

### **Updates and plans on the VLab**

During the past year, the Virtual Laboratory for Education and Training in Satellite Meteorology (VLab) Management Group (VLMG) coordinated efforts through quarterly online meetings. On 20-23 January 2024, they will convene for the Eleventh meeting of the VLMG, in Muscat, Oman. The Directorate General of Meteorology (DGMET) will host the meeting at the VLab Oman Centre of Excellence.

Since CGMS-51, VLab members offered a variety of training opportunities, focusing on accessing data and enhancing skills related to the utilization of various satellite systems, including the new generation of satellites. Additionally, specialized training efforts were dedicated to support the Early Warnings for All (EW4ALL) Initiative. Stronger collaboration and coordination of efforts between VLab members resulted in increased opportunities for user training during the past year.

The VLab Trust Fund receives annual contributions from NOAA/NWS, EUMETSAT, and KMA. In order to keep up with WMO-CGMS Member requirements and needs for training, and to improve the long-term sustainability of VLab activities, an increase in the number of contributing CGMS agencies is required. Regular financial contributions from CGMS Members are critical to maintain the VLab training activities (action).

CGMS members are invited to review and sustain support to their own Satellite Programs that offer International Training. (action)

#### **Actions proposed:**

1. CGMS members are invited to contact WMO to provide contributions to the WMO VLab Trust Fund to ensure the continuation of technical support to the VLab through the VLab Technical Support Officer as well as to the implementation of VLab projects.
2. CGMS members are invited to review and sustain support to their own Satellite Programs that offer International Training.

## 1 INTRODUCTION

This document reports on the activities of the WMO-CGMS Virtual Laboratory for Education and Training in Satellite Meteorology (VLab) in 2023. Since CGMS-51 the VLab has:

- Responded to training needs and user requirements by offering training on the new generation of satellites
- Organized a total of **116 training events**, training more than **6800 people** during the period from December 2022 to November 2023
- Collaborated with the WMO Training and Education Programme, the Community for the Advancement of Learning in Meteorology and related disciplines (CALMET), the COMET Program, the Applied Remote Sensing Training Program (ARSET), the Earth Observation Training, Education, and Capacity Development Network (EOTEC DevNet), and other initiatives.

The VLab Management Group (VLMG) had four virtual meetings (June, September, December 2023, and March 2024). The Eleventh meeting of the VLMG will convene from January 20-23, 2024, in Muscat, Oman. The Directorate General of Meteorology (DGMET) will hoar the meeting at the VLab Oman Centre of Excellence.

## 2 MAJOR ACTIVITIES OF THE VLAB SINCE CGMS-50

VLab Centres of Excellence (CoEs) and supporting Satellite Operators have recently reported on their training activities for the period December 2022 to November 2023.

VLab Centres of Excellence and Satellite Operators offered 116 training events during the reporting period. Training was offered in all the WMO official languages and Portuguese.

Participants from all WMO Regional Associations (RA) took part in training. There were more than 6800 participations in VLab training events. This number does not include the number of participants using the online resources, such as modules and recorded lectures.

Monthly WMO VLab Regional Focus Group (RFG) discussions are regularly conducted in five Regions. These informal sessions continue to connect instructors and participants after the formal training to apply concepts learned.

The VLab [RFG sessions of the Americas and Caribbean](#) have conducted their regular bilingual (English and Spanish) monthly weather and climate sessions for **20 years (248 sessions) now**. This effort continued to build on close cooperation with the NOAA/NWS/NCEP/WPC International Desks and WMO Centers of Excellence in Barbados, Costa Rica, Brazil, and Argentina.

The Australian VLab Centre of Excellence celebrated its 10th yeat of monthly [RFG meeting](#) in October 2023. Joint RFG meetings were conducted with CMA, KMA, JMA,

and a newly established VLab Indonesia Agency for Meteorology Climatology and Geophysics (BMKG) Centre of Excellence.

Additionally, the Monthly Weather and Climate [Forum](#) was established in August 2022 by the Oman Centre of Excellence. The events consist of a weather briefing highlighting current weather or a case study and some other topic of interest.

The following regional training activities were delivered by the VLab Centres of Excellence and satellite operators, as described by VLab members in their annual reports.

### **2.1 Training in the GOES and JPSS satellites series**

- The Regional Focus Group of the Americas and Caribbean conducted 12 virtual bilingual (English and Spanish) weather and climate briefings. The average number of countries participating each month was 22, the average number of participants each month was 75 and ranged between 43 and 133 (total = 895). All sessions are recorded and available online: [http://rammb.cira.colostate.edu/training/rmtc/fg\\_recording.asp](http://rammb.cira.colostate.edu/training/rmtc/fg_recording.asp). This informal learning reinforces application of data and products from GOES and JPSS satellites;
- NOAA collaborated with MARN in El Salvador to conduct a 4 day virtual workshop in Spanish for RA IV on Satellite Applications;
- NOAA organized a GOES-R Datajam for undergraduate and graduate students on applications of GOES-R Series data;
- NOAA and SENAMHI, Peru conducted a workshop on 'Tropical Meteorology Applications during El Niño with emphasis on air quality and extreme rainfall'.
- NOAA and ICAO conducted a workshop in Mexico on 'Significant meteorological information (SIGMET) Workshop Part 1: Analysis and forecasting techniques'.
- NOAA and ISFPA (Instituto Superior de Formacion Profesional Aeronáutica) conducted a workshop in Spanish in Panama on 'Satellite Imagery Interpretation and Applications'.
- CoE Barbados/CIMH, CMO, and NOAA organized the NOAA/WMO RA IV Virtual Satellite Applications Training Workshop in support of the Caribbean Weather Forecasting Initiative December 2022, conducted in blended format;
- CoE Brazil in collaboration with NOAA organised several online workshops: 14th GEONETCast-Americas User Group Webinar, GEONETCast Training for Eastern Caribbean States, GOES-R DataJam 2023, as well as face-to-face training event on "Adding GOES-16 Imagery and Products to an online visualization interface".
- CoE Barbados in collaboration with the WMO and the University of Leeds organized the face-to-face workshop in support of the WMO Severe Weather Forecasting Programme - EUREC4A-CMO-SWFP Workshop.

### **2.2 Training in the Himawari, FY, GEO-KOMPSAT satellites series**

- AOMSUC-13 Training Event (3-5 November 2023) hosted by KMA became a

collaborative effort from multiple VLab partners. Trainers from KMA, JMA and CMA conducted training sessions, presenting the information on Himawari-8, FY, and GEO-KOPSAT data and products, covering a wide range of topics, including the status of the new generation satellite Himawari-10: [National Meteorological Satellite Center \(kma.go.kr\)](http://kma.go.kr);

- VLab CoE Australia continued organising monthly RFG meetings during 2023, with close collaborations from KMA, JMA, and BMKG and other partners (University of Wisconsin-Madison and CIRA). Recorded sessions are available at: <http://www.virtuallab.bom.gov.au/archive/regional-focus-group-recordings/>.
- JMA in collaboration with ESCAP/WMO organized the 22nd ESCAP/WMO Typhoon Committee Attachment Training course;
- JMA and JAXA organized the online Tackling Extreme Precipitation Events Workshop for the Indo-Pacific region;
- CMA/NSMC organized the 2023 FengYun Satellite International User Conference, covering a wide range of topics in relation to utilization of FY data for various application areas;
- CMA Training Centre conducted a wide range of international training course based on mainly FY-3 and FY-4 data and products:
  - two International Distance Training Courses on the Application of Meteorological Satellite Products (in English);
  - Senior Management and Operation Course on Tropical Cyclone Monitoring and Forecasting (in English);
  - The training course on the application of FY satellites in weather forecasting (in English);
  - The training course on the application of meteorological satellites for senior meteorologists (in Chinese);
  - The training course on the satellite remote sensing for meteorological sectors (in Chinese);
  - The training course on the satellite remote sensing for industrial meteorologists (in Chinese).
- CoE Nanjing conducted 10 national and international training events, attended by 426 participants. Those events covered a wide variety of areas for use of satellite data and remote sensing technology applications, from Multi-hazard Early Warning System climate change, meteorological forecasts, agriculture (in English and Chinese).

### **2.3 Training in the Meteosat, Metop, and Sentinel satellites series**

- EUMETSAT continued working closely with the training centres, Centres of Excellence in Oman, Casablanca, Niger, Kenya and South Africa to make sure that they have access to data and help them to develop expertise in the use of current and future satellite data. In 2023, special focus was put on the preparation for MTG. In particular, the following training courses were organized:
  - RA-I Basic Satellite Application Course (in collaboration with Kenya CoE) – in English;
  - WMO Satellite Training Course on MTG (in collaboration with

- Kenya CoE) – in English;
- The 18th Satellite Applications Course (in collaboration with Oman CoE) – in English;
- Satellite Applications Workshop for Middle East Trainers (in collaboration with Oman CoE) – in English & Arabic;
- RA-I Basic interpretation of satellite imager for meteorological applications (in collaboration with Morocco CoE and Niger CoE) – in French;
- Online training on nowcasting tools using EUMETSAT satellite products for the NMHSs in African countries (in collaboration with Morocco CoE and Niger CoE) – in French;
- Online workshop: EUMETSAT MTG-I data Reception and Visualization (in collaboration with Morocco CoE and Niger CoE) – in English & Arabic;
- Workshop on the use of Altimetric and scatterometric data in maritime forecasting (in collaboration with Niger CoE) – in French;
- The Satellite Marine Application Event (in collaboration with Oman CoE) – in English & Arabic;
- The African Satellite Meteorology Education and Training (ASMET) continues to be an effective initiative for collaboration between EUMETSAT, COMET, and the VLab CoEs South Africa, Niger, Kenya and Morocco. The ASMET website provides the information on training resources and courses for the African region. Access at <https://asmet.africa/>;
- For the first time, the course on Introduction to METEOSAT Third Generation and Data Processing from EUMETSAT's MTG-I1 and Metop satellites was held in Brazil. The event was hosted by the Federal University of Ceará and conducted in Brazilian Portuguese through collaboration between EUMETSAT and Brazil CoE;
- Oman CoE conducted Monthly Weather and Climate Forums. The events are divided into 2 parts: weather briefing (current weather/case study) and some other relevant topic of interest.

## **2.4 Training in the Electro-L and Meteor-M satellites series**

- Roshydromet/SRC Planeta conducted an online training course on “Data collection system of Roshydromet”;
- CoE Russian Federation hasted by the Russian State Hydrometeorological University conducted a number of training course (both online and classroom), covering utilization of satellite data and products for a wide range of application areas.

## **2.5 Training in support of the EW4ALL initiative**

VLab members have dedicated significant efforts to supporting the Early Warnings for All (EW4ALL) Initiative through a variety of specialized training initiatives. Some notable examples include:

- BMKG VLab CoE, in collaboration with WMO, organized the WMO Development of Competency in Weather Forecasting Course to Support the

EW4ALL Initiative.

- VLab Niger CoE organized the WMO Development of Competency in Weather Forecasting Course to Support the EW4ALL Initiative.
- Nanjing CoE organized Training Courses on Multi-hazard Early Warning System and on Monitoring and Warning of Hydro-meteorological Disasters.
- Weather and Climate Information Services Early Warning for Southern Africa (WISER- EWSA) Pre-Test bed training

## **2.6 Collaboration between Centres of Excellence and Satellite Operators**

The launching of a new generation of satellites is setting a growing demand on training needs for members of all WMO Regional Associations. Close collaboration between VLab CoEs as well as satellite operators is driving the response to address these training needs as they are identified.

The prime example of collaboration between Centres of Excellence and Satellite Operators can be the AOMUSC-13 Training Event (3-5 November 2023) hosted by KMA. The event resulted in close cooperation between Satellite Operators (CMA, JMA, KMA, NOAA) and Centres of Excellence (BoM, CMA TC, BMKG) in Asia-Oceania region.

The RFGs of the Americas and Caribbean organised by NOAA/CIRA and the RFGs organised by the Australian CoE as well as RA-I Meteorological Satellite Applications courses conducted jointly by EUMETSAT and Centres of Excellence in Africa serve as other successful examples.

Another example of global partnership is the CALMet XV Conference, with the leading themes: Collaboration, Lessons learned, Future challenges & opportunities. This conference was hosted by Deutscher Wetterdienst, Germany, on 7-11 November 2023, in collaboration with BMKG, Indonesia. The event gathered 175 educators, trainers and managers from universities, research institutions, and National Meteorological and Hydrological Service from 60 different countries that covered all Regional Associations of WMO.

## **2.7 Engagement with other Training Providers**

VLab continues collaborating with various training providers and scientific committees. Training providers that have been most active in recent collaborations with VLab are WMO Education and Training Programme (ETR), NASA/ARSET, COMET, and the CEOS Working Group on Capacity Building and Data Democracy (WGCapD), and [EOTEC DevNet](#) (the Earth Observation Training, Education, and Capacity Development Network). Representatives of these programmes have been participating in VLMG meetings and engaging in discussions.

## **3 WMO VLAB TRUST FUND**

The WMO VLab Trust Fund has received a stable level of contributions over past years, i.e. 80K USD per year total from NOAA/NWS, EUMETSAT, and KMA. This

money is used to arrange the VLab SSA and support travel for experts from developing countries. Although the current financial status of the Fund seems stable, in part due to no travel during 2020-2021, an increase in the number of contributing CGMS agencies is required to improve its resilience. Regular financial contributions from CGMS Members are critical to maintain technical support to the expanding range of VLab activities.

## **4 VLAB MANAGEMENT GROUP**

### **4.1 VLab Co-Chair to represent CGMS**

Dr. Bernadette Connell from the Cooperative Institute for Research in the Atmosphere of Colorado State University, representing the CGMS space agencies, and Mr. Wen Bo, from the CMA Training Center, representing the VLab Centres of Excellence, are serving as VLab Co-Chairs. Dr. Marcial Garbanzo, Head of the Centre of Excellence in Costa Rica, serves as VLab Technical Support Officer.

### **4.2 VLMG Meetings and Plans**

VLMG meets quarterly online and focuses on actions and discussions to ensure the implementation of the VLab Strategy. VLMG strengthens VLab regional communication through collaboration within the Satellite Data Requirements groups (SDR) in various regions.

The next in-person meeting of the VLab management group (VLMG-11) will be hosted by the Oman Centre of Excellence in Muscat, from 20 to 23 January 2025.

## **5 CONCLUSIONS**

This paper reports on participation in VLab training opportunities worldwide, which highlights the increased visibility of the activities organized by members. It also highlights the diverse collaboration between VLab Members and partners, which allows for building capacity among and between Regional Associations and across disciplines. Overall, this helps reach the UN/WMO goal of Early Warning for All.

CGMS and its membership has been a strong sponsor of VLab. It is important to review the level of support for both the international training efforts directly within satellite operator programs and for contributions to the WMO VLab Trust fund. A renewed and strong commitment of sponsors is needed to continue the training initiatives for the preparation of users for both the current and the new generation of satellites.