Virtual meeting OceanSITES
13th Science Committee (SC) & 9th Data Management Team (DMT) meeting
14 - 18 September, 2020

Objective of the meeting: Create a vision and mission for OceanSITES in 2030

Session Title:
Opening & Ocean Observing in 2030 – recommendations for an OceanSITES pathway into the future

Format:
Panel discussion

Moderators
Tom Trull, Doug Wallace & Johannes Karstensen

Panellists
David Legler (NOAA) OCG chair
Martin Visbeck (GEOMAR) UN Decade EPG
Weidong Yu (SYSU) GOOS OOPC Panel
Gabrielle Canonico (NOAA) GOOS BioEco Panel
Maciej Teleszewski (IOCCP) GOOS Biogeo Panel IOCCP
Boris Kelly-Gerreyn (BOM) DBCP chair

Session description:
This session will frame where global Ocean Observing might move towards in the coming decade and what the place for OceanSITES can be.

- OceanSITES as of now – Vision/Mission statement and aftermath OceanObs19
- The UN Decade for Ocean Science for Sustainable Development - opportunity space for OceanSITES
- The OCG vision for the 2030 (focus on cross network / cross disciplinary observing for society)
- Moored observations in DBCP and OceanSITES – Metocean data for operational purposes versus high quality multidisciplinary time series
- The future ocean observing design for global ocean observing and positins from the GOOS panels for Physics, Biogeochemistry and Ecosystem/Biology
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Reference Links:
Meeting Agenda
Meeting Announcement on YouTube
Meeting registration at IOC-Unesco.org or Signup Genius

Session Title: (Day 1)
OceanSITES as part of GOOS2030 Data System

Session Date and Time:
Monday September 14, 2020 at 14:45-16:15 UTC

Session description:
The goal of this session is to envision the OceanSITES data system of 2030 and discuss the challenges to achieving that vision. New guidance from governing bodies like the WMO, IOC/IODE\(^1\), and OCG\(^2\) will influence the direction of the OceanSITES data system and may introduce new requirements and/or opportunities for cross-observing network integration. New technologies such as cloud computing and the Big Data approaches that the cloud can enable (Artificial Intelligence and Machine Learning) will influence many aspects of computational science in the next decade and offer opportunities expanding the reach and utility of OceanSITES data. Finally, the GOOS Panels and the Observations Coordination Group are promoting a focus on integrated data sets of essential ocean variables which could influence the way OceanSITES manages data. In light of these external technology and policy factors, this session will focus on the strengths and weaknesses of the existing OS data system in hopes of informing future goals for the system evolution.

Format:
- Panelists introduce themselves and provide 5 minute introduction to their interest in OceanSITES data management (Optional, panelists are encouraged to create a pre-recorded video presentation that can be viewed prior to the session)
- Open panel discussion based on questions asked by the moderator
- Incoming questions from the audience via chat function or hand raising function

OceanSITES Panel Moderators:
Derrick Snowden (NOAA/IOOS)

Panel Members:

\(^1\) IOC/IODE Inter-sessional Working Group to propose a Strategy on Ocean Data and Information Stewardship for the UN Ocean Decade (IWG-SODIS) Draft Report
\(^2\) Observation Coordination Group Data Strategy is being drafted
Virtual meeting OceanSITES
13th Science Committee (SC) & 9th Data Management Team (DMT) meeting
14 - 18 September, 2020

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- Kevin O’Brien (University of Washington/CICOES, NOAA/PMEL and Observations Coordination Group)
- Jeremy Tandy (UK Met Office and WMO Standing Committee on Information Management and Technology)
- Taco de Bruin (NIOZ and IOC/IODE IWG-SODIS)
- Steve Diggs (Scripps Institution of Oceanography)
- Adam Leadbetter (Marine Institute, Ireland)
- Conor Delaney - Technical Coordinator @ EMODnet

Session Timing:
14:45-15:00 (15 minutes): Introductions & Logistics
Initial presentation providing structure (pre-recorded and available before the meeting starts)
- Provide a description of the current state of the OceanSITES data system including an introduction to the underlying standards, a description of the structural elements (GDACs etc), and a high level description of the services provided to the public
- Short introduction to the panelists including why they were chosen or what their perspectives are

Policy drivers Kevin (OCG)/Taco (IODE)/Jeremy (WMO)
- IOC/IODE, OCG, and the WMO are all in the midst of articulating new strategies for the coming decade. What are the implications for participating observing systems like OceanSITES and how can we influence these strategies and/or benefit from them?
- Integration with other data systems, either to provide integrated data sets for science (e.g. EOV based data sets instead of platform based data sets)
- We’ve all probably heard a great deal about FAIR principles for data management. From your perspective, do you think the OceanSITES data system adheres to these principles? If not, can you think of one or two priorities you would suggest for us to consider?
- How can we better promote OceanSITES products for use by the scientific community? Have you seen exceptional examples of community outreach that OceanSITES might be able to leverage?
- Are our data [sharing] policies fit for purpose?

Technology Drivers Adam/Jeremy/Steve
- It’s hard to envision any future data system without contemplating the role of cloud platforms. How are your organizations contemplating the use of the cloud and what are the challenges you’re encountering? Do you foresee any implications for observing systems like OceanSITES who are trying to increase the visibility and utility of their observations? What are the critical functions that cloud services can usefully replace? Who will pay for the cloud services? How will we ensure metadata is connected to data hosted in cloud formats?
- As more of our data resides in the cloud, how do we make sure that we have an open ecosystem and avoid creating Google, AWS, Azure and Alibaba coloured siloes?
**Virtual meeting OceanSITES**

13th Science Committee (SC) & 9th Data Management Team (DMT) meeting

14 - 18 September, 2020

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- What do you want from a dream data platform as a service?
- WMO and IOC - they’re both building their own systems (WIS and ODIS). Users don’t care which international organisation is pulling the strings. How do we make both of these ‘ecosystems’ appear to uniform to data users?
- Is the WMO significantly invested in the cloud for operational data dissemination? Or are there plans for this?
- What are the barriers to participating in the OceanSITES data system?
- OceanSITES is a distributed system with data artifacts residing at PI labs, regional Data Assembly Centers, global Data Assembly Centers, and other national science data repositories (e.g. Pangea). What advances from the linked open data world can help us join together this distributed system?
- Automatically populating metadata repositories such as JCOMMOPS
- Creating and publishing scientifically derived products such as long time series and other synthesis products.
- Discovering and linking to data that is published in other (non-GDAC) data repositories
- How best to ensure citation credit for OceanSITES data and Products? Are DOIs the best choice?

**Outcomes:**
The key points from each of the panelists will be summarized at the start of the session so that the bulk of the session can be devoted to Q&A and to developing recommendations for both short-term and long-term OceanSITES activities that could lead to improved data products over the next decade that will address the scientific and societal needs of the next decade.

Recommendations developed during this discussion will be shared broadly within and beyond OceanSITES.

**Supplemental Material:**

- Adam Leadbetter - Quality Management Framework at the Marine Institute, Ireland (video)
- Jonathan Yu, Mark Hedley, Adam Leadbetter - Using Linked Open Data techniques within netCDF files to better connect disparate data sets (video)
- Jeremy Tandy - Update on WMO Data and Information Activities (video)
Virtual meeting OceanSITES
13th Science Committee (SC) & 9th Data Management Team (DMT) meeting
14 - 18 September, 2020

**Objective of the meeting:** Create a vision and mission for OceanSITES in 2030

**Session Title:**
Ocean Transport Moorings Array

**Format:**
- Pre-recorded short talks by Panellists, focussing on the role of their work in OceanSITES, their view of OceanSITES, questions and ideas for OceanSITES
- During session a Summary by the moderators will be provided and key points/questions are extracted from the talks to be addressed in the panel discussion

**Panel Moderators:**
Uwe Send (SIO), Johannes Karstensen (GEOMAR)

**Panellists:**
Jaime Palter (URI, USA) - Multidisciplinary transport arrays
Eleanor E. Frajka-Williams (NOC, GBR) - Overturning arrays
Karin Margretha H. Larsen (FMRI, FRO) - Overflow Arrays
Bernadette Sloyan (CSIRO, AUS) - Boundary Current arrays
Rebecca Woodgate – (UW, USA) Arctic Arrays
Katy Hill (UK G7 Marine Science Coordinator, GBR) - Challenges for sustaining Transport Arrays

**Session description:**
This session will discuss, based on specific examples, the current and future design and sustainability aspects of Transport Arrays.

Questions which can be addressed by the Panellists pre-recoded presentations:
- What is the relation of your science program with OceanSITES?
- What would you like OceanSITES to do for your efforts?
- How do you approach multidisciplinary observing aspects? What are the biggest obstacles to overcome?
- What challenges do you face where OceanSITES might be able to assist?
- Where do you see global transport arrays 10 years from now? how will a global map of transport moored arrays look into 2030 in an ideal (unlimited funding)? What are the limitations that may case reality will look different?
- What do we know about the potential use cases for transport arrays? (“Day after tomorrow“?) and who currently cares about that?
Objective of the meeting: Create a vision and mission for OceanSITES in 2030

Session Title: Air-Sea Exchange – Reference Time Series for 2030
Please register here

Session Date and Time: Tuesday September 15, 2020 at 14:45-16:15 UTC

Format: Pre-recorded presentations and Open Panel discussion

OceanSITES Panel Moderators: Meghan Cronin (NOAA/PMEL), Iwao Ueki (JAMSTEC) & Bob Weller (WHOI)

Panel Members: Air-sea fluxes in models: Simon Josey (NOC)
Hybrid satellite / NWP air-sea flux products: Lisan Yu (WHOI)
Global Carbon Flux products, global carbon assessments required for Paris Agreement
Air Sea Exchange of CO2 and the Global Carbon Budget Elizabeth Shadwick (CSIRO)
Proposed OceanSITES air-sea interaction metrics & products: Dongxiao Zhang (UW/CICOES)

Session Description: This session will discuss the vision for Air-Sea Interaction observations within the OceanSITES network. Each panelist will have a short (i.e., upto 10-minute) pre-recorded presentation that should be reviewed prior to the session. The presentations will address the following questions:

- How have you used OceanSITES surface data in your air-sea interaction research?
- What are the societal benefits of your scientific findings using these OceanSITES observations?
- Where do you hope to see Air-Sea Exchange research and applications in 10 years? what could be a major breakthrough that put Air-Sea exchange observation to a new level - for services and for research?
- What needs to be improved/added within OceanSITES in order to meet these 10-year goals? and to better constrain global, regional and time varying fluxes? What are the gaps in the OceanSITES network affecting your air-sea interaction research? How can OceanSITES better serve your needs?
- What are shortterm and longterm recommendations for addressing these gaps?

Outcomes: The key points from each of the panelists will be summarized at the start of the session so that the bulk of the session can be devoted to Q&A and to developing recommendations for both short-term and long-term OceanSITES activities that could lead to improved air-sea flux fields over the next decade that will benefit society. Recommendations developed during this discussion will be shared broadly within and beyond OceanSITES.
Session Title:
Global Ocean Watch OceanSITES—Optimal Approaches for 2030

Format:
Panel discussion

Panel Moderators:
Tom Trull and Richard Lampitt

Panel Members:
Observing climate trends in ocean biogeochemist: When and where? Stephanie Henson (NOC).
Time series observation of marine snow: Makio Honda (JAMSTEC)
Emerging capabilities - on-float analysers: Matt Mowlem
Emerging problems - determining the influence and fate of micro-plastics: Chris Reddy
Emerging opportunities - ground-truth for satellite ocean colour: David Antoine/Emmanuel Boss
SCOR WG154 (P-OBS Working Group): Integration of Plankton-Observing Sensor Systems to Existing Global Sampling Programmes: Emmanuel Boss and Anya Waite

Session description:
This session will develop vision for “Global Ocean Watch” observations within the OceanSITES network over the coming decade. The concept of “Global Ocean Watch” is relatively new within OceanSITES, and differs somewhat from the other foci on air-sea flux stations and transport arrays, in being much broader. Essentially the idea is that OceanSITES can provide unique capabilities in the open ocean that can address a multitude of problems across the fields of biogeochemistry and ecology. Many capabilities allow tracking changing baselines, e.g. sensors and samplers for nutrient availability and plankton ecology and their responses to global warming, or hydrophones that listen for the passage of marine mammals or fish. Other capabilities can address catastrophic events such as the arrival of a heatwave or a harmful algal bloom, or a pollution event, for example the Deepwater Horizon oil well blow-out for which the presence of moored sediment traps provided key insights into the oil dispersal and fate.

The range of opportunities is very large, but what is the optimal global approach for the coming decade? How will organizing a uniform approach across the OceanSITES network magnify the returns? Which problems require a minimum network of stations to solve, and which can be addressed individually? Which problems are best addressed by OceanSITES versus other ocean observation platforms such as Argo, Go-Ship, or SOOP? What are the principles that should guide development of the OceanSITES Global Ocean Watch network? A decade is a very short time for OceanSITES, which often have only yearly visits and correspondingly bi-annual development cycles. What specific advances should we target as a community? What are the most important problems we can address?

Each panelist will have a short (i.e., up to 10-minute) pre-recorded presentation that should be reviewed prior to the session. The presentations will address the following questions:
- How have you used OceanSITES or other mooring data in your research? If not, what changes might attract you to use OceanSITES data?
- What are the societal benefits of your scientific findings using these OceanSITES observations?
- Where do you hope to see Ocean Watch research and applications in 10 years? What could be a major breakthrough that takes OceanSITES observations to a new level - for services and for research?
- What needs to be improved/added within OceanSITES in order to meet these 10-year goals? How can OceanSITES better serve your needs?

The key points from each of the panelists will be summarized at the start of the session so that the bulk of the session can be devoted to Q&A and to developing recommendations for both short-term and long-term OceanSITES activities that could lead to improved understanding of changing ocean ecology over the next decade that will benefit society. Recommendations developed during this discussion will be shared broadly within and beyond OceanSITES.

**Running sheet for the 90 minutes:**

1300-1315: Recap
1315-1330: What are Global Watch Stations?
1330-1400: Expert opinions on
The value of long time series in ocean biogeochemistry
The value of autonomous sample collection
Emerging capabilities - on-float analysers
Emerging problems - determining the influence and fate of micro-plastics
Emerging opportunities - ground-truth for satellite ocean colour
1400-1430: Discussion – is it possible or useful to design an optimal array, or to prioritize EOVs, ECVs, or EBVs? What are the most important problems that could be addressed through standardization? Or is diversity a strength? Do we already have any redundancy within OceanSITES Global Watch Stations? Are there aspects of OceanSITES that will become redundant versus other emerging networks such as floats or gliders? What are the most important things we can do THIS YEAR to be fit for purpose by the end of the decade?
OceanSITES Virtual Meeting, Sept. 2020

Meeting Objective: Create a vision and mission for OceanSITES in 2030

Session Title: Deep Ocean Observing

Session Date and Time: Wed., 16 Sept 2020, 14:45-16:15 UTC

Format:
- Pre-recorded short talks by panelists, focusing on the role of their work in OceanSITES, their views of OceanSITES, and their questions and ideas for OceanSITES
- Summary by session chair, reflecting on OceanSITES and extracting questions and ideas from the talks
- Panel discussion

Panel Moderators:
R. Venkatesan, National Institute of Ocean Technology, Chennai, India
M. Lankhorst, Scripps Institution of Oceanography, La Jolla, CA, USA

Panel Members:
TBD

Session Description:
OceanSITES platforms have made observations of the deep ocean for decades, but even so, data amounts are sparse. This session will explore how OceanSITES fits into the Deep Ocean Observing Strategy (DOOS) of the Global Ocean Observing System (GOOS), and what scientific and technical achievements we hope to make in the next decade. The discussion is structured into technical, infrastructure, and scientific parts that should each outline what progress is envisioned and achievable. A series of pre-recorded video talks by panel members, which participants should review before the session, forms the basis of these deliberations. The videos will be summarized at the beginning of the session, leaving plenty of time for discussion.

Proposed Discussion Topics:

- Technical
  - Coordinated approaches to calibration and validation across observing systems
  - What technical requirements are unique to the deep ocean, and how to address them efficiently (e.g. signals are small, calibration/validation data are sparse, available ship time to visit sites is limited, instruments need to withstand high pressure and corrosion)
  - Insights from OceanSITES Working Group on Deep Ocean Temperature and Salinity Observations

- Infrastructure
  - Organisation and delivery of data in different “levels”: derived data products versus in-situ data at native resolution in space and time
  - Does the focus on EOVs help accelerate or organize our results?
  - Collaboration with other observing groups: DOOS, Deep Argo, GO-SHIP, IAPSO Best Practice Study Group on Moored CTD Measurements. How can these be fostered and deliver tangible results?
Science
  - What science is enabled by existing deep ocean observing, and what would we like to address in the future?
  - Is real-time data telemetry from the deep ocean important?
  - What is the role of time series observations made by OceanSITES, and how do they fit in with other systems such as Argo and GO-SHIP? Does DOOS articulate these relationships properly?
  - What science disciplines are underrepresented in OceanSITES observations of the deep ocean? E.g.: biology, optical measurements and cameras, seismic and geophysics, cabled observatories. How should this evolve until 2030?

List of Video Presentations:
  TBD
Session Title:
Synergy with Modelling communities

Session Date and Time:
Thursday September 17, 2020 at 13:00-14:30 UTC

Format:
Open Panel discussion

Panel Moderators:
Raquel Somavilla, R. Venkatesan, J. Karstensen

Session Description:
This session will discuss the linkages between the diverse types of ocean modelling and OceanSITES observations, observing design, data access, and potential future needs. Each panellist will have a short (i.e., up to 8-minutes) pre-recorded presentation. A general summary will be compiled from the videos and used as a stimulation for Q&A. The presentations may address the following questions:

- How have you used data from the OceanSITES network for your model simulations?
- Is there a link between your work and uptake of the knowledge to inform society?
- Where do you see the Ocean Modelling community is taking up observational data? What kind of data and for which purposes?
- Where do you see your research and application space in 10 years? what could be a major breakthrough will bring modelling communities and observationalists closer together? Even to a new level with benefit for ocean services and for research?
- What needs to be improved/added within OceanSITES in order to meet these 10-year goals? and to better constrain global, regional and time variability?
- What are the gaps in the OceanSITES network affecting your research? How can OceanSITES better serve your needs? What are shortterm and longterm recommendations for addressing these gaps?

Outcomes:
The key points from each of the panelists will be summarized at the start of the session so that the bulk of the session can be devoted to Q&A and to developing recommendations for both short-term and long-term OceanSITES activities that could lead to improved use of OceanSITES data products over the next decade and that ultimately will benefit society. Recommendations developed during this discussion will be shared broadly within and beyond OceanSITES.
Synergy with other Networks

**Moderators:** Tony Knap and Richard Lampitt

**Time:** 14:45-16:15 UTC, 17 Sep

**Provisional Topics and Panelists**

1. Mike Lomas (Bigelow) to present on ship based observations at Eulerian observatories especially BATS
2. Dave Siegel (UCSB) to talk about Process Studies especially EXPORTS which is at two of the OceanSITES observatories.
3. Morten Iversen (AWI) to talk about process studies at fixed point observatories
4. Karen Wild-Allen (CSIRO) Open ocean to coastal observations achieved in IMOS
5. Kate Moran (ONC) The benefits of cabled observatories
6. Joaquin Tintore: Integrated Ocean Observing and Forecasting Systems, in response to science and society needs
7. Meric Srokosz (NOC) : Satellite observations
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Reference Links:
Meeting Agenda
Meeting Announcement on YouTube
Meeting registration at IOC-Unesco.org or Signup Genius

Session Title: (Day 5)
Data submission, metadata, long time series and DOIs: A proposal to smooth OceanSITES data workflows

Session Date and Time:
Friday September 18, 2020 at 14:45-16:15 UTC

Session description:
Introduction, presentation and open discussion between OceanSITES DMT members

Format:
14:45 - 14:50 - Introductions
14:50 - 15:15 - Presentation on PMEL development in support of OceanSITES workflows
15:15 - 16:15 - Group discussion.

Discussion Topics:
● The PMEL development: objectives and timeline
  ○ Data submission tools
  ○ Metadata synchronization with JCOMMOPS
  ○ OceanSITES support
  ○ Integration with the DACs
● What is preventing you from participating more fully in OceanSITES?
● DOIs
● Can OceanSITES support modern NetCDF DSG formats?
● Cloud hosting of infrastructure - does it offer a solution?
● Dealing with Data Products that reside in other repositories or project web sites and not in the GDAC. Do we harvest and re-serve? Do we need a catalog that points to many places? Examples:
  ○ https://doi.pangaea.de/10.1594/PANGAEA.861222
  ○ IMOS/AODN: Catalog -
    https://catalogue-imos.aodn.org.au/geonetwork/srv/api/records/723a3e85-04ae-40e6-ac2a-237a93d84abe
  ○ OCS Project Site: https://www.pmel.noaa.gov/ocs/data/fluxdisdel/
  ○ WHOI UOP Project Site:
  ○ MOCHA/RAPID Project SITE:
    https://www.rapid.ac.uk/rapidmoc/rapid_data/datadl.php
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  ○ SEANOE Catalog: https://doi.org/10.17882/43749

Discussion Moderator:
Eugene Burger (NOAA/PMEL)

Participants:
Thierry Carval
Karen Grissom
Long Jiang
Magali Krieger
Kevin O’Brien
Nathan Anderson
and OceanSITES DMT members