2021 VLab Progress Report

This document reports on activities within the WMO-CGMS Virtual Laboratory for Education and Training in Satellite Meteorology (VLab) in 2021. Since CGMS-49, VLab members have offered a variety of training opportunities which highlight training efforts addressing the new generation of satellites. This continues to be the major training need identified by VLab members. Strong collaboration and coordination of efforts between VLab members resulted in increased opportunities for user training during the past year.

The VLab Management Group (VLMG) continued to coordinate its activities with support from co-chairs representing CGMS satellite operators and VLab Centres of Excellence. In 2021 the two VLab Co-Chairs, Dr. Mark Higgins (EUMETSAT Training Manager) and Dr. Marinés Campos (Director of the RTC WMO-SMN Argentina), stepped down. Subsequently, the CGMS Plenary in May 2021 endorsed Dr. Bernadette Connell from the Cooperative Institute for Research in the Atmosphere of Colorado State University as the new VLab co-chair representing the CGMS space agencies. Mr. Wen Bo, from the CMA Training Center, was endorsed by the WMO as a representative of the Centres of Excellence.

In January 2021, Luciane Veeck, the VLab long-term TSO, resigned to take a position with the WMO Education and Training Office. Dr. Marcial Garbanzo, the Head of the Centre of Excellence in Costa Rica, was appointed as the new VLab TSO on 1 October 2021.

The VLab Trust Fund continues to receive yearly contributions from NOAA/NWS, EUMETSAT, and KMA. A larger number of contributing CGMS agencies is desired to expand VLab activities to meet WMO-CGMS Members' requirements and needs for training and to improve the long-term sustainability of VLab activities. Regular financial contributions from CGMS Members are essential to maintain the VLab training activities.

VLMG continued to coordinate its activities and support for training events via regular online meetings. Due to travel restrictions caused by the COVID-19 pandemic, the Tenth meeting of VLMG was postponed to September 2022 (Darmstadt, Germany). CGMS members active in VLab are invited to send representation to participate in the meeting.

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 active in VLab to send representatives to participate in the Tenth VLab Management Group Meeting (VLMG-10) to be held in Darmstadt, Germany, 26-30 September 2022.

1   INTRODUCTION

This document reports on the activities of the WMO-CGMS Virtual Laboratory for Education and Training in Satellite Meteorology (VLab). Since CGMS-49 the VLab has:

- Responded to training needs and user requirements by offering training on the new generation of satellites;

- Organized a total of 126 training events, training more than 4250 people during the period from December 2020 to November 2021;

- Collaborated with the WMO Education and Training (ETR) Programme and their Global Campus initiative and with the Community for the Advancement of Learning in Meteorology (CALMET) to ensure that information about training opportunities and resources are more widely shared.

- Joined discussions with the Committee on Earth Observation Satellites to explore the Earth Observation Training, Education, and Capacity Development Network (EOTEC DevNet) as a means to expand the VLab reach.

The VLab Management Group (VLMG) had three virtual meetings (January and December 2021, and March 2022), and will have its Tenth face-to-face meeting in Darmstadt, Germany, 26-30 September 2022.

2   MAJOR ACTIVITIES OF THE VLAB SINCE CGMS-49

VLab Centres of Excellence (CoEs) and supporting Satellite Operators have recently reported on their training activities for the period December 2020 to November 2021. A general outline of activates is presented below, full reports of activities from each VLab member, including a list of events organised in 2021, can be downloaded from http://www.wmo-sat.info/vlab/coe-reports/.

VLab Centres of Excellence and Satellite Operators offered a total of 126 training events during the reporting period. These were delivered in various modes: 5 events were classroom based (face-to-face courses), 4 events had a mixed delivery mode (blended courses), and 117 events were delivered online. Most of the events were offered online due to the COVID-19 pandemic and related travel restriction. Training was offered in seven languages.

Participants from all WMO Regional Associations (RA) took part in training. The total number of participants attending VLab training events included about 4,250 people. This number excludes the number of participants using the online resources that are accessible via VLab members' websites, such as the recorded lectures available from some VLab CoEs and Satellite Operator websites.

WMO VLab Regional Focus Group (RFG) discussions continue to take place on a monthly basis in each of the three main hemispheres.

The monthly weather and climate RFG sessions of the Americas and Caribbean continued to build on close cooperation between CIRA, the NOAA/NWS/NCEP/WPC

International Desks, and WMO Centers of Excellence in Barbados, Costa Rica, Brazil, and Argentina, to conduct 12 regular bilingual (English and Spanish) sessions. Their sessions have been running continuously for 18 years, since March 2004.

The Australian VLab Centre of Excellence celebrated eight years of monthly [RFG meetings](#) during the session conducted on the 29th October 2021. Joint RFG meetings were conducted with KMA in August 2021, CMA in June and October 2021 and NOAA in May 2021. There has been continuing close cooperation with JMA as a sponsoring Satellite Operator during the past year.

The Monthly Weather Discussions organised by [EUMeTrain/EUMETSAT](#) with contributions from various European national meteorological services continued to be regularly held in the reporting period.

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

2.1 Training in the GOES and JPSS satellites series

- The Regional Focus Group of the Americas and Caribbean is hosted by CIRA, the NOAA NWS/WPC International Desks, and CoEs Barbados, Costa Rica, Brazil and Argentina. They conducted 12 virtual bilingual (English and Spanish) weather and climate briefings. The number of countries participating each month ranged between 17 and 26; and the number of participants each month ranged between 43 and 83 (total number of participants is 708). The organizers also conducted three special topic sessions presented in two languages (English and Spanish) which engaged another 267 people. The combined RFG and special sessions attracted participants from 32 countries. All sessions were recorded and are available online at: http://rammb.cira.colostate.edu/training/rmtc/fg_recording.asp. The sessions utilize an informal learning approach to promote continuing professional development for data and products from GOES and JPSS satellites;
- Two virtual workshops were conducted with hosts from the Group on Earth Observations (GEO) and WMO Partner IDEAM in Colombia and WMO/NMH DMC in Chile that highlighted collaborative efforts between CIRA, NOAA, the CoEs Costa Rica, Brazil & Argentina, the RTC in Peru, and many others. The agendas for each event were tailored to meet the needs of each region. The Colombia RA-III/IV & Chile RA-III training workshops engaged 100 & 140 people respectively.
- Collaborations with CoEs Costa Rica and Brazil supported linkages in data access associated with the new satellites and in support of the WMO Satellite Data Requirements goals and objectives and also GEO via AmeriGEO;
- As of November 2021, COMET offers 132 English-language environmental satellite training resources on the MetEd website, including five new lessons covering geostationary and polar-orbiting satellite use for convection and lightning, RGB composites, flood maps, and climate data records. Several of the 132 resources have been translated to Spanish, Portuguese, or French to provide forecasters with training in their own languages; this number is

continually increasing. Additionally, COMET hosts an online Translation Resource Center providing the community with a guide to translation project management, available in English, Spanish, and French;

- CoE Brazil and INPE in collaboration with NOAA organised and hosted the 9th, 10th and 11th GEONETCast-Americas User Group Webinars;
- CoE Barbados organized the virtual workshop in support of the WMO Severe Weather Forecasting Programme – Eastern Caribbean (SWFP-Eastern Caribbean) and for the introduction of the RA IV- Hurricane Forecasters' Competency Framework in collaboration with the Regional Forecast Support Facility (RFSF), Martinique (hosted by Météo-France Antilles-Guyane), Regional Specialized Meteorological Centre (RSMC), Miami (hosted by US NOAA/National Weather Service), Caribbean Meteorological Organization (CMO) Headquarters Unit, and the University of Leeds.

2.2 Training in the Himawari & GEO-KOMPSAT satellites series

- AOMSUC-11 Training Event (online, 27-28 October 2021) hosted by CMA Training Center became a collaborative effort from multiple VLab partners. Trainers from JMA and KMA conducted training sessions, presenting the information on Himawari-8 and GEO-KOPSAT data and products, covering the RGB imagery of Himawari-8, KMA's Satellite Data Service and application of GEO-KOMPSAT-2A Data for Severe Weather Detection as well as Tropical Cyclone Analysis using GK2A Data;
- VLab CoE Australia continued organising monthly RFG meetings during 2021, with close collaborations from CoE Republic of Korea, JMA, BMKG and other partners (KMA, NOAA). This marks the 8th year of organising monthly RFG meetings in the Region. Recorded sessions are available at http://www.virtuallab.bom.gov.au/archive/regional-focus-group-recordings/;
- KMA conducted training programs as part of KOICA (Korea International Cooperation Agency) ODA (Official Development Assistance) project;
- CoE Republic Korea organized the Real-time Online Training Course on Capacity Building for GK-2A Satellite Data Receiving and Analysis System for Forecasting and Warning of Natural Disaster in Cambodia and Bangladesh (in English);
- CoEs Australia and Republic of Korea jointly conducted Regional Focus Group meeting in August 2021, addressing Application of GEO-KOMPSAT-2A Data for Severe Weather Detection.

2.3 Training in the Fengyun (FY) satellite series

- CMA Training Center hosted the AOMSUC-11 Training Event (online, 27-28 October 2021). There were 140 participants from 49 countries in total. This event was organized totally virtually for the first time. The training event was divided in two parts: the first day was focused on the presentations from the satellite operators (CMA, JMA, KMA) to introduce various topics related to access to satellite data; the second day was focused on various application areas and case analysis (with contribution from BoM, NOAA, BMKG).

AOMSUC-11 Training Event presentations and resources are available at https://www.nsmc.org.cn/conference/fysuc/2021/en/course.html;

- Two International Distance Training Course on The Basic Principles of Satellite Remote-sensing and on the Application of Satellite Products on Eco-environment Monitoring (in English);
- Three training courses on Fengyun Meteorological Satellite Remote Sensing Applications (in Chinese);
- Three training courses on FY Satellite Product Application for Audiences Outside the Meteorological Industry as well as on FY Satellite Product Application for non-atmospheric professional staff from CMA (in Chinese);
- Pre-job training on FY Satellite Product Application for beginner forecasters (in Chinese);
- The 22nd training classes on application of satellite data in weather analysis included introduction of FY satellite products and their application in weather analysis and prediction. In addition, other topics included the application of cloud image interpretation, FY-4 temperature and humidity profile products, and lightning products in weather analysis. (in Chinese);
- CoE-Beijing developed the book on Application of Fengyun Satellite Products in Severe Convective Weather Analysis (in Chinese);
- CoE Nanjing conducted 12 national and international training events, attended by 330 participants. Those events covered a wide variety of areas for use of satellite data and remote sensing technology applications, from climate change, climate information service, meteorological forecasts, technology transfer and aeronautical meteorological forecasting (in English and Chinese).

2.4 Training in the Meteosat and Sentinel satellites series

- EUMETSAT continued working closely with the regional 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 2021, four Satellite Application Courses were organized in the African region (delivered online in English and French) as well as the Satellite Application Course: Dust events, which was delivered in-person in Oman in Arabic and English;
- 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/;
- The EUMeTrain Weather briefings conducted 12 online sessions. All sessions were recorded and are available at http://www.eumetrain.org/briefings.html;
- In addition, EUMETSAT run a series of online short courses on data discovery for weather, oceanography, air quality and climate (15 in total during the reporting period);
- EUMETSAT also contributed to a number of RFG sessions of the Americas and Caribbean as well as the WMO RA-III Virtual Trainings on Satellite Applications.

2.5 Training in the Electro-L and Meteor-M satellites series

- In collaboration with EUMETSAT, SRC Planeta (Roshydromet) and VLab CoE Russian Federation jointly organized a Training Event on Satellite Data and Product Applications for National Hydrometeorological Services (NMHSs) of CIS countries (May-June 2021). The Training event consisted of two components: a preparatory online asynchronous course (May 2021) and a synchronous virtual training event (8-11 June 2021). The training event allowed to gather around 450 participants from NMHSs and other institutions from CIS countries.
- CoE Russian Federation in collaboration with SRC Planeta translated eight of the JMA RGB Quick Guides, making a great contribution to collection of satellite training resources in Russian language. The resources were also included into the preparatory online course materials.

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-11 Training Event (online, 27-28 October 2021) hosted by CMA Training Center. The event resulted in close cooperation between Satellite Operators (CMA, JMA, KMA, NOAA) and Centres of Excellence (BoM, 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 was the CALMet XIV Conference, with the theme "Bringing Together the Best of Online to Learning". This was hosted by Servicio Meteorológico Nacional, Argentina, on 27 September – 1 October 2021, in collaboration with EUMETSAT. The Community for the Advancement of Learning in Meteorology and related disciplines (CALMET) gathered around 260 educators, trainers and managers from universities, research institutions, and National Meteorological and Hydrological Service. There were 56 contributors from all Regional Associations of WMO.

2.7 Collaborations with WMO Education and Training Programme and their Global Campus Initiative

VLab maintains continuous collaboration with the WMO Education and Training (ETR) Program and their Global Campus Initiative. VLab continues to take part in the

technical task team for the development and maintenance of the WMO Global Campus Events Calendar and Global Campus section of WMO E-Library. The sharing of training resources designed by VLab partners has been growing, and these are being continuously added to the WMO-GC E-Library. The ETR program recognizes the importance of competencies for trainers and users and we are grateful to be able to partner with them to enhance the reach and effectiveness of training. Many VLab members attended the ETR online Symposium on Education and Training in a Period of Rapid Change in November 2021. In particular, the following themes are very relevant for the VLab training activities:

Theme #1: Securing institutional commitment to share learning resources
Theme #3: Micro-credentials and credit transfer, how could we proceed
Theme #4: Considering new pedagogical approaches and assessment methods
Theme #5: Technological barriers to online learning
Theme #6: Supporting the lifecycle of professionals
Theme #8: Update to the WMO Capacity Development Strategy
Theme #9: How do we identify the critical regional needs for the professional development of operational staff? How do we ensure that appropriately qualified participants attend our training events?

2.8 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 COMET, NASA/Applied Remote Sensing Training (ARSET) Program, and the CEOS Working Group on Capacity Building and Data Democracy (WGCapD). The WGCapD launched a new networking project EOTEC DevNet (the Earth Observation Training, Education, and Capacity Development Network) that encourages interdisciplinary sharing of satellite data and resources. 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 the last years, i.e. 80K USD per year, from NOAA/NWS, EUMETSAT, and KMA. Although the current financial status of the Fund is stable, a larger number of contributing CGMS agencies would be required to improve its resilience. Regular financial contributions from CGMS Members are essential to maintain technical support to the expanding range of VLab activities.
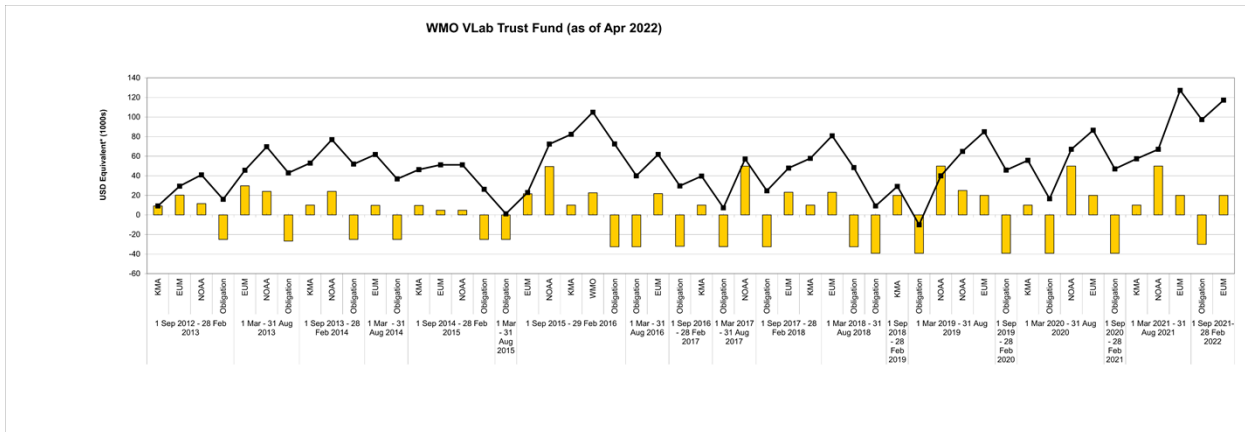
Figure 1. Overview of the WMO VLab Trust Fund. Figures in this chart are approximate, as it does not fully take account of exchange rates.

## 4	VLAB MANAGEMENT GROUP

### 4.1	VLab Co-Chair to represent CGMS

In 2021 the VLab Co-Chair, Dr. Mark Higgins (EUMETSAT Training Manager) stepped down after a four-year period of serving as a VLab co-chair representing CGMS space agencies. Subsequently, NOAA nominated Dr. Bernadette Connell from the Cooperative Institute for Research in the Atmosphere of Colorado State University for the positions of the new VLab Co-chair. The CGMS Plenary in May 2021 endorsed Dr. Connell as a new VLab co-chair representing the CGMS space agencies.

### 4.2	VLMG Meetings and Plans

The next face-to-face meeting of the VLab management group (VLMG-10) will be hosted by EUMETSAT in Darmstadt, Germany. Due to the unprecedented challenges related to COVID-19, the meeting was postponed for two years and will be taking place on 26-30 September 2022.

The VLMG meeting quarterly online and focuses on actions and discussions to ensure the implementation of the VLab Strategy 2020-2024. In addition, VLMG intends to strengthen VLab regional communication through collaboration within the various Satellite Data Requirements groups (SDR).

## 5	CONCLUSIONS

This paper reports participation in VLab training opportunities worldwide, highlighting the increased visibility of the training activities organized by VLab. It also highlights the strengthening of collaboration between VLab Members, which allows for these training opportunities to be offered.

CGMS and its membership has been a strong sponsor of VLab. It is important that the level of support is now reviewed, as a renewed and stronger commitment of sponsors is needed to aid the training initiatives for the preparation of users of the current and new generation of satellites to continue.

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