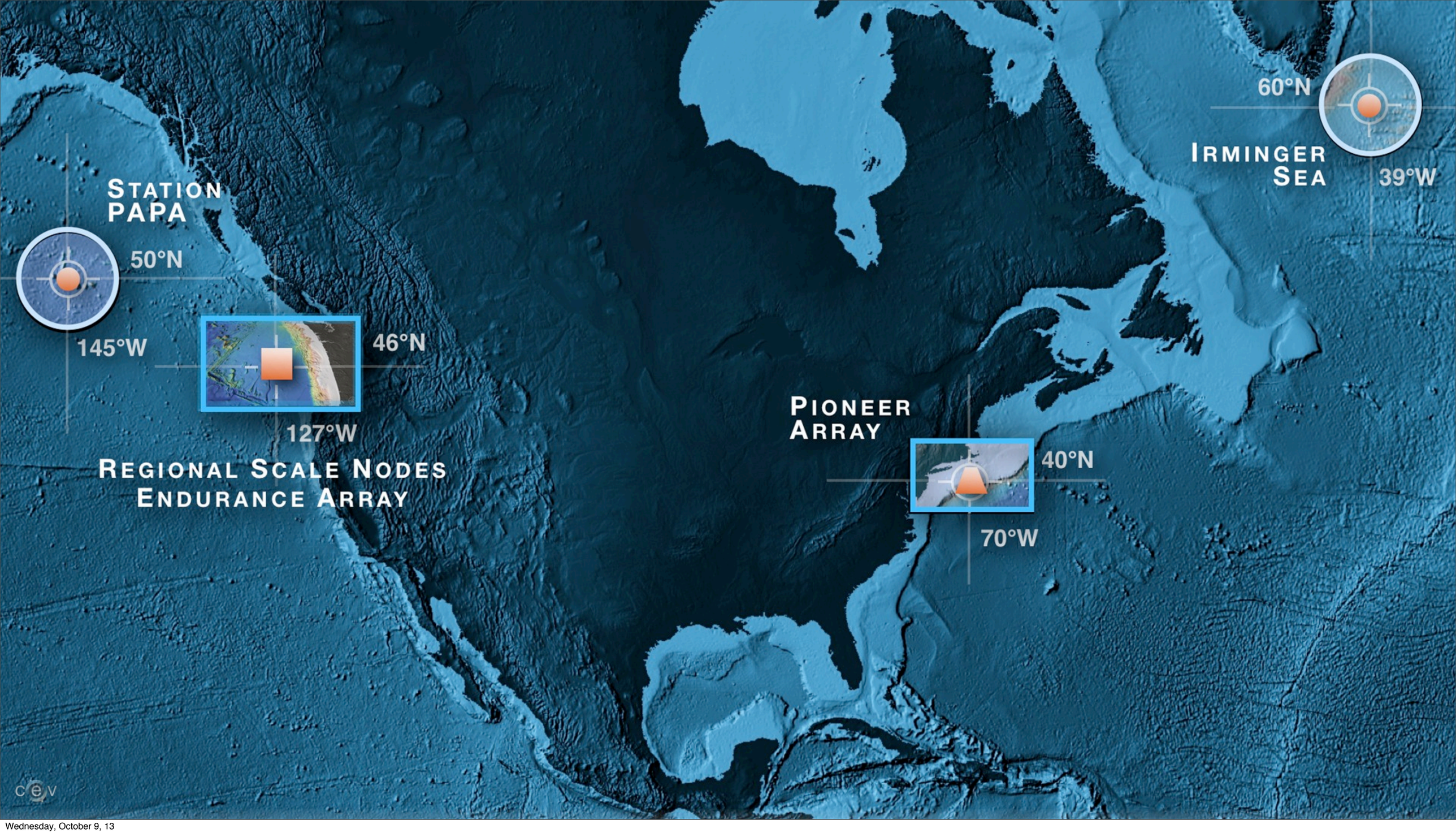


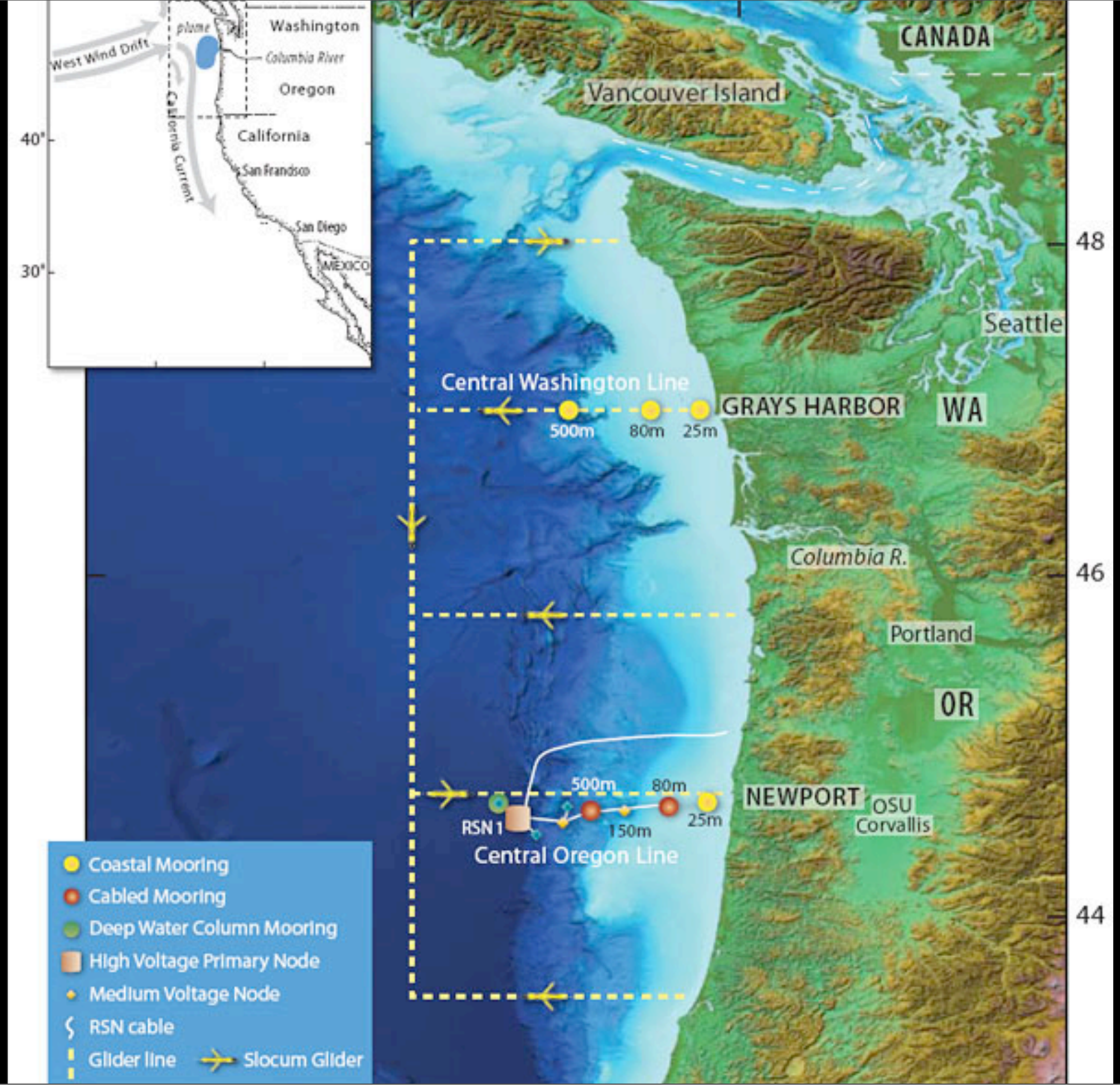
National Science Foundation's

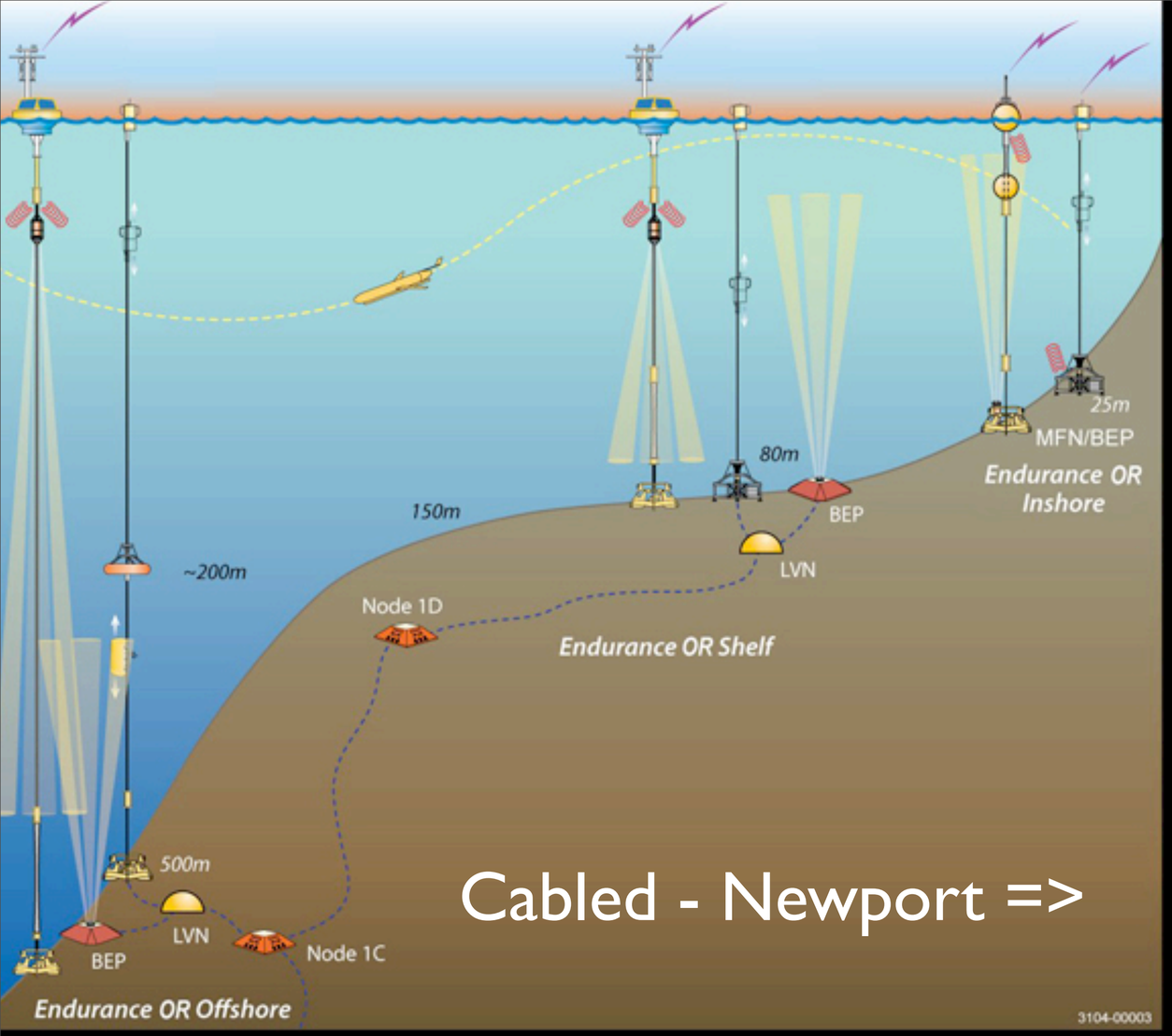
Ocean Observatories Initiative

Facilitated by the Consortium for Ocean Leadership

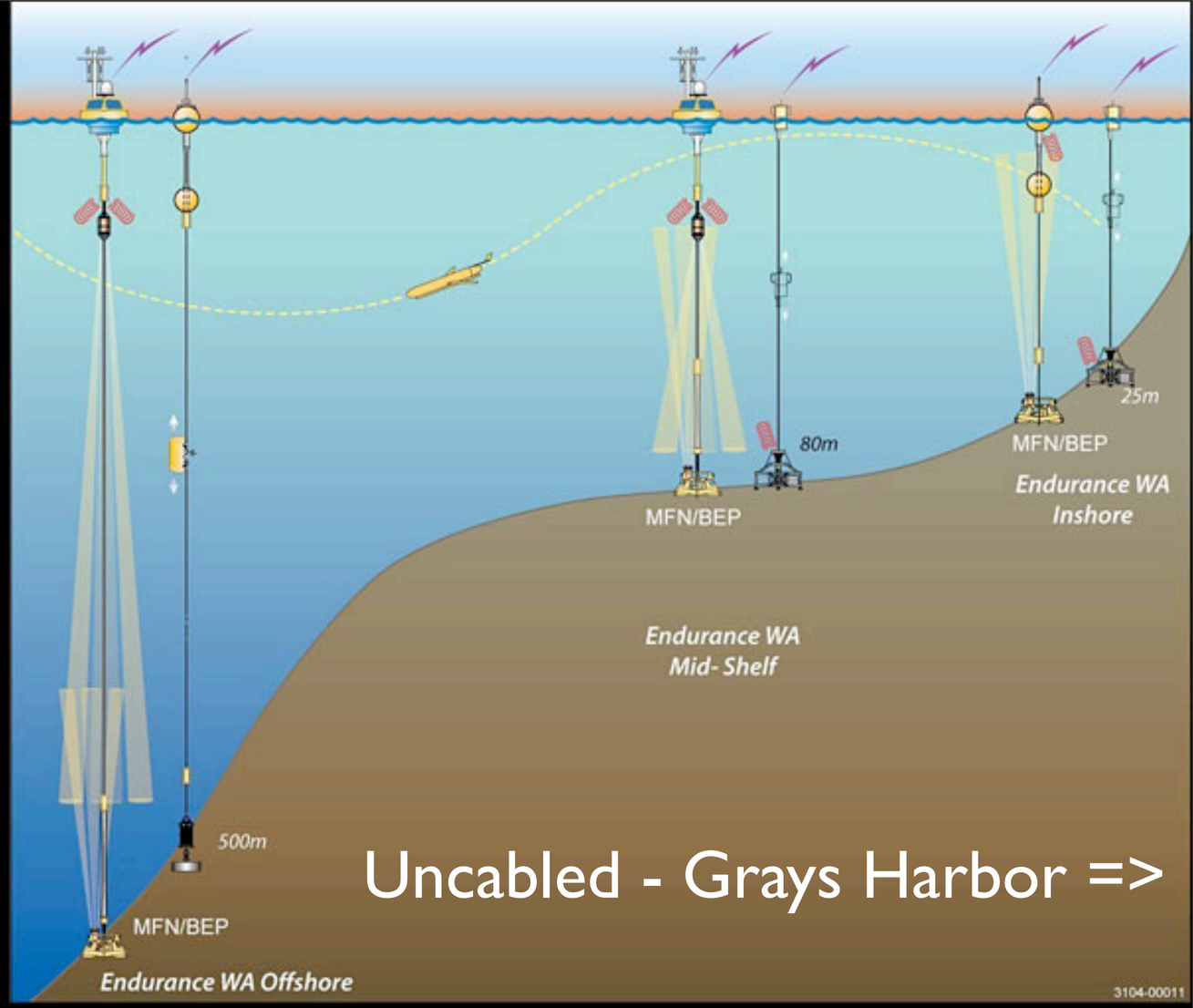



STATION PAPA
50°N
145°W
46°N
127°W
REGIONAL SCALE NODES ENDURANCE ARRAY
PIONEER ARRAY
40°N
70°W
IRMINGER SEA
60°N
39°W
cev


Washington
Columbia River
Oregon
California
San Francisco
San Diego
MEXICO
plume
West Wind Drift
California Current
40°
30°
CANADA
Vancouver Island
48
Seattle
Central Washington Line
GRAYS HARBOR
WA
500m
80m
25m
Columbia R.
46
Portland
OR
500m
80m
NEWPORT
OSU
Corvallis
RSN 1
150m
25m
Central Oregon Line
44
Coastal Mooring
Cabled Mooring
Deep Water Column Mooring
High Voltage Primary Node
Medium Voltage Node
RSN cable
Glider line
Slocum Glider

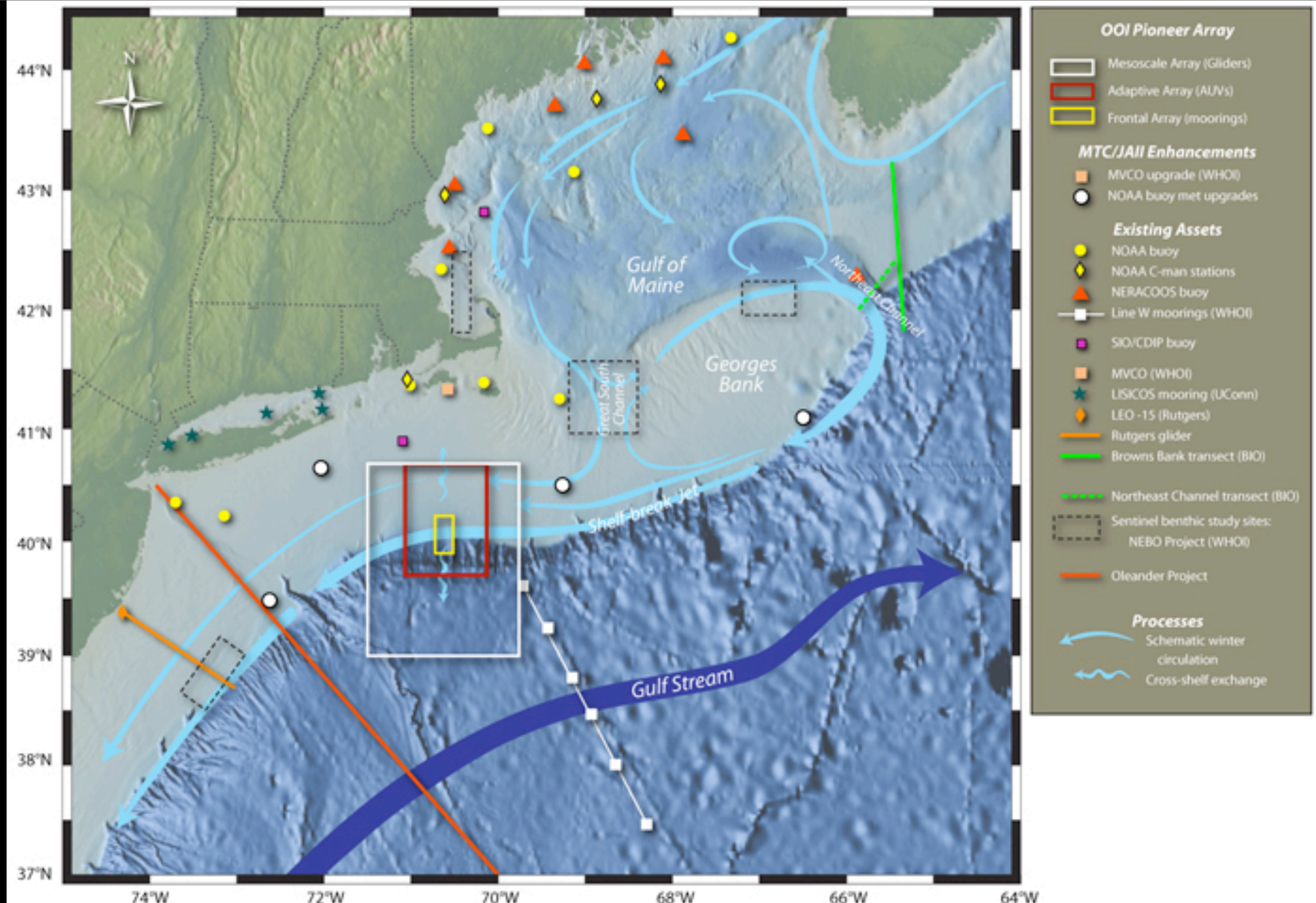


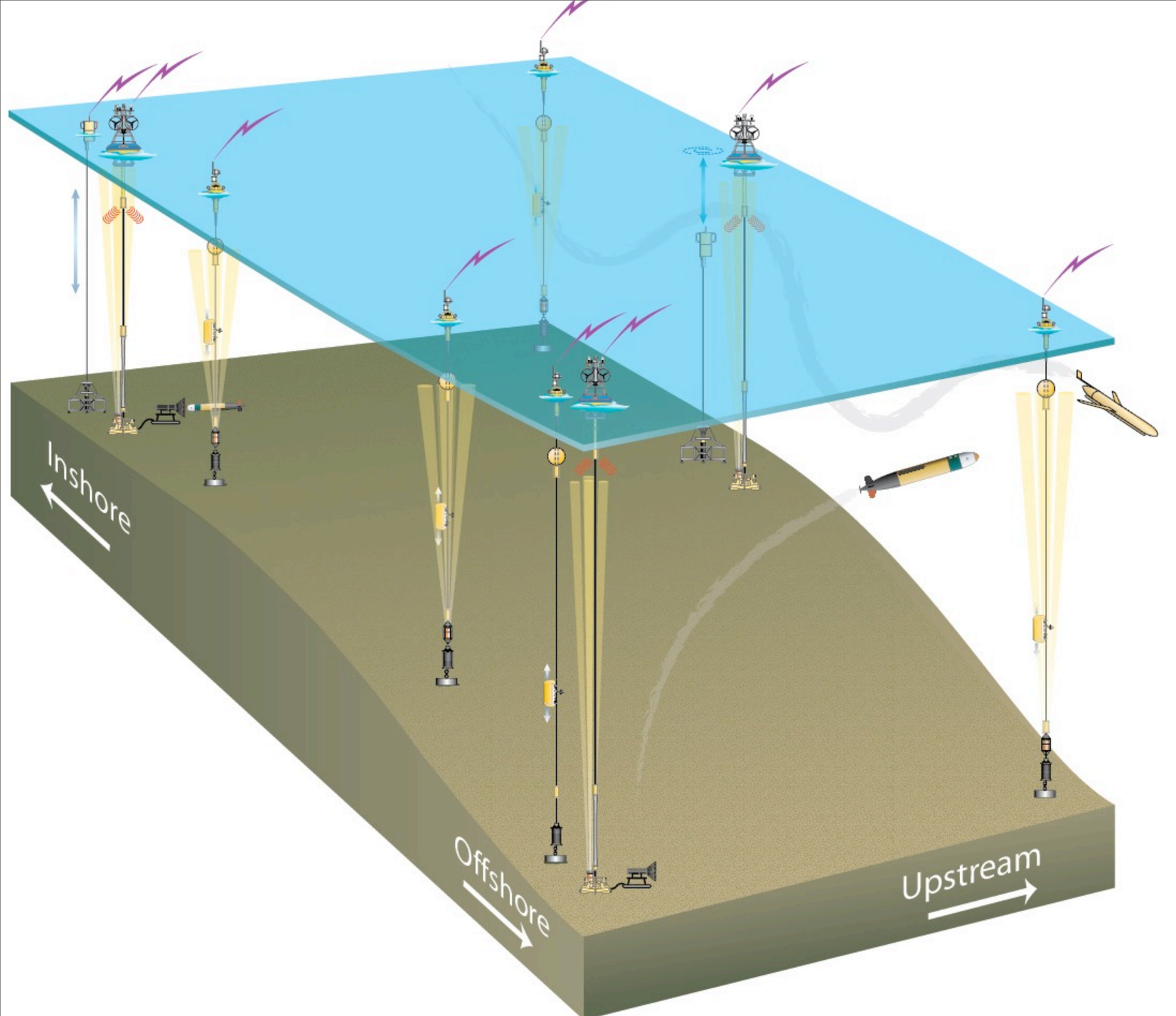
Cabled - Newport =>

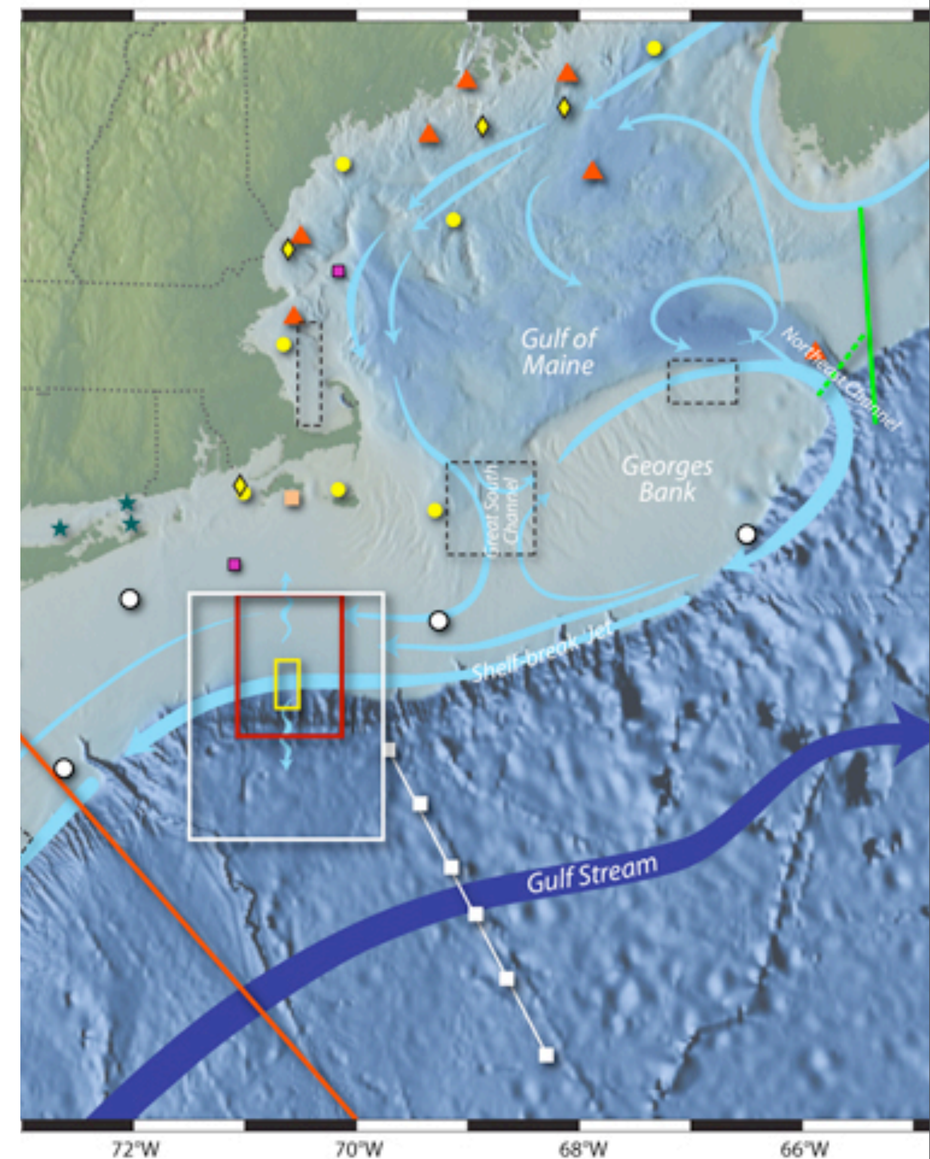


Uncabled - Grays Harbor =>

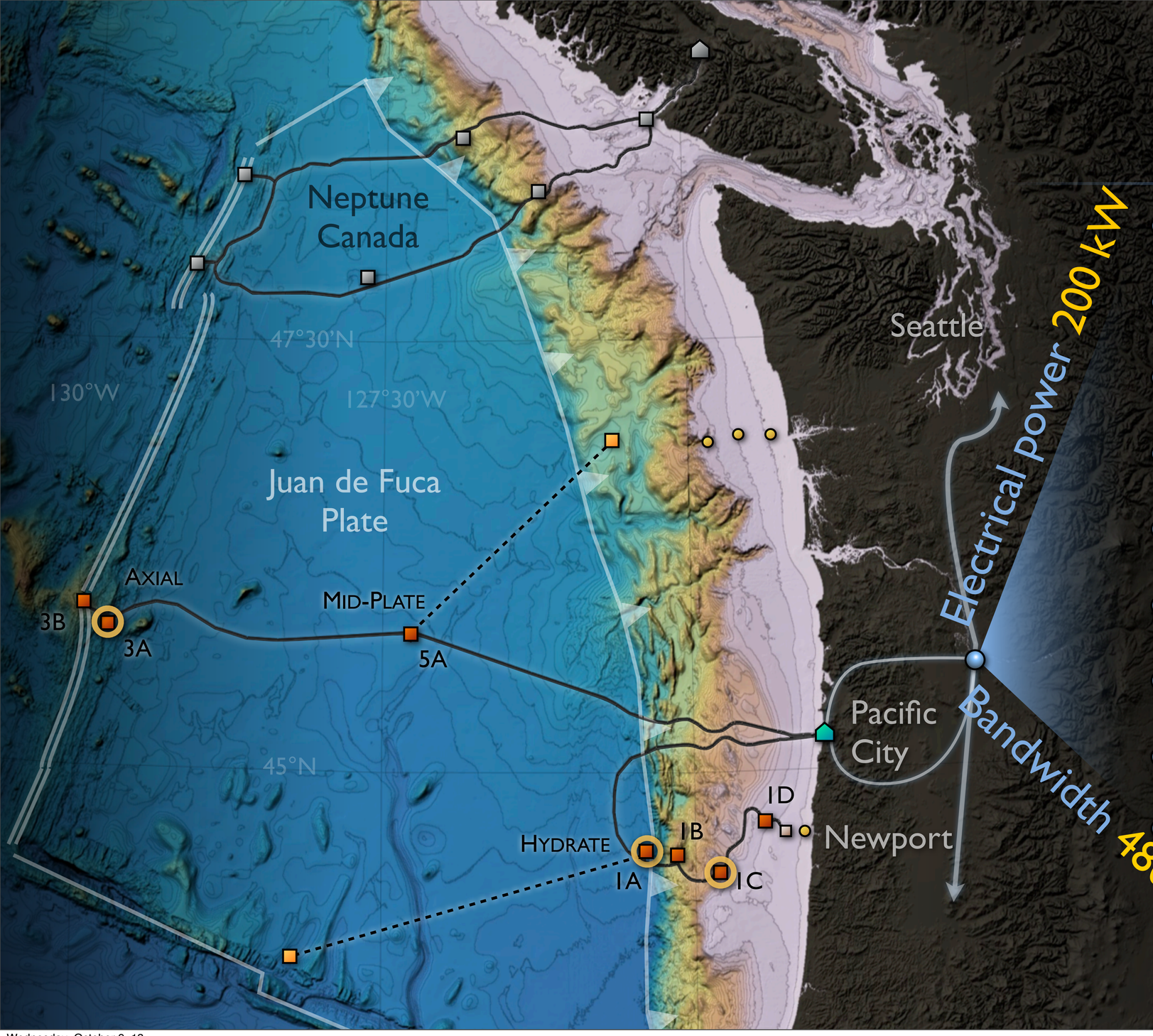
http://www.whoi.edu/ooi_cgsn/endurance-array?tid=1621&cid=107169&article=43286


OOI Pioneer Array
Mesoscale Array (Gliders)
Adaptive Array (AUVs)
Frontal Array (moorings)
MTC/JAII Enhancements
MVCO upgrade (WHOI)
NOAA buoy met upgrades
Existing Assets
NOAA buoy
NOAA C-man stations
NERACOOS buoy
Line W moorings (WHOI)
SIO/CDIP buoy
MVCO (WHOI)
LISICOS mooring (UConn)
LEO -15 (Rutgers)
Rutgers glider
Browns Bank transect (BIO)
Northeast Channel transect (BIO)
Sentinel benthic study sites:
NEBO Project (WHOI)
Oleander Project
Processes
Schematic winter circulation
Cross-shelf exchange
Gulf of Maine
Georges Bank
Northeast Channel
Great South Channel
Shelf-break Jet
Gulf Stream
N
44°N
43°N
42°N
41°N
40°N
39°N
38°N
37°N
74°W
72°W
70°W
68°W
66°W
64°W





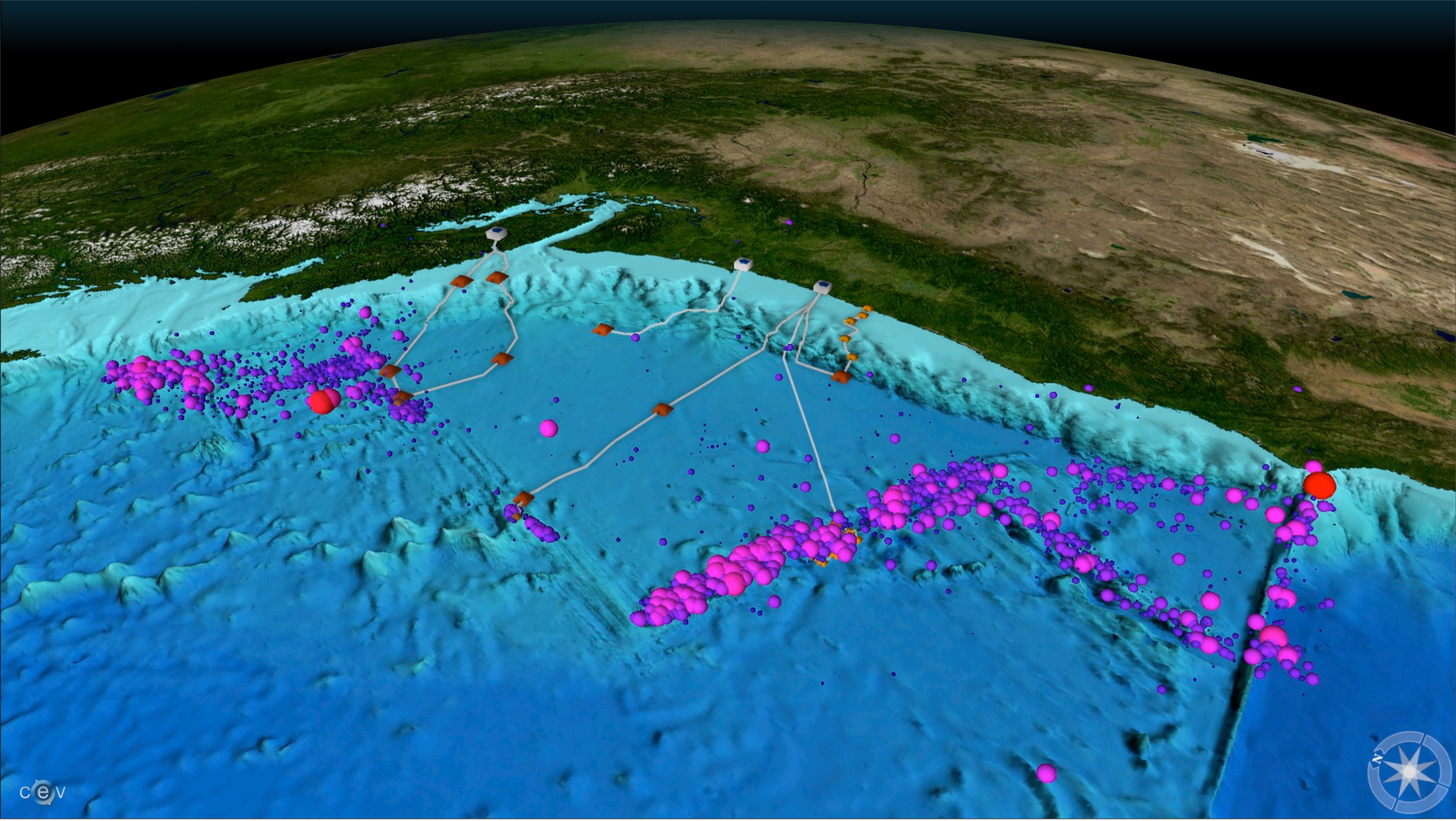
http://www.whoi.edu/ooi_cgsn/home



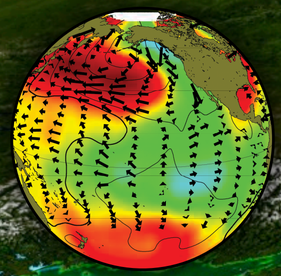
Power

Bandwidth

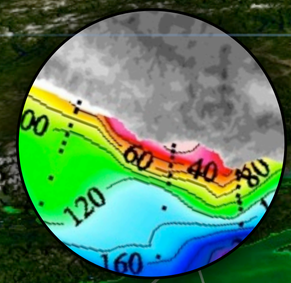
- High Definition Video
- High Frequency Acoustics
- Adaptive Sampling
- Ecogenomics
- Charging Mobile Platforms
- Subsea Cloud Computing
- Subsea Mechtronics
- Remotely Operated Vehicles
- Photonic Sensors


cev
N

Science Drivers

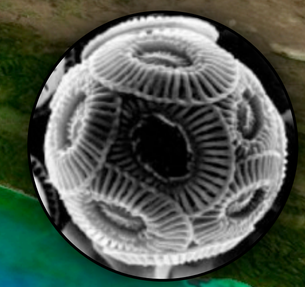


Climate Change

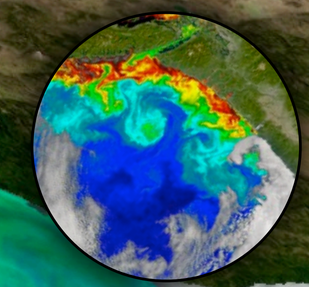


Ocean Acidification

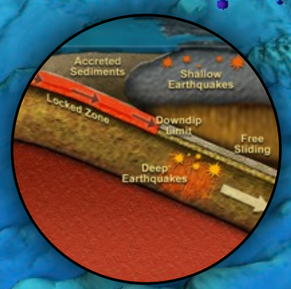
Dissolved Oxygen



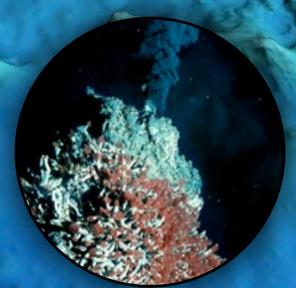
Carbon Cycle



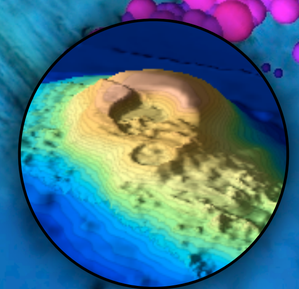
Coastal Upwelling



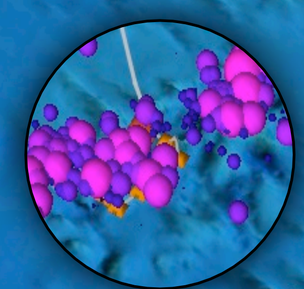
Subduction Zone



Spreading Centers



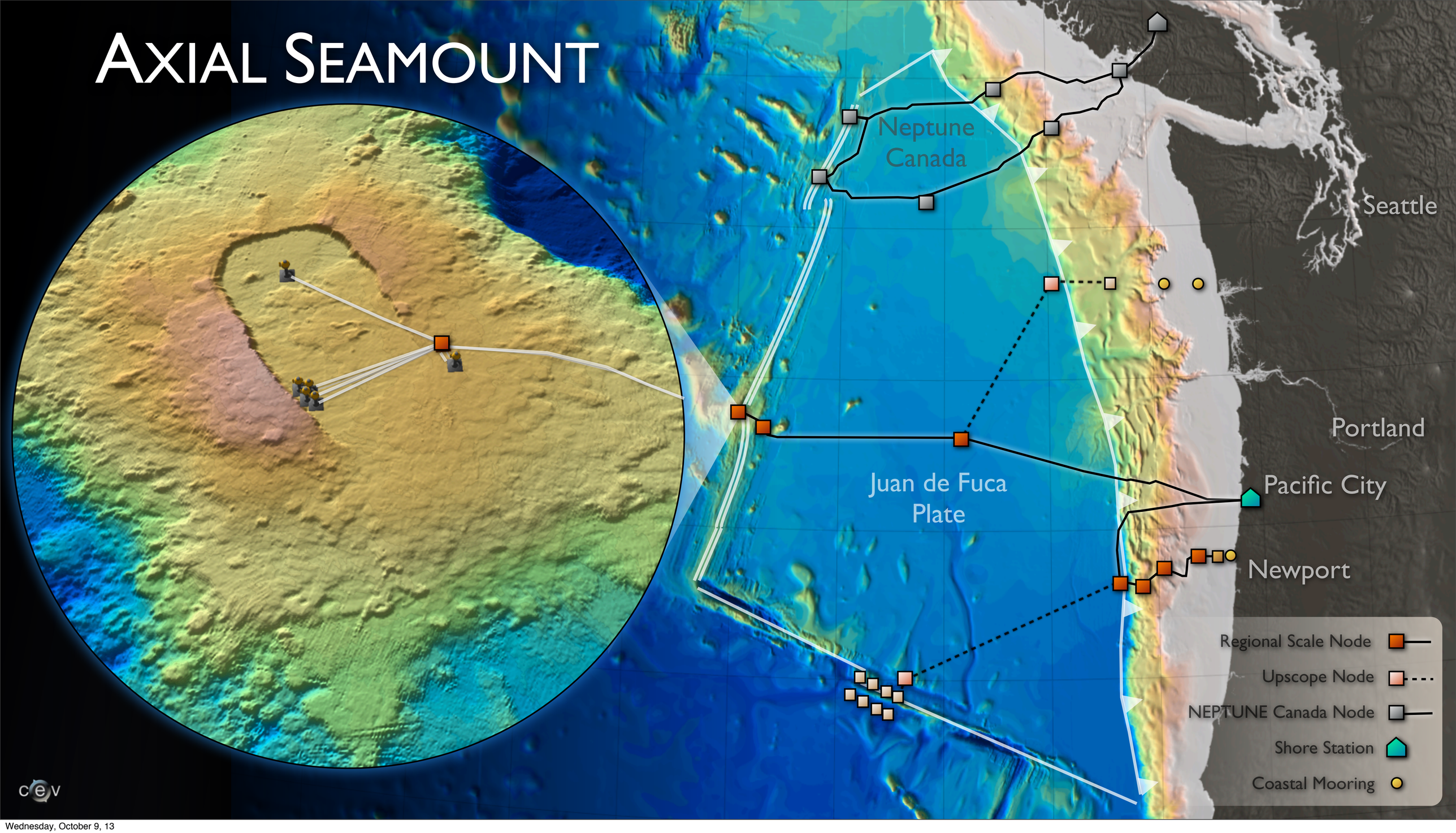
Bathymetric Forcing

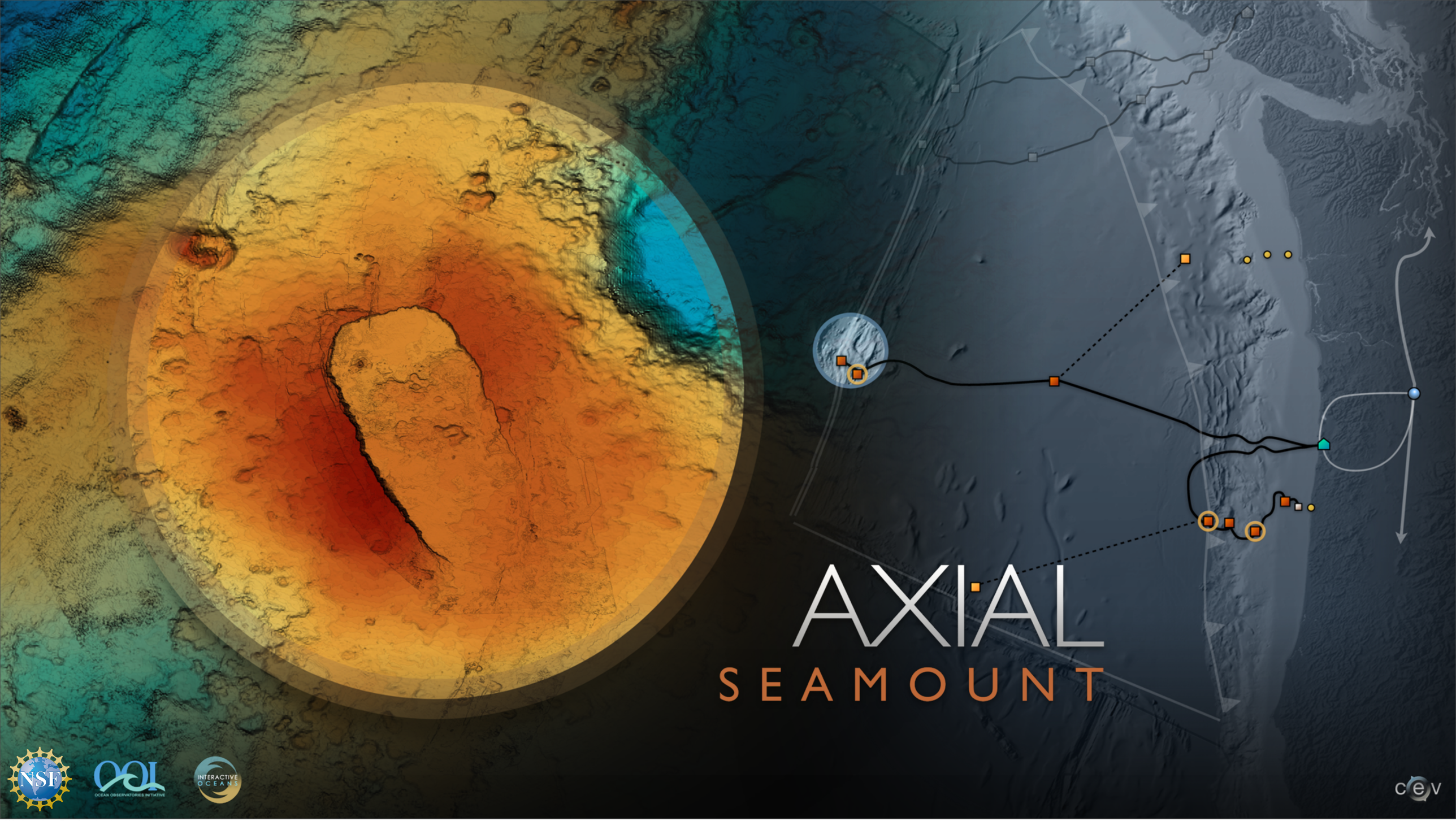


Seismic Activity

Gas Hydrates

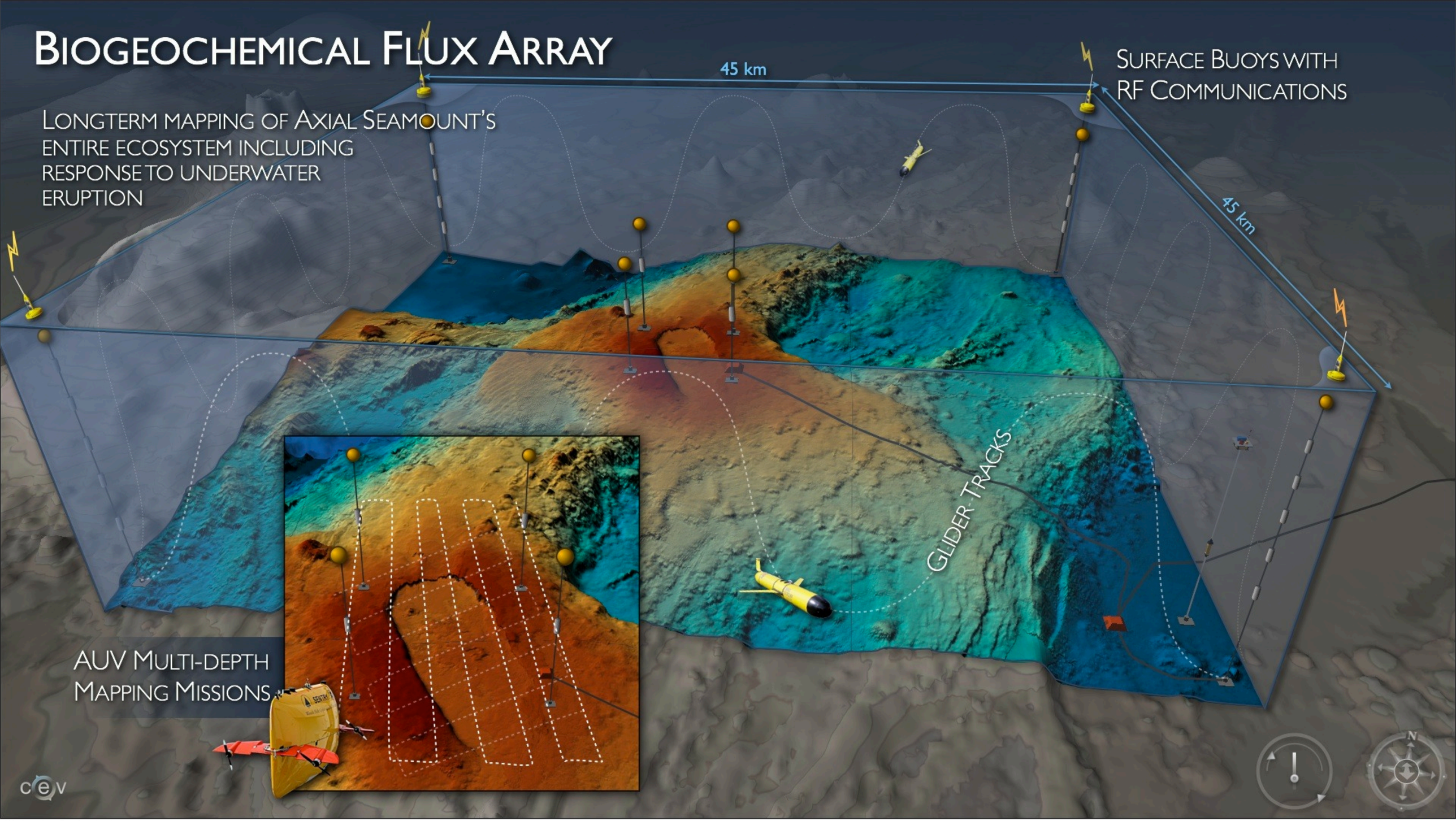
Axial Seamount

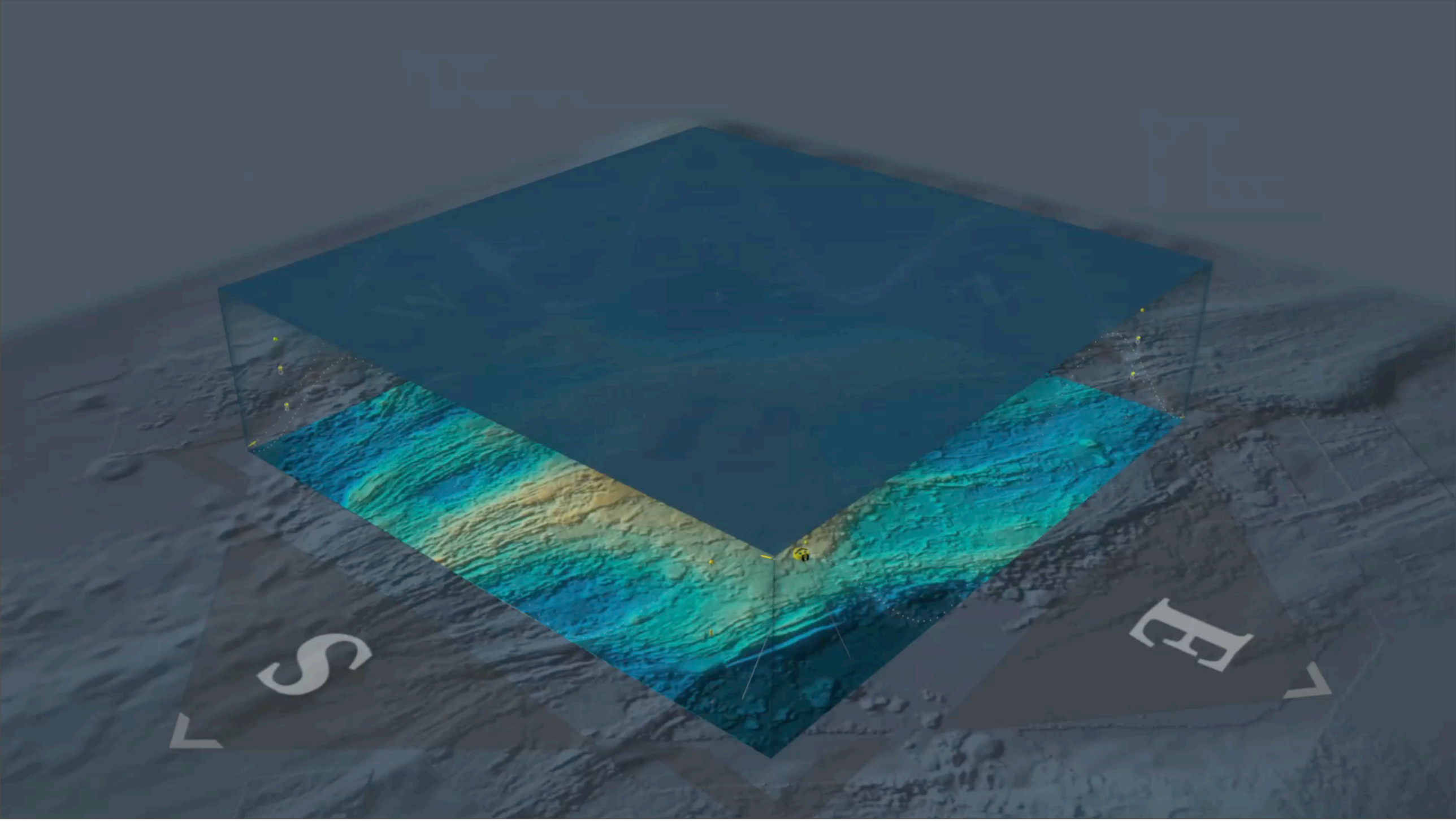


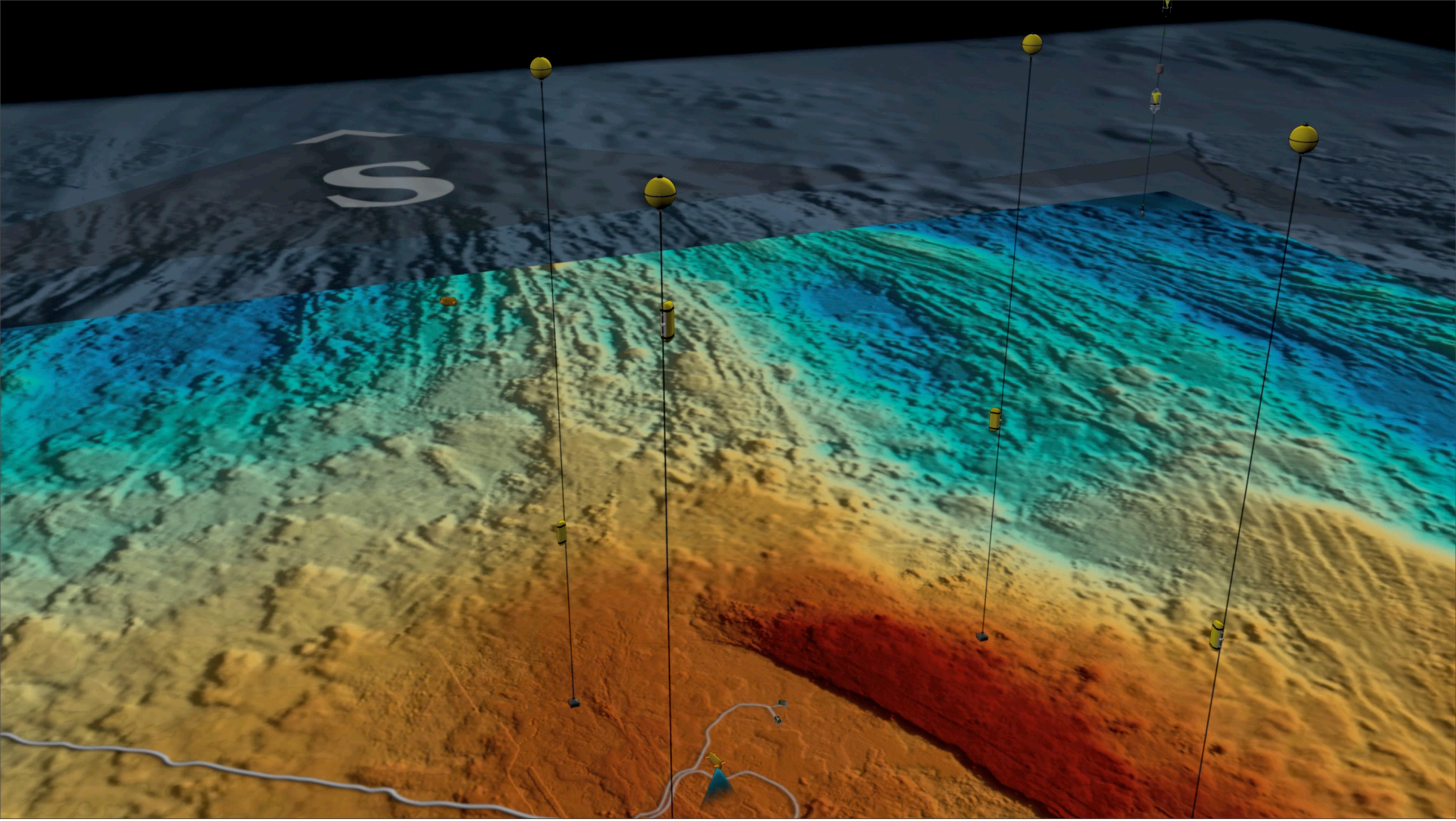

AXIAL
SEAMOUNT
NSF
OOI
OCEAN OBSERVATORIES INITIATIVE
INTERACTIVE OCEANS
cev

Biogeochemical Flux Array

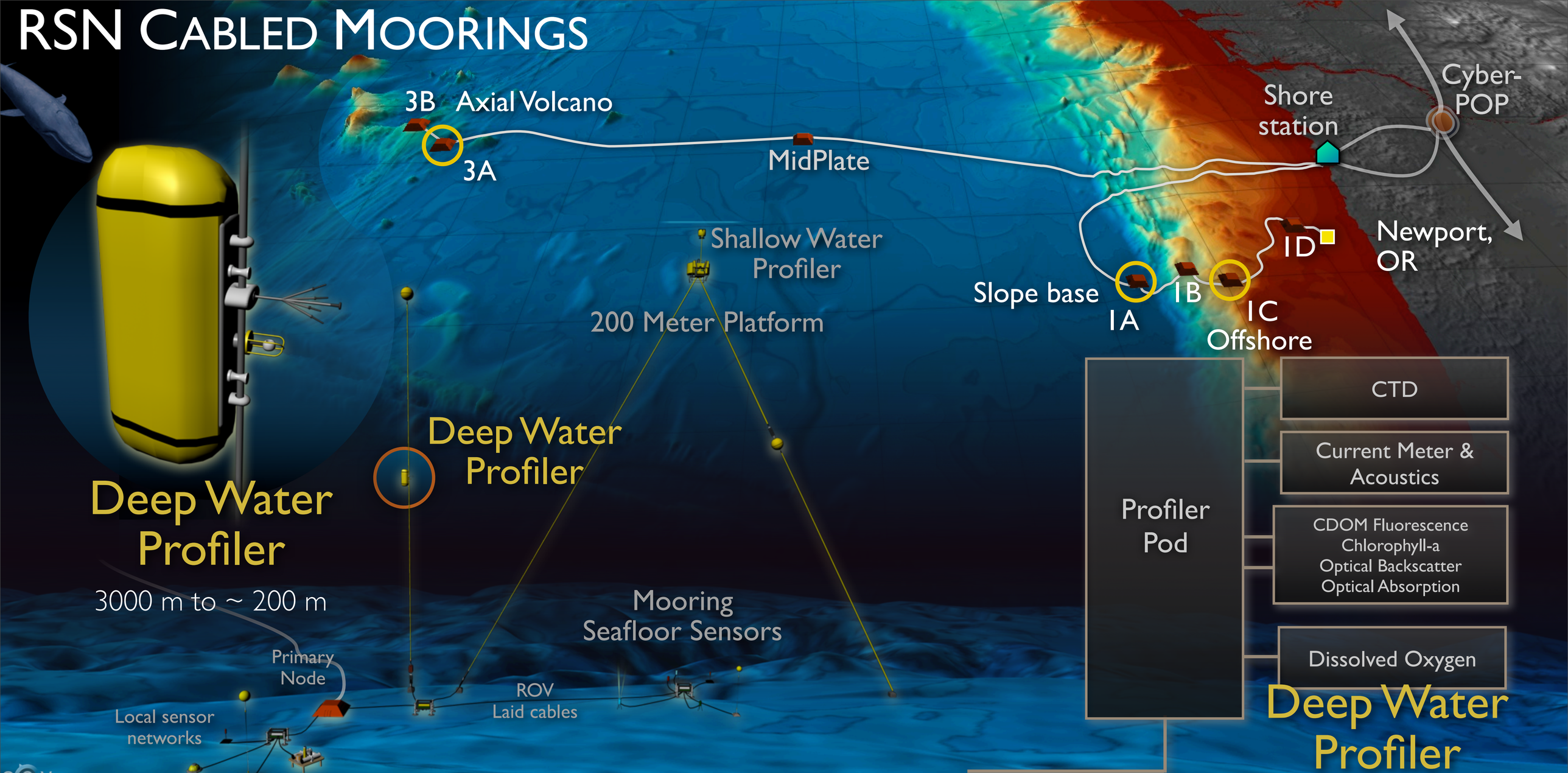
Longterm mapping of Axial Seamount's entire ecosystem including response to underwater eruption



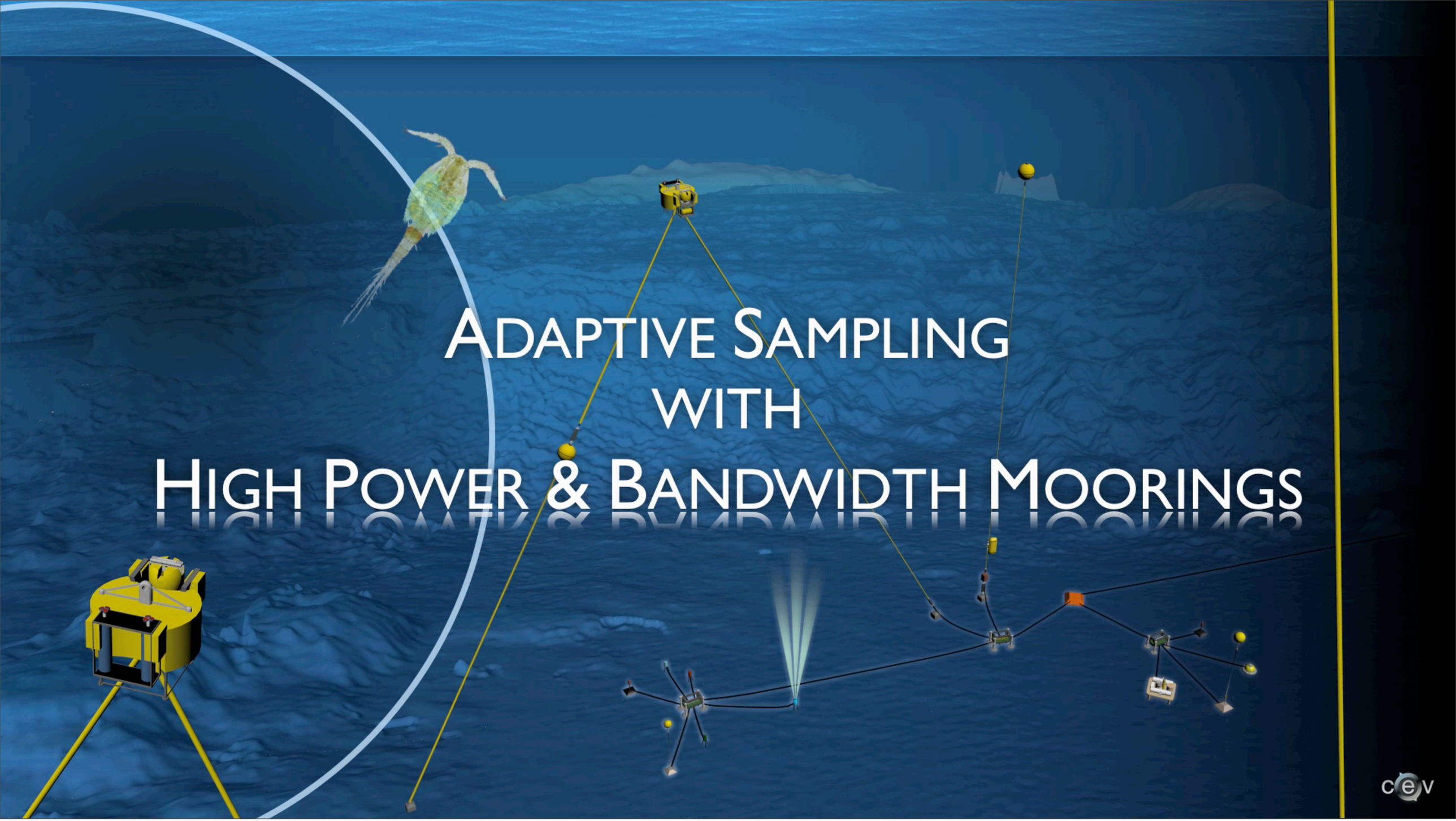

S
E



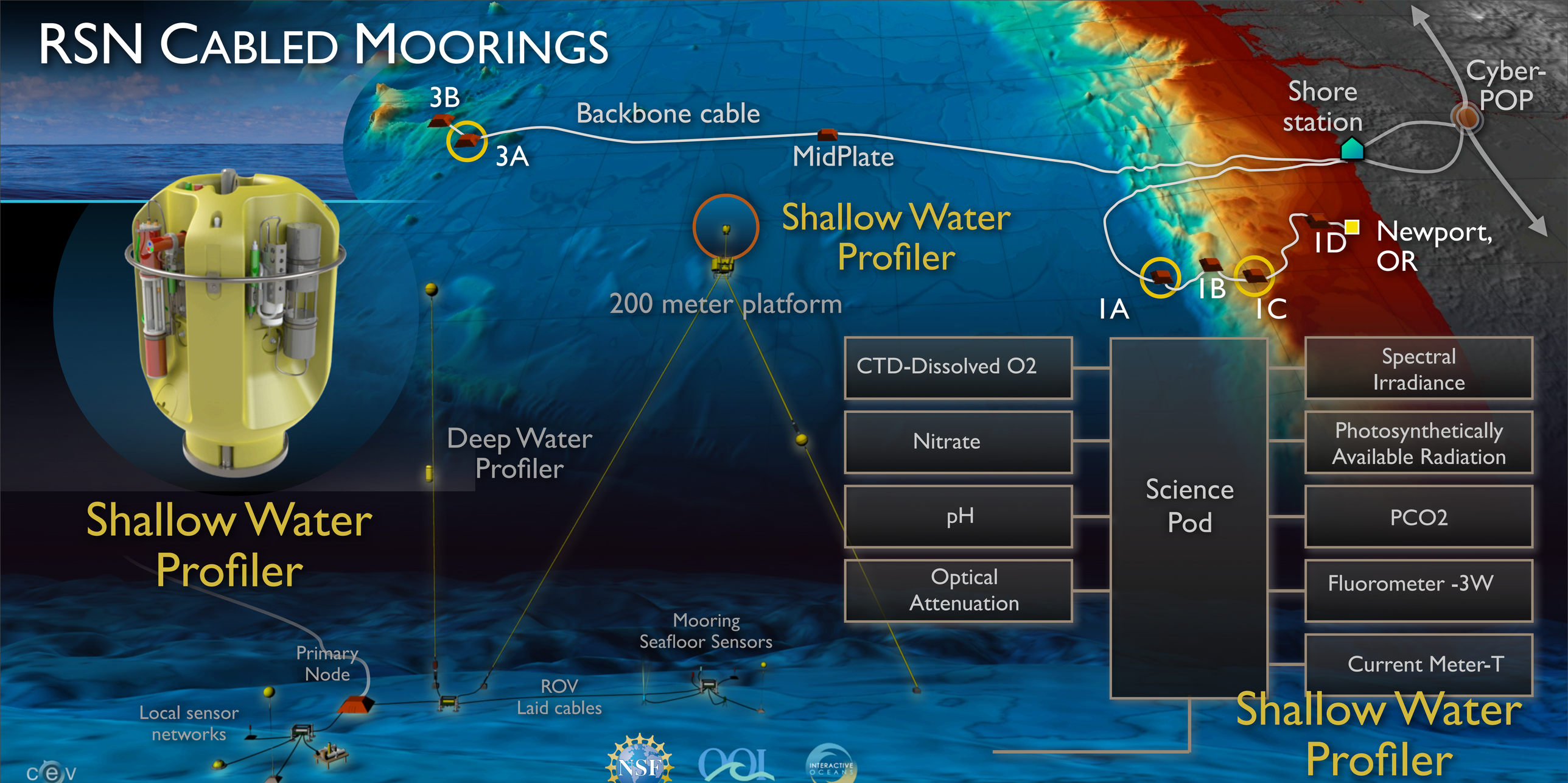
RSN Cabled Moorings



Deep Profiling Mooring: include an instrumented McLane profiler making multiple trips daily - inductive couple allows recharge and data download, changing of sampling

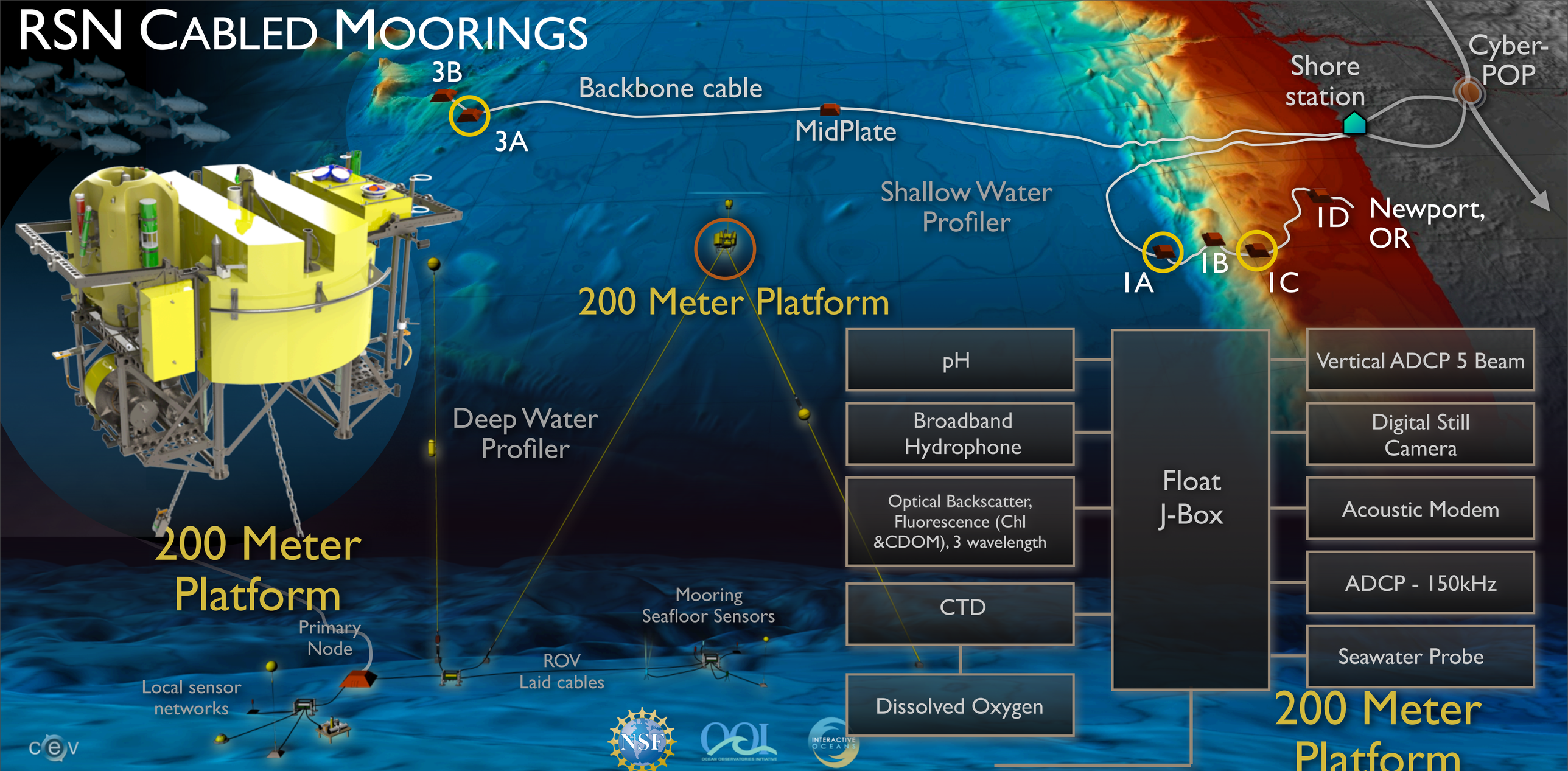

Adaptive Sampling
with
High Power & Bandwidth Moorings
cev

RSN Cabled Moorings



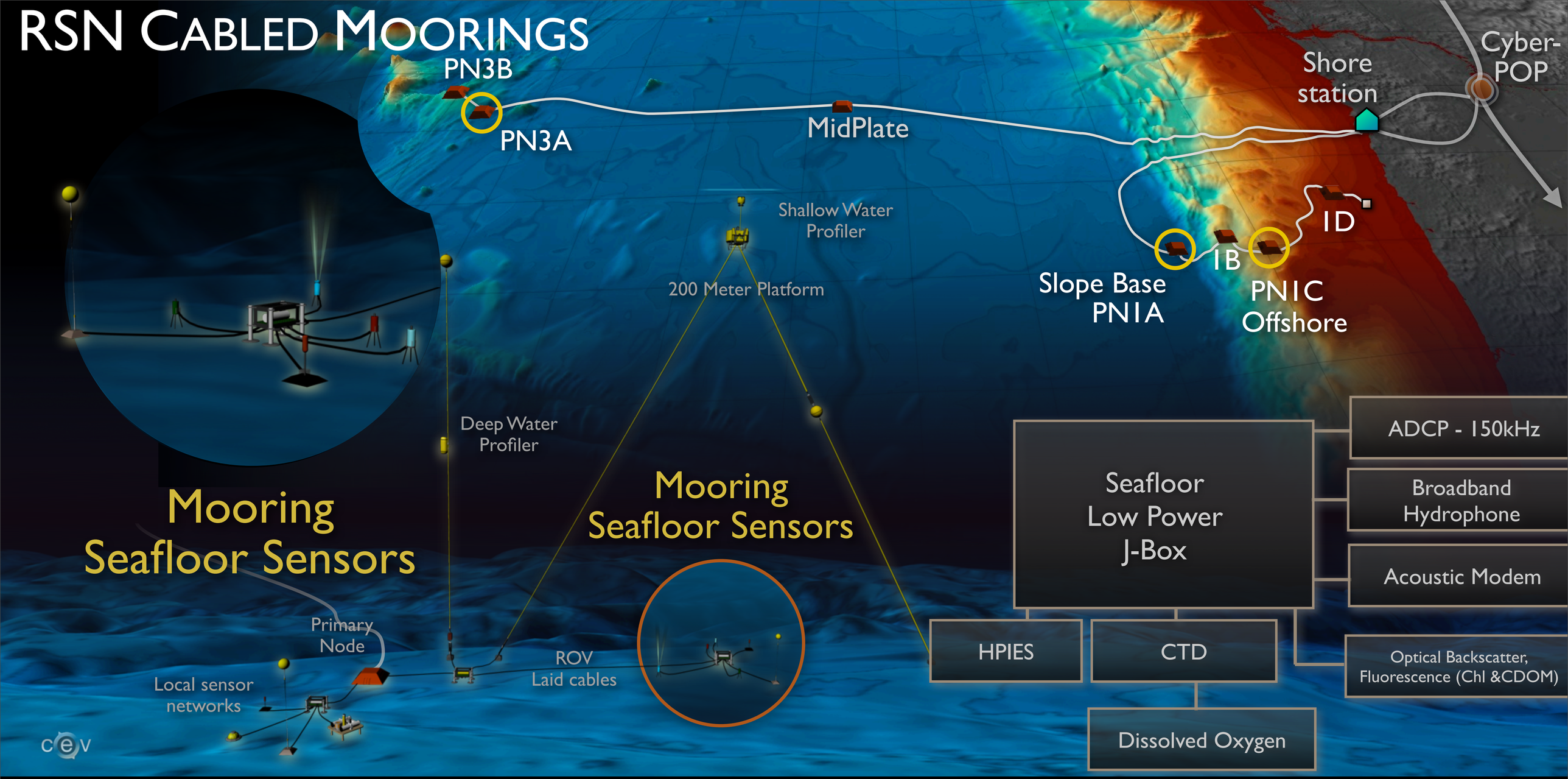
RSN Shallow Profiler: a novel two-legged mooring with an instrumented platform at 200 m and an instrumented shallow winched profiler. Cable allows real-time adaptive sampling.

RSN Cabled Moorings

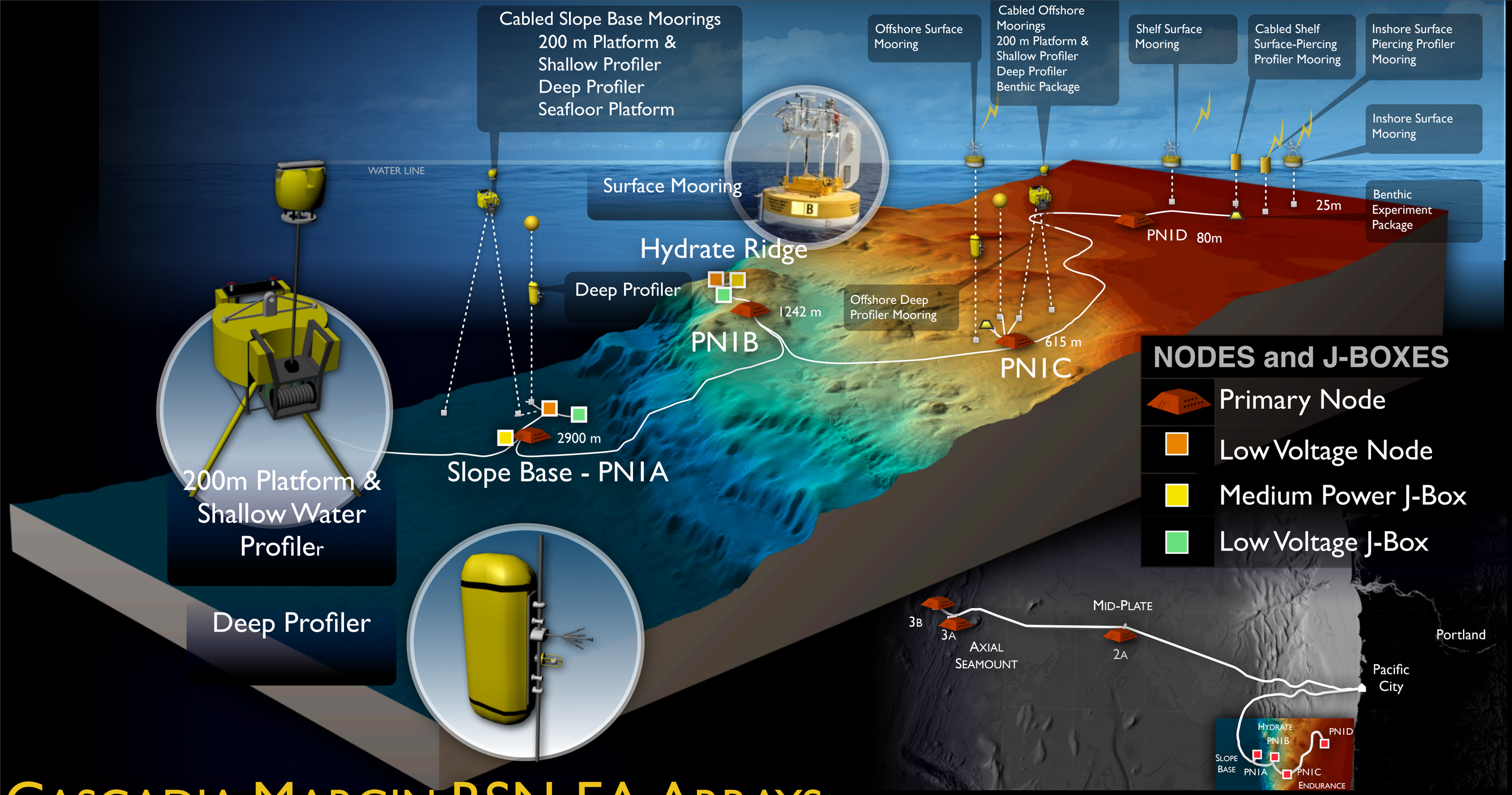


200 m Deep Platform: A 12 ft across (7 ton) instrumented platform will be positioned 200 m water depth - highly expandable for future instruments (e.g. flow cytometers, DNA analyzers)

RSN Cabled Moorings

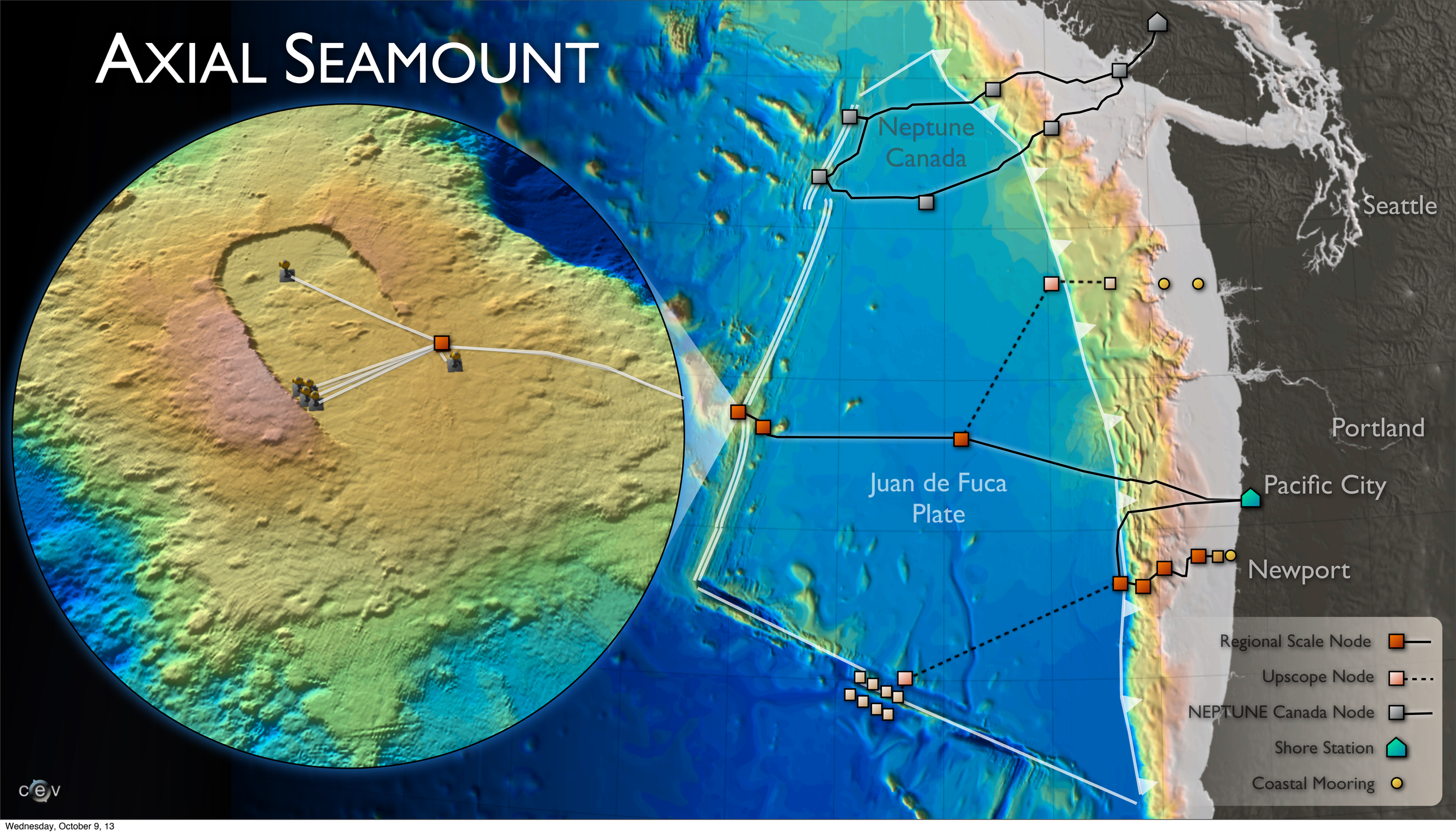


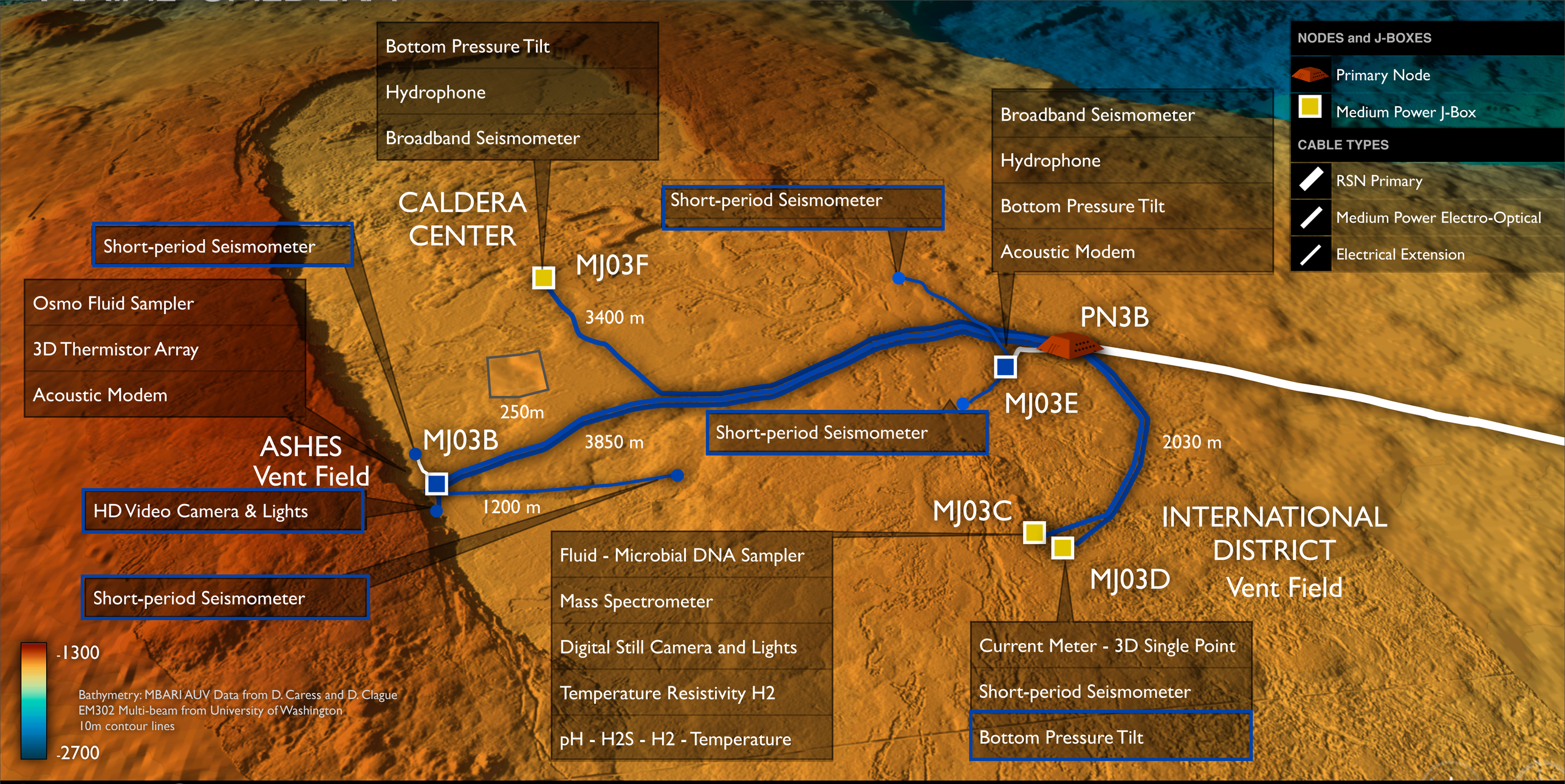
Seafloor Platform: The junction boxes provide 1 Gbs and 374 kV to an array of instruments on the seafloor to measure water column properties.



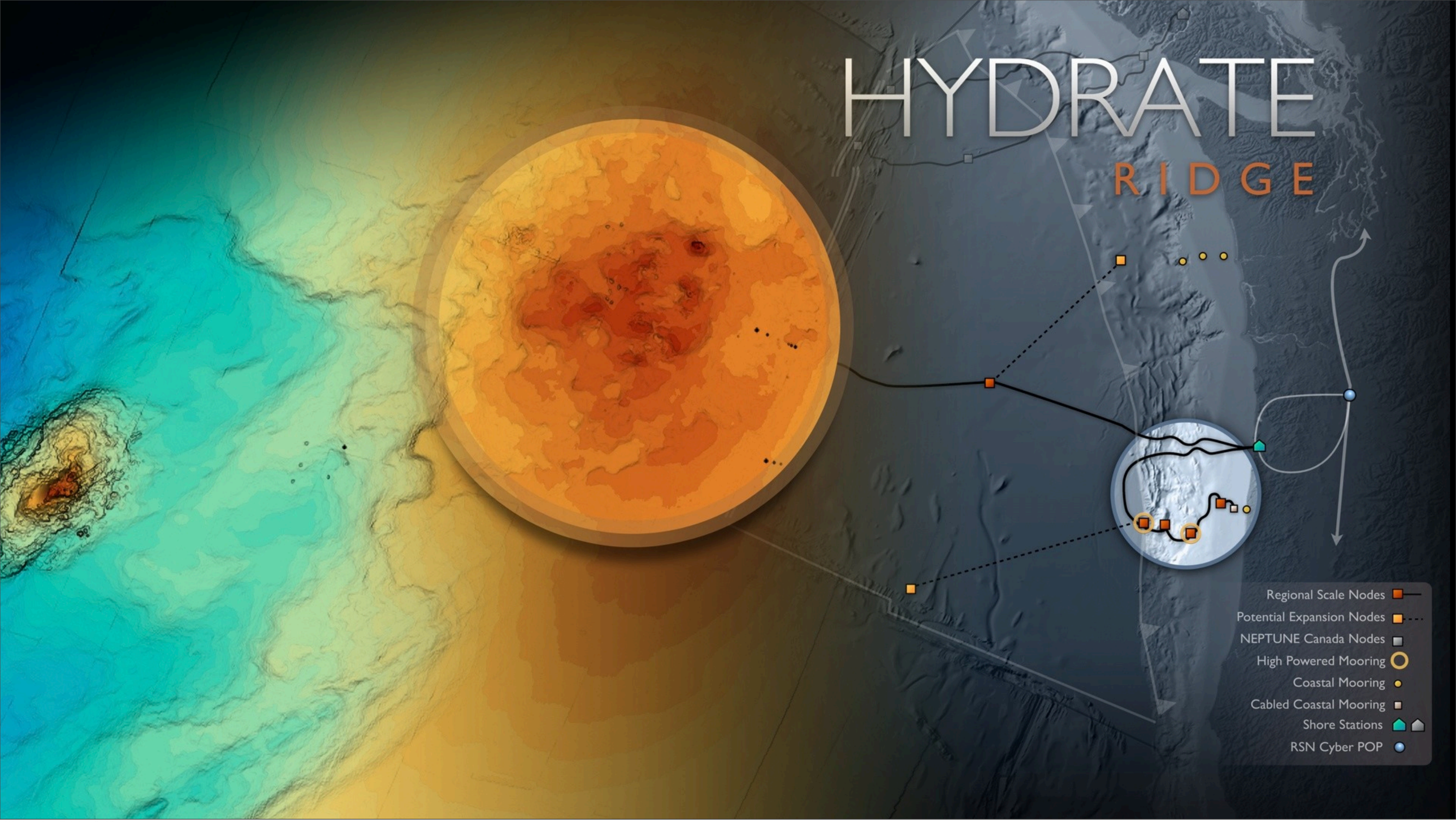
Cascadia Margin RSN-EA Arrays: Real-time adaptable measurements of key environmental parameters (e.g. CO_2, pH, nitrate, O_2, chlorophyll) from 3000-80 water depth.

Axial Seamount

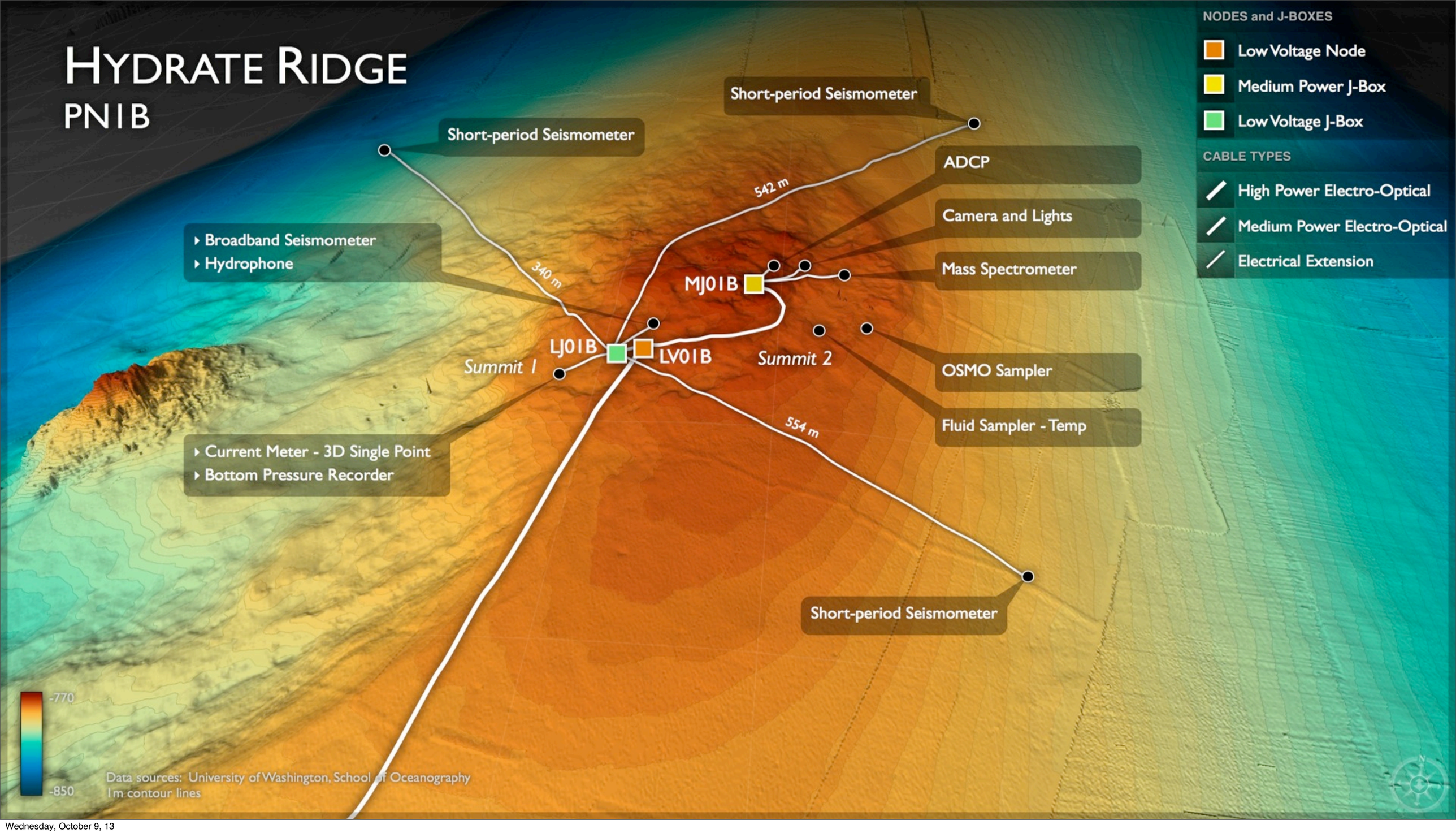


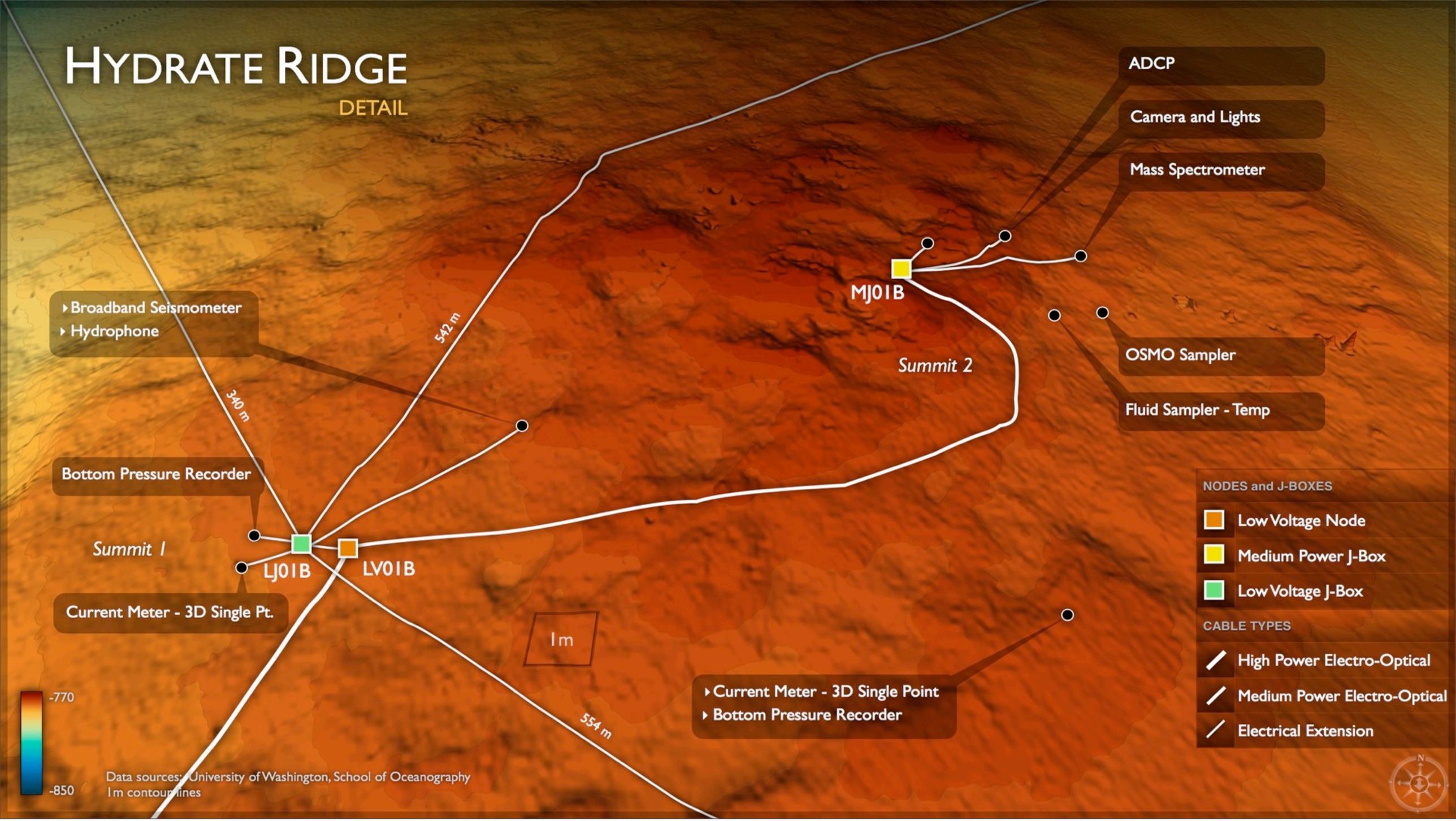


AXIAL CALDERA: Infrastructure outlined in blue was deployed during the VISIONS'13 expedition and fully tested. All is functional and awaiting connection to PN3B


HYDRATE
RIDGE
Regional Scale Nodes
Potential Expansion Nodes
NEPTUNE Canada Nodes
High Powered Mooring
Coastal Mooring
Cabled Coastal Mooring
Shore Stations
RSN Cyber POP

HYDRATE RIDGE
PN1B

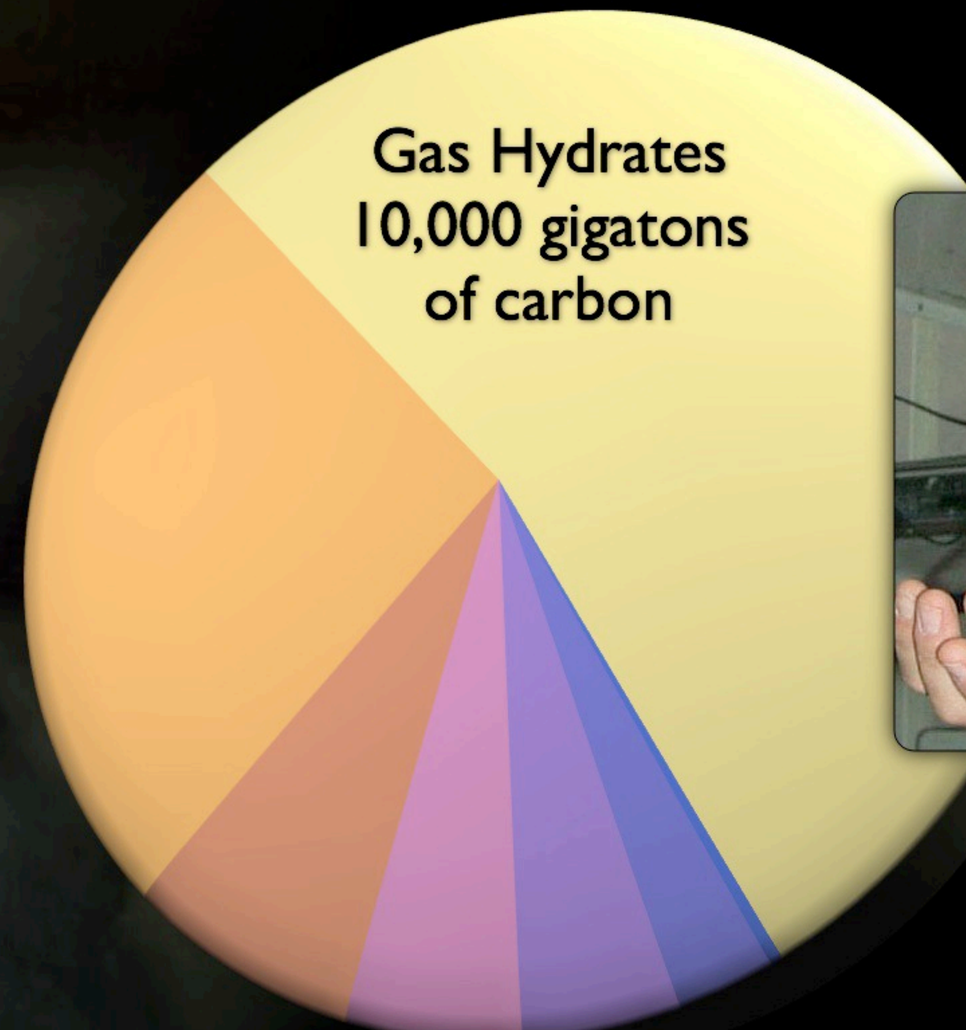



HYDRATE RIDGE
DETAIL
ADCP
Camera and Lights
Mass Spectrometer
MJ01B
Summit 2
OSMO Sampler
Fluid Sampler - Temp
Broadband Seismometer
Hydrophone
542 m
340 m
Bottom Pressure Recorder
Summit 1
LJ01B
LV01B
Current Meter - 3D Single Pt.
1m
Current Meter - 3D Single Point
Bottom Pressure Recorder
554 m
-770
-850
Data sources: University of Washington, School of Oceanography
1m contour lines
NODES and J-BOXES
Low Voltage Node
Medium Power J-Box
Low Voltage J-Box
CABLE TYPES
High Power Electro-Optical
Medium Power Electro-Optical
Electrical Extension

Earth's Carbon Reserves: Importance of methane hydrates

Quantities in gigatons of carbon

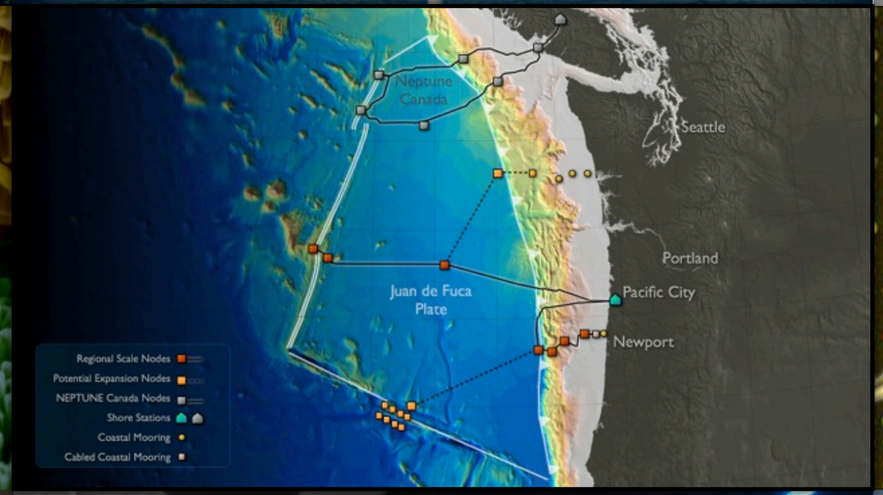
atmosphere	4
detrital organic	60
peat	500
terrestrial biosphere	830
dissolved organic matter	980
soils	1400
fossil fuels	5000
gas hydrate	10,000

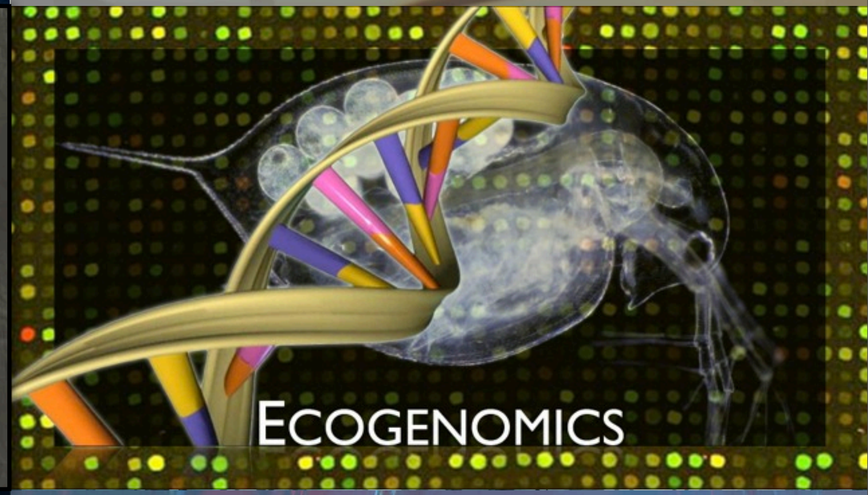



POWER DELIVERY

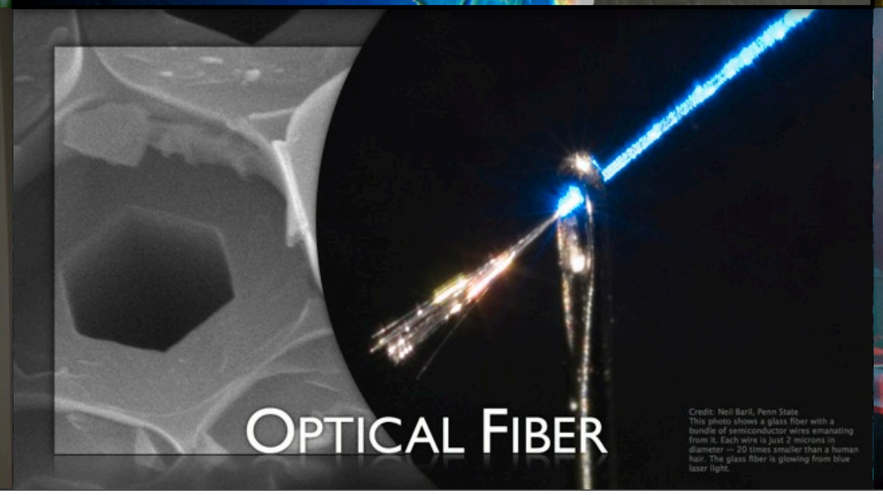

ROBOTICS


NANOTECH

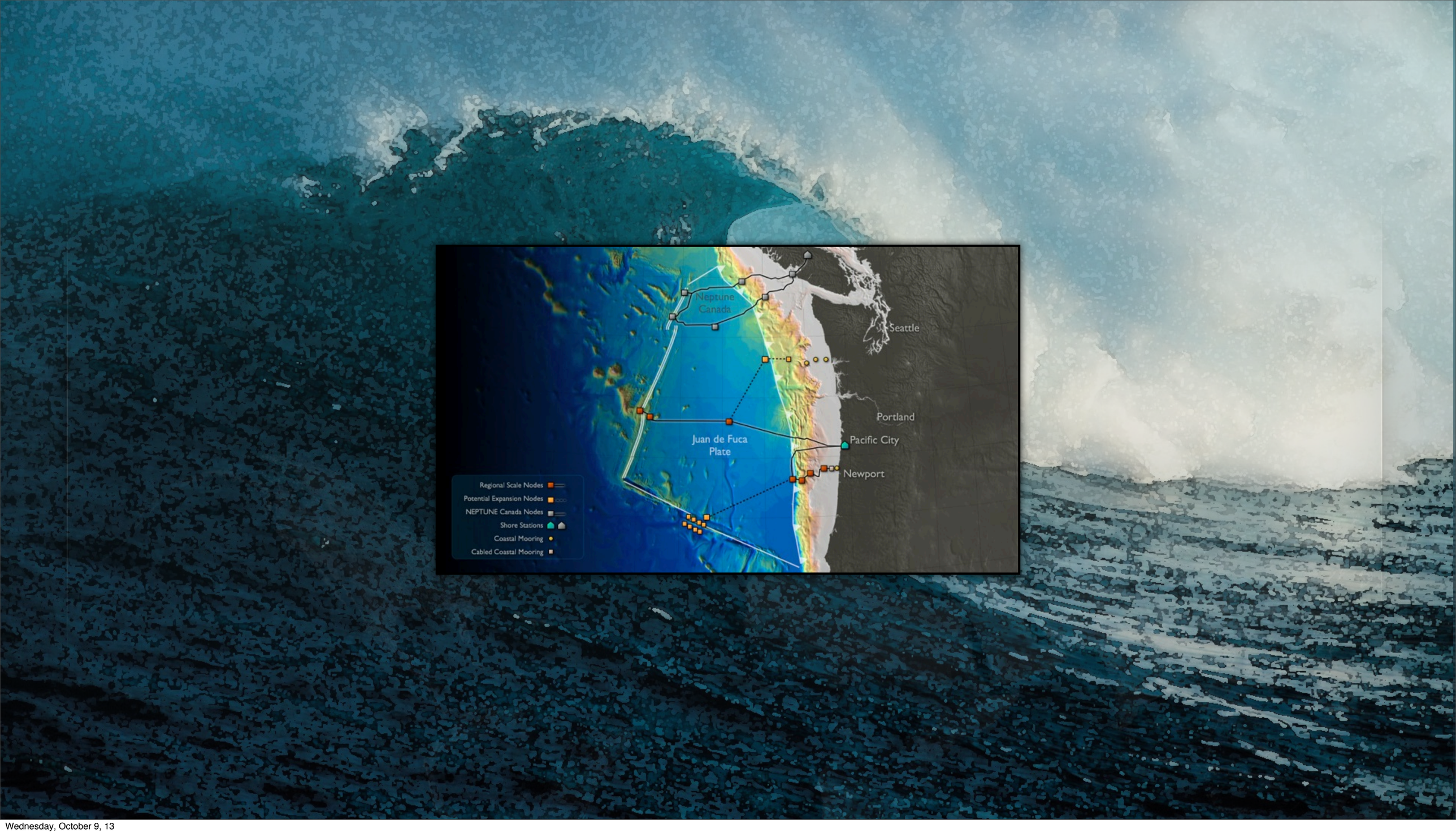

Neptune Canada
Seattle
Portland
Juan de Fuca Plate
Pacific City
Newport
Regional Scale Nodes
Potential Expansion Nodes
NEPTUNE Canada Nodes
Shore Stations
Coastal Mooring
Cabled Coastal Mooring


ECOGENOMICS


GRID/CLOUD COMPUTING


OPTICAL FIBER


DIGITAL IMAGING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