OCEAN OBSERVATORIES INITIATIVE

Developing realistic proposals and hypotheses to carry forward deep ocean observations on the OOI Cabled Array and broader NE Pacific.

OOI Deep Ocean Observing Workshop

27-29 August 2018

Seattle, Washington

Courtyard by Marriott Seattle
925 Westlake Ave N
Seattle, WA 98109

SCHEDULE AT-A-GLANCE

Monday

8:00	Continental Breakfast *(Puget Sound)*
8:30	Workshop Convenes & Presentations *(Puget Sound)*
10:30	Break
11:00	Presentations *(Puget Sound)*
12:30	Lunch & Lightning Talks *(Foyer / Puget Sound)*
1:30	Group Discussion *(Puget Sound)*
3:00	Break
3:30	Individual Working Groups *(meet in breakout rooms)*
4:15	Re-convene Report Out *(Puget Sound)*
5:15	Working Dinner at Art Marble 21 *(food provided; cash bar)*

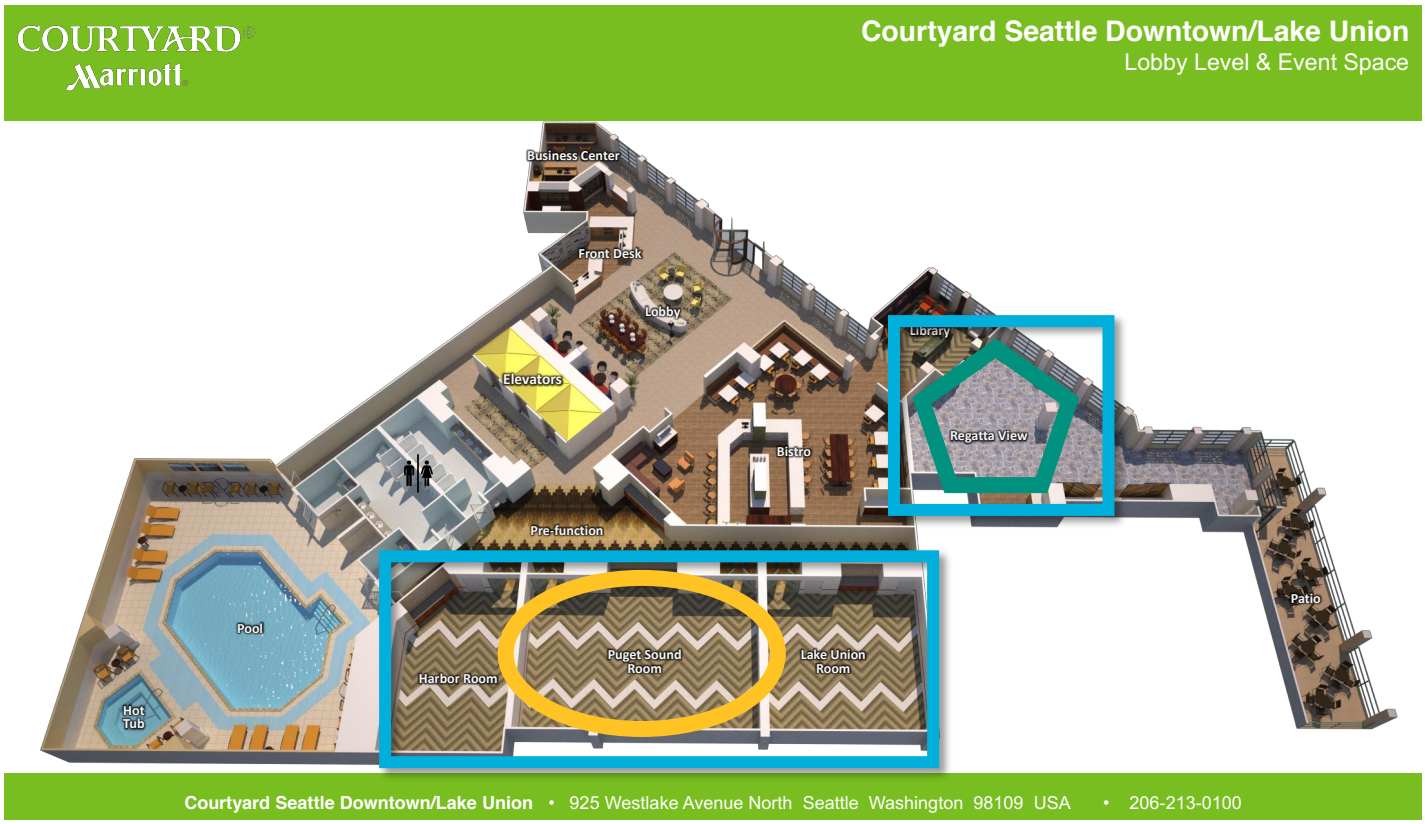
Tuesday

8:00	Continental Breakfast *(Regatta View)*
8:30	Presentations *(Puget Sound)*
9:00	Individual Working Groups *(meet in breakout rooms)*
10:30	Break
11:00	Report out *(Puget Sound)*
12:30	Lunch & Lightning Talks *(Foyer / Puget Sound)*
1:30	Presentations/Group Discussion *(Puget Sound)*
3:00	Break
3:30	Individual Working Groups *(meet in breakout rooms)*
4:50	Re-convene for Day 2 wrap up *(Puget Sound)*
5:00	Dinner Off-Site *(not provided)*

Wednesday

8:00	Continental Breakfast *(Regatta View)*
8:30	Presentations/Group Discussion *(Puget Sound)*
10:30	Break
11:00	Individual Working Groups *(meet in breakout rooms)*
12:30	Lunch & Lightning Talks *(Foyer / Puget Sound)*
1:30	Individual Working Groups *(meet in breakout rooms)*
3:00	Break
3:30	Individual Working Groups *(meet in breakout rooms)*
4:50	Re-convene for final Report Out *(Puget Sound)*
5:00	Workshop officially adjourns

MEETING SPACE MAP



Breakfast: Regatta View

General Session & Lunch: Puget Sound Room

Breakout Rooms: Puget Sound Room, Harbor Room, Lake Union Room, and Regatta View

LIGHTNING TALKS

Lightning talks will be given each day during a portion of the lunch break.

These provide participants with the opportunity for the group to get to know each other more and for individuals to have the opportunity to share what they are working on.

Lightning talks are one slide in length and are meant to be delivered in 1-2 minutes.

Please focus your slide on describing an aspect of your work in Deep Ocean Observing that you think the group would find most interesting. If you are currently using OOI data in the deep ocean we would love for you to highlight that work.

Please submit your slide – PDF or Powerpoint format, please - by **Sunday August 26th.**
Email slides to Liana (Lvaccari@oceanleadership.org)

Lightning Talk Schedule

Monday	Tuesday	Wednesday
1. Simone Baumann-Pickering	1. Chris Edwards	1. Nick Rome
2. Kendra Daly	2. Kanae Komaki	2. Henry Ruhl
3. Kathleen Donohue	3. Nadine Le Bris	3. Joe Schumaker
4. Elva Escobar	4. Wu-Jung Lee	4. Paul Snelgrove
5. Richard Feely	5. Lisa Levin	5. Sun Song
6. Jim Holden	6. Aaron Marburg	6. Tony Song
7. Bruce Howe	7. Andrea McCurdy	7. Dax Soule
8. Felix Janssen	8. Rosanna Milligan	8. Laurenz Thomsen
9. Kim Juniper	9. Tushar Mittal	9. Michael Vardaro
10. Orest Kawka	10. Tom Moore	10. Jenny Waddell
11. Julie Keister	11. Jan Newton	11. Travis Washburn
12. Deb Kelley	12. Brendan Philip	12. Robert Weller

WORKING GROUP GUIDANCE

The goal of this workshop is to develop realistic ideas and concepts that can be turned into proposals to carry forward deep ocean observations on the OOI Cabled Array and broader NE Pacific. As such, much of the workshop will be focused on small working groups in order to solidify what these proposals and hypotheses might be.

The work in the small working groups is critical to the success of the workshop. It is our hope that collaborations formed within these groups will carry forward after the workshop to turn these ideas into actual proposals and funded projects. By the end of the workshop, each group will have a 10-minute power point presentation summarizing their ideas, a plan and timeline for developing a proposal, and an idea of where to go for funding.

At the beginning of the workshop, science questions for each of the four working groups will be selected during a broader group discussion, starting with the multi-disciplinary DOOS Science Questions as a foundation. Participants will divide themselves into working groups based on these science questions and will work to explore these questions further.

Groups will report out the results of this preliminary discussion and finalize the science question(s) they seek to address for the remainder of the workshop. Note that questions that have become very similar (e.g. similar measurement needs) acriss groups may seek to merge and groups with split interest may wish to separate. Additionally, these presentations will give participants the opportunity to see if the focus of another group better fits their interest. After this report out, questions and working group participants will be fixed for the remainder of the workshop.

Groups will be assigned a group leader from the Planning Committee to moderate discussions and a notetaker to record conversation ideas on a computer projected at the front of the room.

Specific goals for each working group session are outlined within the agenda. These were intentionally selected to follow the flow of workshop presentations and discussions. As such we ask that you, as much as possible, please focus your discussion on those areas.

At the end of the workshop, participants who would like to continue working with their groups to fully develop a proposal will be asked to solidify their level of commitment.

OOI Deep Ocean Observing Workshop

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WORKING DINNER

Overall Objective: To engage workshop participants in a less formal venue to begin the formation of collaborations and shared interest that will be fostered throughout the workshop.

Schedule:

5:15 Adjourn from hotel walk down to Art Marble 21

5:45 Opening remarks

6:00 Dinner starts *(food provided; cash bar)*

6:15 OOI data demo from Mike Vardaro

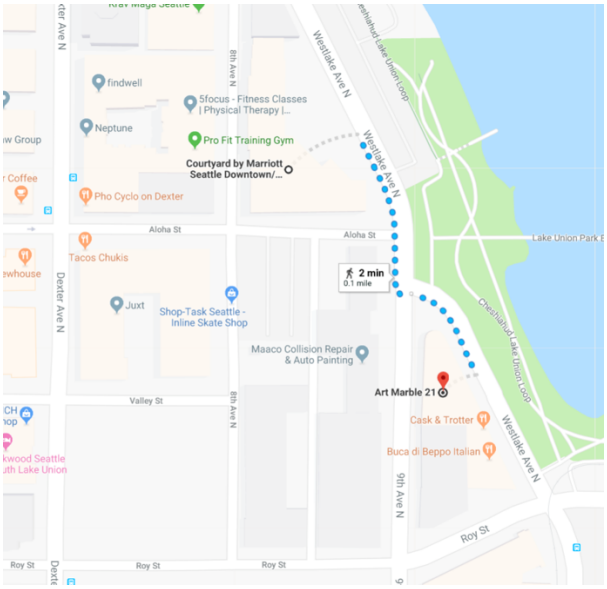
7:00 Deep ocean open discussions

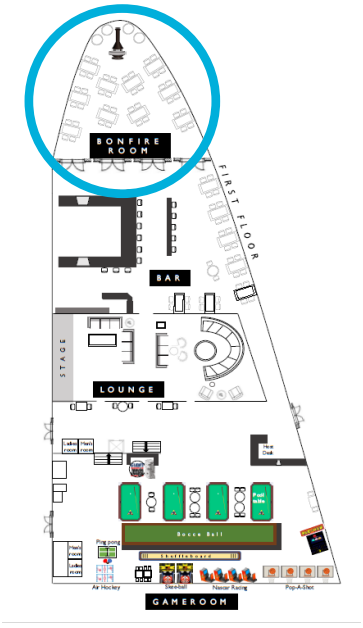
8:00 Formal dinner concludes

Deep Ocean Open Discussion:

We encourage participants to informally engage in discussions in small groups to share experiences and insight from the broader field of deep ocean observing. To facilitate those discussions, we have provided a list of potential discussion topics:

1) What is the role and connection of the deep ocean in the global earth system? How we could use ocean observations to enhance that understanding?
2) How can we use deep ocean observations to advise on ocean sustainability strategies?
3) What are the observation gaps (spatial/technological) that we need to fill to make the most optimum use of observatory structures?
4) Why is the deep ocean important to society and ocean conservation (e.g. ecosystem services)?





OCEAN OBSERVATORIES INITIATIVE

AGENDA DAY 1:
MONDAY AUGUST 27, 2018

DAY 1 OBJECTIVE: Provide background information to guide the creation of a set of science questions that can be addressed using the OOI and surrounding observatories.

Time	Agenda Item	Person	Time
8:00	**Continental Breakfast** *(provided)*		
8:30	**I. Welcome** a. Opening Remarks/Housekeeping b. Welcome from the National Science Foundation	 *Leslie Smith* *Lisa Clough*	 5 min 5 min
8:40	**II. Workshop Participant Introductions**	*ALL*	20 min
9:00	**III. Outline of Workshop Goals and Objectives**	*Kristen Yarincik*	15 min
9:15	**IV. The Ocean Observatories Initiative** a. Overview & Deep Assets in the NE Pacific b. Introduction to the Cabled Array	 *Kendra Daly* *Deb Kelley*	 15 min 30 min
10:00	**I. The Deep Ocean Observing Strategy** a. Introduction to GOOS b. Introduction to DOOS & DOOS Projects	 *Andrea McCurdy* *Lisa Levin*	 10 min 20 min
10:30	**Break**		
11:00	**II. NE Pacific Regional Observatories** a. Ocean Networks Canada b. NANOOS	 *Kim Juniper* *Jan Newton*	 15min/each
11:30	**III. Essential Ocean Variables** a. Introduction to concept of EOVs b. Update on Deep Ocean EOVs i. Biology ii. Biogeochemistry iii. Physics iv. Solid Earth c. Connection between OOI and the EOVs	 *Henry Ruhl* *Henry Ruhl* *Felix Janssen* *Bruce Howe* *Bruce Howe* *Leslie Smith*	 5 min 10 mins/each
12:30	**Lunch** *(provided) – Lightning Talks*		

AGENDA DAY 1:
MONDAY AUGUST 27, 2018

1:30	**I. DOOS Science Questions**	*Felix Janssen*	15 min
1:45	**II. Discussion of working group topics**	*Henry Ruhl & Felix Janssen*	75 min
	Goal: *This discussion will center around determining the key, cross-discipline science questions for each of the 4 initial working groups. Questions will focus on aspects of the deep ocean that can be addressed by the OOI and neighboring observatories in the NE Pacific. Going into the break, folks will be divided into their *preliminary* groups and will reconvene at their working group meeting location.*		
3:00	**Break**		
3:30	**III. Individual Working Groups**		45 min
	Goal: *Groups explore their science questions in more detail. The aim is to come up with a brief description of how your questions can be addressed using the OOI and nearby NE Pacific observatories. Make sure to focus on the types of measurements needed (what is available and what would need to be added).*		
4:15	**IV. Working Group Report Out**	*Group Reps*	45 min
	Goal: *Groups present their ideas to receive feedback (10 min each group). This report out will provide a look at how questions have evolved. Questions that have become very similar (e.g. similar measurement needs) may seek to merge and groups with split interest may wish to separate. Additionally, these presentations will give participants the opportunity to see if the focus of another group better fits their interest. After this report out, questions will be solidified for the remainder of the workshop.*		
5:00	**V. Day 1 Wrap-Up & Day 2 Look Ahead**	*Leslie Smith*	15 min
5:15	**Working Dinner** *(provided)* **until 8pm at Art Marble 21 with Data Demo** (by Mike Vardaro)		

OCEAN OBSERVATORIES INITIATIVE

AGENDA DAY 2:

TUESDAY AUGUST 28, 2018

DAY 2 OBJECTIVE: Solidify working groups surrounding these questions and craft the details of how to address them.

Time	Agenda Item	Person	Time
8:00	**Continental Breakfast** *(provided)*		
8:30	**I. Hello and Objectives for Day 2** a. Brief review of final group themes/topics	*Leslie Smith*	15 min
8:45	**II. OOI Data**	*Mike Vardaro*	15 min
9:00	**III. Individual Working Groups**		90 min
	Note: *Participants may switch to a new group now but must stay there for the duration.* ***Goal:*** *Draft a brief 10-minute presentation about your group's key science questions and how to address them. In your discussion/presentation, focus on addressing whether existing OOI & nearby regional observatories fully address these questions and if not, what modifications would be needed.*		
10:30	**Break**		
11:00	**IV. Working Group Report Out**	*Group Reps*	20 min each
12:30	**Lunch** *(provided) – Lightning Talks*		
1:30	**VI. Modelling – what data are available to the region**	*Chris Edwards*	15 min
1:45	**VII. Deep Ocean Sensors & Technology** a. Scalable Methods and Approaches b. Cabled Array Technology	*Henry Ruhl & Dana Manalang* *Orest Kawka*	15 min each
2:15	**V. Discussion – Deep Ocean Sensors & Technology**	*Bruce Howe*	45 min
	Goal: *The discussion will address the following topics…* • *Difference in sensor technology for global vs regional observational purposes* • *Variation in platform needs (cabled junction box vs float)* • *New sensors in development (prototype vs mature) and sensor readiness testing protocols*		
3:00	**Break**		
3:30	**VI. Individual Working Groups**		80 min
	Goals: *(1) Re-group after receiving comments from presentations and finalize group slide set (deliverable).* *(2) Technology and Sensor needs for you question(s) and respective readiness levels.*		
4:50	**VII. Day 2 Wrap-Up & Day 3 Look Ahead**	*Leslie Smith*	10 min
5:00	**Adjourn**		

AGENDA DAY 3:

WEDNESDAY AUGUST 29, 2018

Day 3 Objective: Create a road map to a project proposal

Time	Agenda Item	Person	Time
8:00	**Continental Breakfast** *(provided)*		
8:30	**I. Hello and Objectives for Day 3**	*Leslie Smith*	15 min
8:45	**II. Proposing to use the OOI (data, adding infrastructure, etc)** a. Overview of Science Change Request Process b. Cabled Array Specific Changes	 *Leslie Smith* *Deb Kelley*	 20 min 10 min
9:15	**III. Discussion – Adding Infrastructure**	*Deb Kelley & Paul Snelgrove*	45 min
	Goal: *Discussion of what infrastructure would need to be added to the OOI in order to more fully address these NE Pacific projects. Discussion will include:* *1) If infrastructure needs to be added, what would leverage best across working groups?* *2) Does this infrastructure currently exist or is it still in development?* *3) What pre-proposals are coming down the pipe in the next few years?*		
10:00	**IV. Discussion – Potential Funding Sources**	*Lisa Clough*	30 min
	Goal: *Discuss the potential funding sources that may be able to fund projects like these.*		
10:30	**Break**		
11:00	**V. Individual Working Groups**		90 min
	Goal: *Discussion of infrastructure additions (instruments, platforms) and potential funding sources.*		
12:30	**Lunch** *(provided) – Lightning Talks*		
1:30	**VI. Individual Working Groups**		90 min
	Goals: *Discussion of writing process to formalize plans for each project* *1) Outline a process for drafting a project plan and a timeline for steps ahead* *2) Solidify level of commitment from working group members; identify key leadership individuals* *3) Discuss mechanisms to continue momentum – Slack Channel, Gdrive folder, upcoming gatherings*		
3:00	**Break**		
3:30	**VII. Final Working Group Report Out**	*Group Reps*	20 min each
	Goal: *Describe progress, plan moving forward, and any remaining questions/comments for feedback.*		
4:50	**Workshop Wrap up & Farewell**	*Leslie Smith*	10 min
5:00	**Workshop Concludes**		

PARTICIPANT LIST

Simone	Baumann-Pickering	*Scripps Institution of Oceanography*
Lisa	Clough	*National Science Foundation*
Kendra	Daly*	*University of South Florida*
Kathleen	Donohue	*University of Rhode Island*
Chris	Edwards	*University of California, Santa Cruz*
Elva	Escobar	*Universidad Nacional Autónoma de México*
Dick	Feely	*National Oceanic and Atmospheric Administration*
Jim	Holden	*University of Massachusetts, Amherst*
Bob	Houtman	*National Science Foundation*
Bruce	Howe	*University of Hawaii*
Felix	Janssen*	*Alfred Wegener Institute*
Kim	Juniper	*University of Victoria*
Orest	Kawka	*University of Washington*
Julie	Keister	*University of Washington*
Deb	Kelley*	*University of Washington*
Kana	Komaki	*University of Washington*
Nadine	Le Bris	*Sorbonne University*
Wu-Jung	Lee	*University of Washington*
Lisa	Levin	*Scripps Institution of Oceanography*
Aaron	Marburg	*University of Washington*
Andrea	McCurdy	*University Corporation for Atmospheric Research*
Rosanna	Milligan	*Nova Southeastern University*
Tushar	Mittal	*University of California, Berkeley*
Tommy	Moore	*Northwest Indian Fisheries Commission*
Jan	Newton*	*University of Washington*
Brendan	Philip	*University of Washington*
Nicholas	Rome	*Consortium for Ocean Leadership*
Henry	Ruhl*	*Monterey Bay Aquarium Research Institute*
Joe	Schumacker	*Quinault Indian Nation*
Leslie	Smith	*Consortium for Ocean Leadership*
Paul	Snelgrove*	*Memorial University*
Sun	Song	*Chinese Academy of Science*
Tony	Song	*Jet Propulsion Laboratory*
Dax	Soule	*Queens College*

Laurenz	Thomsen	*Jacobs University Bremen*
Liana	Vaccari	*Consortium for Ocean Leadership*
Michael	Vardaro	*Rutgers University*
Jenny	Waddell	*National Oceanic and Atmospheric Administration*
Travis	Washburn	*Duke University*
Robert	Weller	*Woods Hole Oceanographic Institution*
Kristen	Yarincik	*Consortium for Ocean Leadership*

**Workshop Planning Committee*

EOVs & DOOS Science Questions

Legend

GOOS EOV status	Key
GOOS EOVs most directly applicable to coast and the surface	
GOOS EOVs most directly applicable to DOOS	
GOOS EOVs that are emerging and applicable to DOOS	
EOVs under consideration by DOOS	

	Physics														Biogeochem													Biology and Ecology													
	Sea state	Ocean surface stress	Sea ice	Sea surface height	Sea surface temperature	Surface currents	Sea surface salinity	Ocean surface heat flux	Subsurface temperature	Subsurface currents	Subsurface salinity	Ocean Bottom Pressure	Seafloor Fluxes	Ocean Turbulence	Oxygen	Nutrients	Inorganic carbon	Transient tracers	Particulate matter	Nitrous oxide	Stable carbon isotopes	Dissolved organic carbon	Ocean colour (Spec Sheet under development)	Seafloor labile organic matter	Seafloor respiration	Seafloor fluid and gas effluxes (focus on methane)	Litter including microplastics	pH	Phytoplankton biomass and diversity	Marine turtles, birds, mammals abundance & distributio	Seagrass cover	Macroalgal canopy cover	Mangrove cover	Zooplankton biomass and diversity	Fish abundance and distribution	Hard coral cover and composition	Microbe biomass and diversity	Benthic invertebrate abundance and distribution	Bodysize	Bioacoustics	Seafloor sponge habitat cover	Connectivity of species
What is the role of the deep-ocean in the Earth's energy imbalance and land/sea water redistribution on annual to multi-decadal time scales? This includes closing the heat and fresh water budget, the warming and freshening of the deep ocean, and their contribution to sea level change.																																									
How are natural and anthropogenic variations in climate connected to the global overturning circulation and its variability? This includes variations in deep and bottom water formation rates and water properties, circulation and deep ocean mixing, and geothermal heating, and impacts on deep sea ecology.																																									
How does deep pelagic ecology respond to natural variation and multiple climate change stressors, including warming, deoxygenation, acidification, changes in biological production, as well as industrial activities?																																									
How might natural and anthropogenic variations in climate influence the function of the solubility and biological carbon pumps, continental slope, nephloid layer transport and the sequestering of carbon in the deep ocean, and the supply of organic carbon food supplies to deep-sea communities?																																									
What drives observed variation in seafloor fluxes of heat, nutrients, tracers, oxygen and different carbon pools? How are these quantities connected to larger-scale ocean circulation? This includes long term links between seafloor fluxes and greater oceanic physical and biogeochemical processes.																																									
How might natural and anthropogenic change influence the functional importance of animals and microbes in the deep sea and the seafloor? What environmental variations do they experience in space and time? This includes consideration of benthic storms and currents, fluctuations in turbidity, T, pH, O_2, and POC flux. This will improve spatial planning and impact assessment for seabed mining, bottom trawling and oil and gas extraction.																																									

Qualitative representation of the EOVs needed to address the DOOS key science questions. Saturation of colors in the matrix provide an estimate for the significance of the respective EOVs with darker shades indicating more relevance. The origin and context of the EOVs is indicated in the legend.