TERMS OF REFERENCE FOR THE CEOS OCEAN SURFACE VECTOR WINDS VIRTUAL CONSTELLATION

VERSION 1.0

LAST UPDATED: 19 DECEMBER 2013

CONSTELLATION NAME: Ocean Surface Vector Winds Virtual Constellation (OSVW-VC)

MISSION STATEMENT & OBJECTIVES

The OSVW-VC exists to foster the best quality Ocean Surface Vector Wind data for applications in short, medium, and decadal time scales in the most efficient manner through international collaboration, scientific innovation, and rigor. Strategic objectives to address this aim are:

- Improve coordination, consolidation and development of the collective OSVW capability;
- Foster better engagement by Nations operating or preparing satellite Ocean Surface Vector Winds sensors with the international wind vector community;
- Maintain a strong and mutually supportive relationship with the International Ocean Vector Winds Science Team (IOVWST);
- Provide an interface to CEOS for the IOVWST;
- Develop recommendations on the driving requirements to create, validate and sustain the development of an international ensemble of ECV measurements;
- Provide advice and advocate to the international community the importance of OSVW measurements;
- Development and consolidation of training and outreach.

CHARACTERISATION OF THE MEASUREMENTS AND DATA COLLECTIONS WITHIN SCOPE

The geophysical parameter concerning the OSVW-VC is the wind at the ocean surface, typically provided as a 10 m equivalent neutral wind vector.

Ocean surface winds are an essential variable for both meteorology and oceanography on both short and long time scales. In the short time scales, access to near real time accurate surface wind information is essential in order to ensure the capability to predict and appropriately warn the public about extreme weather events, playing a very direct role in helping protect life and property at sea and in coastal areas. In the long time scales, winds are also essential in regulating the heat exchanges between the ocean and atmosphere and an adequate sampling of accurate wind measurements over the span of decades from a stable measurement system is necessary to help us understand our climate and to predict its development.

Satellite winds have the potential of fulfilling the needs above better than any other wind measurement, but no single mission can adequately do so in isolation. An international effort is needed in order to ensure appropriate measurement quality, spatial-temporal coverage, continuity and sustainability, as well as adequate access to data.

The main focus of the OSVW-VC will be on scatterometer winds, since they provide an all-weather capability that other measurement systems do not allow. However, it is acknowledged by the OSVW-VC that an important effort on cross-validation with radiometer-based wind speeds and vectors is necessary in the context of CDR

development. This cross validation with radiometers can be extended to vicarious inter-calibration of scatterometers. This approach is important because the diurnal variability and other types of natural variability are often much larger than the instrument accuracy.

CHARACTERISATION OF THE SPACE SEGMENT CONCERNED

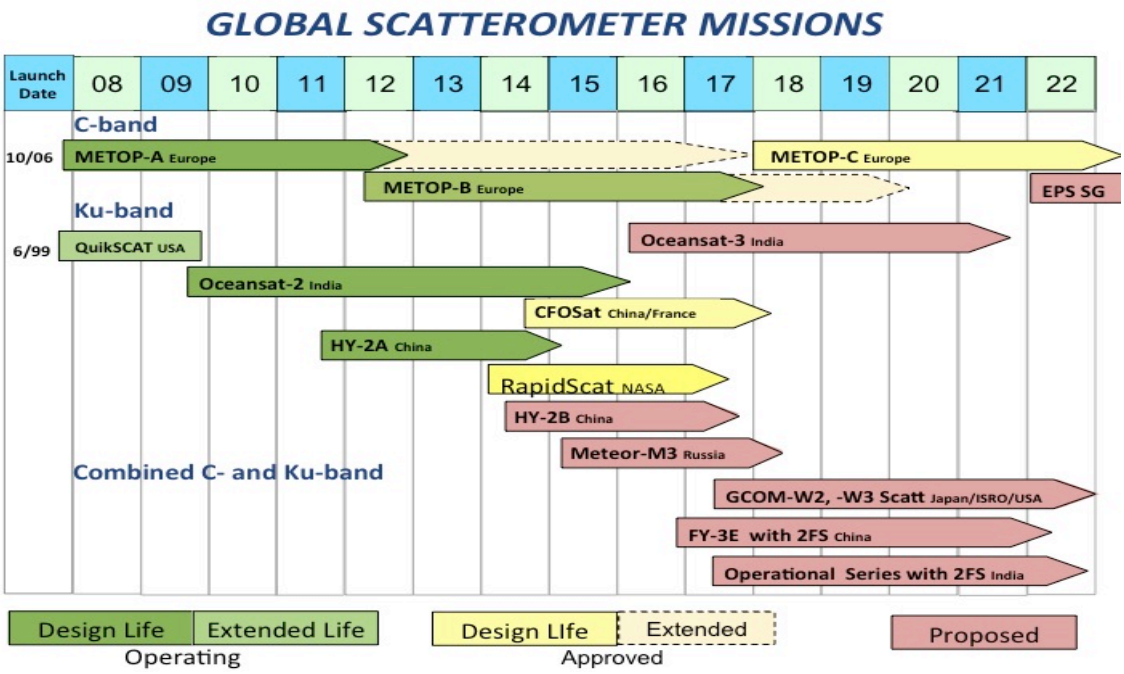
C- and Ku-bands have been proven reliable in remotely inferring the wind field at the ocean surface. C-band satellite scatterometers have been led by Europe, first with ESA's ERS-1/AMI and ERS-2/AMI instruments, and now with ASCAT aboard EUMETSAT's METOP satellite series. The U.S. has been pursuing Ku-band scatterometry first with the scatterometer on SeaSat, and then with the SeaWinds scatterometer on Japan's ADEOS-I and ADEOS-II missions. NASA's QuikSCAT satellite, which lasted over a decade, demonstrated the value of satellite OSVW data in operational weather forecasting in the marine environment. ISRO is continuing the Ku-band measurements with their OSCAT sensor aboard OceanSat-2, with calibration provided by the still functioning QuikSCAT radar. Data from all of these missions is openly available in near real time and at archives maintained by the agencies responsible for each mission.

Missions currently flying in the context of the OSVW constellation and consequently a priority for coordination efforts by the OSVW-VC are:

- METOP-A/B (ASCAT);
- Oceansat-2 (OSCAT);
- HY-2A (HSCAT) – not openly available yet.

In terms of data availability, it is worth noting that data (level 1 and level 2) from HSCAT are not being made available to the broader user community at present, making it necessary for the OSVW-VC to prioritise the engagement of the agencies involved in the data services from this mission. The IOVWST has made a priority of international efforts to work with HSCAT data and the mission owners, in order to help make this data freely available to the global community. The OSVW-VC will continue to aid in these efforts.

The timeline below summarises the known current, planned and proposed OSVW missions. Some of these, but not all, will contribute to and sustain the OSVW-VC objectives.



ACTIVITIES, OUTCOMES AND DELIVERABLES

The OSVW-VC activities address the requirements of meteorology and oceanography for the operational and research and development communities for both short-term and longer-term (climate) observational time scales.

The common grounds of these requirements are **wind data of high quality, that are openly accessible, and in a timely manner**. The OSVW research and development related goals are predominately being accomplished within the context of the IOVWST, with the OSVW-VC serving as the interface to CEOS in the context of providing visibility and a voice for the scientific community (e.g., IOVWST) in the CEOS context. Consequently, some of the deliverables below are in fact those of the IOVWST community and as such will evolve through ongoing discussions and developments within that expert community.

Finally, the requirements for an optimum OSVW constellation for oceanography and climate are currently being discussed and it would be very useful to document and convey these needs to CEOS.

In summary, here are the focus areas of activity:

1. Sustained operations:

    By continuing the operations and open timely access to at least two (note that three or more is preferred) distinct scatterometer missions on different orbits at any given time and by increasing the interest of other agencies/countries to continue/add to OSVW constellation;

2. Outreach and training:

    By broadening the user base to increase advocacy (i.e., forecasters and researchers in developing countries)

3. Support relevant demonstration applications (targeting the end-users):

Defining larger global issues that the satellite OSVW is a necessary part of understanding, will help put these data in a context easily appreciated by the lay person;

4. OSVW-VC as a bridge between research community (IOVWST) and space agencies:

   By providing external science/engineering expertise and guidance where needed and wanted, to OSVW mission owners/operators and by communicating and advocating best practices for cross calibration of missions for data record continuity;

5. Optimization of the OSVW constellation

   By assessing the constellation requirements (spatial/temporal coverage, accuracy and stability) for oceanographic (mesoscale) and climate applications

The OSVW-VC aims to achieve the following outcomes and deliverables:

OSVW-VC deliverables	3-year horizon	5-years or more horizon
Space Segment	Continuous operation of the OSVW constellation, including addition of new missions. White Paper describing and justifying the oceanography and climate requirements for an OSVW constellation.	Continuous operation of the OSVW constellation, including addition of new missions.
Ground Segment & Information Systems	Open data policy for, and timely access to, all scatterometer mission data.	
Products & Services	Standards and metrics for OSVW services and products, including standard cal/val methods. Consistently reprocessed datasets from the VC's core missions. User training workshops to support marine forecasters in the use of satellite winds and waves	Inter-calibrated reprocessed datasets from the VC's core missions allowing the establishment of a consistent wind CDR. Multiple user training workshops to extend the use of OSVW data for Numerical Weather/Ocean/Climate Prediction

Reports to SIT from the SST-VC will emphasize progress towards achievement of these outcomes and deliverables and the issues and obstacles for SIT attention.

IMPLEMENTATION AND COORDINATION ISSUES TO BE ADDRESSED BY SIT

A main challenge facing the OSVW-VC is the continuity of open and timely data access including sufficient information for independent validation and verification of sensor calibrations. In the current OSVW mission fly-out chart, the METOP (EUMETSAT) series is the only *operational* satellite mission. The other missions are either research missions or the mission owners have not yet demonstrated a commitment to open and timely data access. Furthermore, there are a number of missions already flying or planned by agencies not actively involved yet in the OSVW-VC.

Consequently, the following implementation and coordination issues that need to be addressed by SIT are:

- Achieving commitment from all relevant CEOS agencies on an open data policy;
- Fostering a proactive cooperation between CEOS agencies starting at the stage of mission planning, in order to facilitate that payload and orbit choices and their complementarily for different missions are discussed in a global applications context;
- Endorsement of the Oceanobs 2009 white paper.
- Endorsement of the constellation requirements for oceanography and climate.

SCHEDULE

Activity	Milestone	Target Date	Source/approach
Sustained operations	Continuous operation of the OSVW constellation, including addition of new missions	Note in Figure 1 the planned contributions to the space segment from the several agencies involved	Responsibility of agencies represented in the OSVW-VC
	Data from all scatterometers available openly and within 3-5 h from sensing	Continuous after Commissioning activities	Responsibility of agencies represented in the OSVW-VC
Bridging with IOVWST (Note here than the IOVWST has its own working pace and dynamics and that the dates here only reflect our expectations of the group being able to address the	Development and implementation of standards and metrics for OSV services and products, including standard cal/val methods	2016	IOVWST working groups on data and services standards and metrics, as well as working group on climate records
	Consistently reprocessed datasets from the VC's core missions	2016	
	Inter-calibrated reprocessed datasets from the VC's core missions allowing the	2018	

issues presented)	establishment of a consistent wind CDR		
Support relevant demonstration applications	TBC, depending on the definition phase	TBC	In coordination with the IOVWST and very likely with other VCs (typically SST and OST)
Outreach and training	User training workshops to support marine forecasters in the use of satellite winds and waves	Once a year	Responsibility of agencies represented in the OSVW-VC, encouraging participation/support from IOVWST and OSTST
	User training workshops to extend the use of OSVW data for Numerical Weather/Ocean/Climate Prediction	Plan available by the end of 2015	Responsibility of agencies represented in the OSVW-VC, encouraging participation/support from IOVWST
Optimization of the OSVW constellation	White Paper describing and justifying the oceanography and climate requirements for an OSVW constellation.	2015	In coordination with IOVWST

MEMBERSHIP AND LEADERSHIP:

Current Co-Leads are:

NOAA, Paul Chang (paul.s.chang@noaa.gov)
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And the following CEOS and user agency representatives are actively involved in OSVW-VC:

Raj Kumar, ISRO
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Zorana Jelenak, NOAA
Mark Bourassa, FSU (liaison with the IOVWST)
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Peter Hacker, NASA

Wolfgang Lengert, ESA
Wang Chen, CNSA
Juliette Lambin, CNES (Pending confirmation)
Mingsen Lin, SOA (Pending confirmation)
Qingtao Song, NSOA (Pending confirmation)

RESOURCES

The OSVW-VC leverages existing contributions mostly by participants in the IOVWST. Funding of these activities comes currently from different schemes in the USA and Europe.

Additionally, limited resources within NASA, NOAA, EUMETSAT and ISRO have been and will continue to be employed, particularly on Level 1 and measurement systems expertise, as well as for training and outreach. It is hoped other agencies within the constellation will get more and more involved in those activities.