

# CEOS Ocean Virtual Constellation Merger Study Team (OVCMST) Assessment (Version 1.1)

## Background

### Motivation

As originally conceived, the Virtual Constellations (VCs) were primarily a planning and coordination mechanism to address policy-relevant issues, and provided the opportunity to interact with and report to heads of agencies. Coordination and collaboration between agencies operating satellites flying similar sensors has become routine “best practice.” In addition, each of the CEOS VCs continues to coordinate closely with its relevant international science teams in a productive and ongoing process. However, sponsors of CEOS and our community have become increasingly interested in a holistic understanding of environmental phenomena, integrating the process and understanding provided by individual observation types. For the oceans, such a perspective indicates the great value of a more integrated approach for the suite of satellite ocean observations.

The CEOS VCs are made up of willing partners and not defined by any single CEOS organization. The original intention of the VCs, as detailed in the CEOS Virtual Constellations Process Paper, “was to provide CEOS with an outcome-focused vehicle for thematic coordination of space agency missions. As far as possible, they were to be tightly-focused projects with a fixed duration and measurable achievements rather than be ongoing, general coordination frameworks. In practice, the evolution of the original and subsequent Constellations has resulted in a range of different emphases, some of which stress the importance of long-term coordination of some measurement types through the relevant Constellation team.”

The VCs have evolved considerably since their creation and initial goal of demonstrating the value of a collaborative partnership in addressing a key observational gap and end goal of sustaining routine collection of critical observations. Today, it is not just about flying more Earth observation missions to ensure gaps are mitigated, but also making sure that observations for communities are harmonized, meeting user and customer demand for integrated data. In other words, today there is a need to add a focus on mission exploitation to the ongoing focus on mission planning.

In addition to the newly-emerged need for greater cross-domain harmonization and exploitation of data, the engagement levels of each of the individual Ocean VCs have varied over time and some appear to be largely inactive today. While the root causes vary, these low engagement levels, coupled with the newer demands for an integrated, cross-domain approach to ocean observations, motivated the proposal of a merged Ocean Virtual Constellation. The 2018-2019 CEOS SIT Chair prepared a *Concept Paper for Restructuring CEOS Virtual Constellations and Creation of a New Working Group* as an addendum to the *Strategic Directions and Partnerships for CEOS Discussion Paper, V1.0* (21 March 2018). In that paper, a proposal was presented for discussion concerning the merging of the four existing CEOS ocean-related VCs into a single Ocean VC focused on creating an integrated and coordinated multi-variable picture of the oceans.

## Objective and Mandate of the OVCMST

The objective of the Ocean Virtual Constellation Merger Study Team (OVCMST), created in the weeks following the April 2019 at the 34<sup>th</sup> Meeting of the CEOS Strategic Implementation Team (SIT-34), was to assess the feasibility of merging the current four ocean Virtual Constellations – Ocean Colour Radiometry (OCR-VC), Ocean Surface Topography (OST-VC), Ocean Surface Vector Wind (OSVW-VC), and Sea Surface Temperature (SST-VC) – into one Ocean Virtual Constellation and to identify any challenges and opportunities potentially arising from a merger, with a report documenting the outcomes to be prepared for the September SIT Technical Workshop (SIT TW).

Specifically, the OVCMST was tasked with:

1. Determining what user communities would best be served with a new Ocean VC, considering as well how such a reorganization would maintain the important connections between CEOS and the observation-based international science teams.
2. Determining if the VCs are currently addressing their CEOS charter – do the VCs provide the opportunity to convene and address problems that individually agencies cannot address?
3. Assessing what CEOS Agencies are looking to achieve, in the current context, from their cooperation on coordinated ocean observations from space.
4. Identifying how CEOS existing Ocean VCs and proposed merged Ocean VC could provide a coordinated response to the Global Ocean Observing System (GOOS) Essential Ocean Variables (EOVs).
5. Identifying appropriate governance model(s) for the proposed merged ocean Virtual Constellation, along with any issues associated with it, including resourcing feasibility.

The OVCMST was expected to compare the performance of the proposed merged Ocean VC with the status quo.

## OVCMST Modalities

The following individuals and agencies confirmed participation in the OVCMST, with the SIT Chair Team leading the OVCMST and taking care of all logistics:

- NOAA – Kenneth Casey and Paul DiGiacomo
- EUMETSAT – Robert Husband
- NASA – Paula Bontempi, Eric Lindstrom, and Christine Bognar
- JAXA – Misako Kachi
- CEO – Steven Hosford
- SIT Chair Team/NOAA – Kerry Sawyer
- WMO/IOC – David Halpern
- CONAE – Carolina Tauro and Mario Camuyrano
- *Commission – Mark Dowell (observer)*

The OVCMST approached its tasking through a series of telecons, taking place between June and August, 2019. Four telecons were held, each featuring discussions and exchange of ideas among the participants on the identified topics. The results of the discussions and analyses are summarized in this report. During the implementation of its tasks, the OVCMST made reference to the *Virtual Constellation Process Paper*, the *New Initiatives Process Paper*, and the 2014 CEOS Self Study, particularly the report from the Topical Team on Roles and Responsibilities.

## Results

### General Perceptions of the VC Community

The OVCMST discussions highlighted several key concerns and issues. First and foremost, the need to increase the sense of engagement through a more active tasking and structured dialogue with CEOS leadership, including Principals, was identified as a key challenge shared by the existing Ocean VCs. In at least one instance, this limited guidance seems to have resulted in confusion between the respective roles of the VC and supporting science team, with resultant overlapping of activities. From a CEOS mechanism perspective, it is noted that the CEOS Work Plan already provides a vehicle for tasking CEOS entities, but it is felt that this has not been fully exploited in the case of the Ocean VCs. In a similar vein, the lack of top-down direction from CEOS leadership has been missing. CEOS leadership has made very few specific requests of the Ocean VCs. For example, as the satellite arm of GEO, CEOS could channel requests from GEO on ocean-related data needs and turn them into actionable initiative requests of the Ocean VCs. There needs to be two-way communication between CEOS leadership and VC Co-Leads and more tasking interactions. Simple, one-way, upwards reporting alone is insufficient to fully engage and leverage the capabilities of the Ocean VCs and their constituent communities.

Another concern that was highlighted is the lack of opportunities for consistent reporting to CEOS leadership. This concern has been raised in the past and likely contributes to the lack of engagement of the VCs in CEOS. While reporting on activities and opportunities is expected at the annual SIT Meeting each March/April, and again at the September SIT Technical Workshop, the perception in the VC community is that CEOS leadership and agencies file the reports away, without open acknowledgement or rigorous consideration of the achievements, issues, and ideas the VCs are communicating to CEOS leadership. VC Co-Leads do not typically attend the CEOS Plenary, and while the SIT Chair does provide a consolidated report of VC activities to the assembled CEOS Agency Principals, the perception is that this level of reporting is insufficient. Such a high level of consolidated reporting can result in substantial community efforts being condensed down to essentially a single bullet point in a broader report, leaving many from the VC community wondering if it is worth their time to engage.

Instead, the VCs would like to have substantive, documented feedback on the reports and requests, even if negative. Without this feedback, the Ocean VCs cannot be certain if the message was properly received and considered. One possible solution identified would be to allow the VCs to personally report on activities and/or receive formal responses from CEOS on previously-raised issues during monthly CEOS Secretariat telecons.

### Assessment – Pros and Cons of Merged Ocean Virtual Constellation

In addition to the general perceptions documented above, the OVCMST more systematically evaluated the pros and cons of the proposed merger.

#### Pros

1. Merging the Ocean VCs could result in a reduction in the workforce to be supplied by each Agency to staff four Ocean VCs. A merged VC might make it possible for an Agency to provide fewer than four representatives, perhaps limiting the need to one or two persons

with broad expertise in all areas. However, that person would still have to coordinate with internal Agency experts in other oceans disciplines.

2. A merged Ocean VC could possibly provide a mechanism to facilitate the harmonization of multivariate observations into consolidated products.
3. Blending the Ocean VCs into one could reduce the administrative burden for CEOS by eliminating the need for eight to ten Co-Leads down to no more than three Co-Leads.

### **Cons**

1. If Ocean VCs are merged, the feedback received was that some Agencies would only be able send a single person to each CEOS meeting and a single person is not likely to have all the expertise needed to adequately address the needs of the different oceans communities. This concern was raised by several Agency representatives.
2. A blended, singular Ocean VC could result in a loss of focus, dedication, and orientation on specific VC goals, in favor of more general and possibly abstract objectives. Each Ocean VC has close connections to its user community and academia (science teams such as IOCCG, OSTST, IOVWST, and GHRSSST) that can provide expertise and feedbacks to support VC activities in specific area. The concentration of expertise in the forum that a specialized VC offers was considered a strength that would be greatly diminished if the four CEOS Ocean VCs were merged into one VC.
3. A merged Ocean VC could possibly risk weakening the different ocean community voices in CEOS while each community is pertinent to many CEOS Work Plan priorities, like Carbon, Water Quality, Climate, etc.
4. Achievements gained through the current CEOS coordination mechanisms could be derailed by a merged Ocean VC, like the coordination on system vicarious calibration.
5. Some issues still require dedicated, domain-specific CEOS level exposure to support proper coordination and advancement. For example, remote sensing of ocean color (OC) is evolving, with a range of passive radiometric approaches across the VC, and new approaches like polarimetry and lidar. Topics such as this would be challenging to represent well in a more general, merged Ocean VC.
6. Similarly, from a user engagement perspective, some Ocean VCs like SST-VC and OCR-VC have broad and diverse ranges of data users and applications that requires specific OC expertise that would be diffused in a merged constellation.
7. The effort of maintaining a merged Ocean VC is seen as a potential burden on the already-active SST community and VC. Energy spent trying to raise up the activity level and coordinate across the other ocean domains could result in less energy being available to focus on critical SST issues.
8. The proposed merged Ocean VC does nothing to address that missing value proposition that leads to lower levels of engagement with CEOS by some of the Ocean VCs, despite those domains being active outside of the CEOS framework.

### **Alternative Proposals Discussed by the VC Community and OVCMST**

During their deliberations, the OVCMST discussed alternative ideas to address the concerns of engagement and needs for more integrated ocean products. Since linkage between VCs and CEOS Working Groups, which engage with stakeholders to respond to their requests, is currently not strong and visible, efforts to strengthen interactions between them is highly recommended. These discussions focused on the idea of a new “Working Group on Observations” or a distinct role or objective in the proposed new Working Group on Information Provision (WGIP). That new

group could foster the collaboration of experts that do work on integrating EO data products to address the need for cross-domain, secondary user products. Experts from each of the ocean domains that understand the advantages and limitations of individual products could be brought together by a WGIP without compromising the successful functioning of the existing VCs (e.g., passive microwave radiometry continuity, coordination of orbital slots for GEO OCR sensors). This suggestion would also address the concern shared by the VCs that CEOS does not ask anything specific from them. A functioning WGIP could create a manageable flow of requests to the Ocean VCs for specific integrated products, helping to address one of the root causes for the lack of participation currently being exhibited by some Ocean VCs. One particular example discussed on this topic was the CEOS Ocean Variables Enabling Research and Applications for GEO (COVERAGE) pilot project. If integrated data requirements were established and provided by the WGIP their fulfilment could be coordinated via the various Ocean VCs through activities like COVERAGE.

### **Conclusion and Proposed Way Forward**

After deliberating, the OVCMST does not concur with the proposal to merge the four CEOS Ocean VCs into one Ocean VC. In the end, the team believes the potential negatives outweighed the potential positives, and the proposed merger did not appear to directly address the fundamental concern of lack of engagement or improve on the delivery of cross-domain, integrated products. However, the OVCMST does agree that changes need to be made to improve on these situations. The team felt that two key changes should be considered:

1. Implement a more rigorous tasking and feedback process between CEOS Agency Principals and individual VCs that reflects policy-relevant issues and, when points are raised by the individual VCs, it should be ensured that the messages are properly delivered and formally considered by CEOS leadership.
2. Identify a CEOS mechanism (which could be the WGIP – if endorsed) to develop requirements for integrated, cross-domain products, then work with the individual VCs to coordinate the delivery of those products.