

Memorandum of Understanding
between
Committee on Space Research (COSPAR)
and
World Meteorological Organization (WMO)
for

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Annexes /	Filed

Partnership on training and capacity building between the WMO-CGMS Virtual Laboratory for Education and Training in Satellite Meteorology (VLab) and the COSPAR Scientific Commission A on Space Studies of the Earth's Surface, Meteorology and Climate and Panel on Capacity Building (PCB/SC-A).

1. WMO is a specialized agency of the United Nations. It is the UN system's authoritative voice on the state and behaviour of the Earth's atmosphere, its interaction with the oceans, the climate it produces and the resulting distribution of water resources. The VLab is an activity jointly sponsored by the WMO Space Programme and the Coordination Group for Meteorological Satellites with the main objective to help improve the worldwide utilization of satellite data and products by member countries of WMO, with a focus on developing countries.

2. COSPAR is an interdisciplinary scientific organization with the overall objective to promote on an international level scientific research in space, with emphasis on the exchange of results, information and opinions, and to provide a forum open to all scientists for the discussion of problems that may affect scientific space research.

3. VLab and the COSPAR PCB/SC-A are complementary organizational mechanisms with a global mandate for training and capacity building in satellite meteorology and satellite Earth Observation applications, respectively, in terms of (i) application areas addressed, (ii) research/operational focus, (iii) resourcing, (iv) host and partner institutions. There is potential for substantial mutual benefit by partnering and linking activities of the two mechanisms, with the aim to enhance overall capacity in developing countries. Additional coordination overhead should be kept to a minimum.

4. In consideration of the benefits anticipated from entering into this MoU, COSPAR and WMO ('Parties') agree to the following cooperative activities:

- a) Exchange of information on capacity building activities;
- b) Exchange of contact points;
- c) Mutual acknowledgment and promotion;
- d) Collaboration of VLab and COSPAR host institutions, and partner satellite agencies, in organizing capacity building events;
- e) Provision of mutual sponsorship of capacity building events (in-kind);
- f) Exploration of further areas of partnership.

5. This MoU may be amended at any time. Any such amendments shall be agreed by mutual consent and shall be made in writing.

6. Neither Party will make any public statements regarding the purpose of this MoU or activities to be performed under it without the approval and consent in writing of the other Party.

7. Each Party shall appoint the following contact persons in order to make cooperation effective:

For COSPAR:
Executive Director
Committee on Space Research Secretariat
c/o CNES, 2 place Maurice Quentin
75039 Paris Cedex 01
France

For WMO/VLab:
Scientific Officer
Satellite Utilization and Products Division
Space Programme
Observation and Information Systems Dept.
World Meteorological Organization
7bis, Avenue de la Paix
1211 Geneva 2
Switzerland

8. The Parties shall make every effort to settle amicably all disputes, controversies or claims arising from this MoU without recourse to the courts. In case an amicable agreement cannot be achieved through direct negotiations within 60 days of the commencement of the negotiations, the dispute, controversy or claim shall be submitted to arbitration in accordance with the UNCITRAL Arbitration Rules, as at present in force.


9. Nothing contained in this MoU shall be deemed a waiver of any of the privileges or immunities enjoyed by WMO.

10. Annex A (Background to COSPAR PCB/SC-A, VLab) shall be an integral part of this MoU.

11. This MoU shall have no financial consequences for either Party.

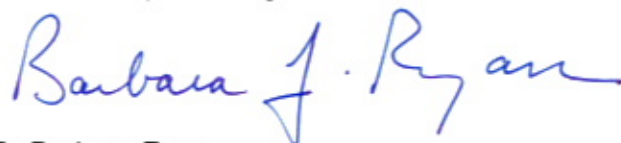
12. This agreement shall remain in force for an initial period of three years from the day of signature by both Parties. It may thereafter be renewed through mutual written consent by both Parties.

For COSPAR:



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For WMO Space Programme:



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ANNEX A – BACKGROUND

A1. COSPAR Scientific Commission A on Space Studies of the Earth's Surface, Meteorology and Climate and Panel on Capacity Building (PCB/SC-A)

A1.1 Current status:

COSPAR's objectives (<http://cosparhq.cnes.fr>) at large are to promote on an international level scientific research in space, with emphasis on the exchange of results, information and opinions, and to provide a forum, open to all scientists, for the discussion of problems that may affect scientific space research. Among others, COSPAR acts mainly as an entity that "strives to promote the use of space science for the benefit of mankind and for its adoption by developing countries and new space-faring nations, in particular through a series of Capacity Building Workshops which teach very practical skills enabling researchers to participate in international space research programs."

Activities related to Earth observation are overseen by its Scientific Commission A on "Space studies of the Earth's surface, meteorology and climate" (SC-A, current chair: Nadine Gobron, European Commission Joint Research Centre Ispra), with three sub-commissions on atmosphere, meteorology and climate; ocean dynamics and productivity; and land processes and morphology.

COSPAR organizes biennial assemblies and is supported by a council, a bureau and a secretariat (current Director: Jean-Louis Fellous).

A1.2 Capacity Building Tools

A1.2.1 Workshops

Capacity-Building Workshops are held at a rate of about 3 workshops in each two-year period, possibly increased to 2 workshops per year in the coming period. These workshops have as a main objective the encouragement of the scientific use of space data by scientists in developing countries. This is particularly pertinent in view of the large number of extensive archives of data from past and current space missions and the ready access to these and the associated analysis software which is afforded by the internet. The typical workshop aims to provide a highly practical training in the use of one or more of these, based on current missions. However, any training activity which is related to science covered by one of the COSPAR commissions is eligible for support. The CB program is led by a Panel (PCB) chaired by Dr Mariano Mendez (University of Groningen, The Netherlands), with Dr Pierre-Philippe Mathieu (ESA/ESRIN, Italy) as Vice-Chair representing SC-A.

The programme of Workshops is not directed but relies on proposals from scientists of standing within the international space science community. It is targeted at a range of participants from final year postgraduate students to young university faculty members in developing countries, usually within a broad geographical region. Practical requirements will often limit the workshop capacity to 25-35 "students" over typically 2 weeks. Usually, the character of the workshop is expected to meet some general selection criteria and then COSPAR expects to provide substantial funding, the level depending of course on particular requirements. However, it is also expected that the project will be in collaboration with the host country, which also will need to provide significant (mostly in-kind) funding. It is hoped that the workshop will be related to either a space project, or some other strategic scientific objective in the host country, but this is by no means always possible.

COSPAR is also willing to provide limited co-sponsorship to workshops with other major agencies, provided these fit the general character of this programme.

A1.2.2 Fellowships

To enable young scientists who have been participants of one of the COSPAR Capacity Building workshops to build on skills gained, the Committee also organizes fellowships. This programme

provides for visits of 2-4 weeks duration for the purpose of carrying out joint research at institutions which collaborate with COSPAR for this project (current list of institutions available at <http://hea-www.harvard.edu/~rsmith/cospar/fellowship.htm>). These fellowships are intended to foster research collaborations between scientists in developing countries and those at the receiving laboratories; they are not primarily for training purposes. For this reason the quality of the proposed research will be an important criterion for success in selection. The programme must be presented jointly by the applicant for the fellowship and an identified scientist who has agreed to receive and work with the applicant in their laboratory. Funding for these trips primarily comes from the host scientist and/or institution, with secondary funding from the applicant's institute or country. COSPAR provides limited funding, typically for direct travel costs only, in cases where the first two sources are insufficient. Fellows will be required to submit a report on their visit within 6 weeks of their return to their home country. The COSPAR Fellowship program is placed under the oversight of a subgroup chaired by Dr Randall Smith (Smithsonian Astrophysical Observatory, Cambridge, MA, USA), PCB Vice-Chair.

A2. WMO-CGMS Virtual Laboratory for Education and Training (VLab)

A2.1 Current status

The Virtual Laboratory for Education and Training in Satellite Meteorology (VLab, <http://vlab.wmo.int>) was established in 2000 by the World Meteorological Organization (WMO) and the Coordination Group for Meteorological Satellites (CGMS) to help improve the world wide utilization of satellite data and products by member countries of WMO, with a focus on developing countries. The VLab is a global network of currently 12 specialized training centres, "Centres of Excellence in Satellite Meteorology (CoE)", benefiting from a partnership with one or more satellite operators (in total eight) that are members of CGMS (see table below; status 15 February 2012). The CoE, often collocated with WMO Regional Training Centres (RTC), are established in all WMO Regions (continents) to meet the needs of operational forecasters and other scientists for skills and knowledge in using satellite data within their Region. Each CoE is responsible for conducting training activities and normally supports one or more Regional Focus Groups involving meteorological and hydrological services from its region.

The day-to-day running of the VLab is maintained by a Technical Support Officer, with support from the WMO Space Programme. VLab governance is provided by a Management Group currently chaired by Kathy-Ann Caesar (Barbados Met Service) and Volker Gärtner (EUMETSAT).

Centre of Excellence for training (Focal points on http://vlab.wmo.int)	Partner satellite agencies
National meteorological service of Argentina and University of Buenos Aires (Buenos Aires, Cordoba)	NOAA, CONAE
Bureau of Meteorology Australia (Melbourne)	JMA
Caribbean Institute for Meteorology and Hydrology Barbados (Bridgetown)	NOAA
Centre for Weather Forecasts and Climatic Studies, INPE, Brazil (Cachoeira Paulista)	INPE, NOAA
China Meteorological Administration Training Centre (Beijing) and Nanjing University of Information Science and Technology	CMA
University of Costa Rica (San José)	NOAA
Kenya Meteorological Department (Nairobi)	EUMETSAT
African School of Meteorology and Civil Aviation, Niger (Niamey)	EUMETSAT
Meteorological Service of Oman (Muscat)	EUMETSAT
Korea Meteorological Administration (Jincheon)	KMA
Russian State Hydrometeorology University (St. Petersburg) and ROSHYDROMET (Moscow)	ROSHYDROMET
South African Weather Service (Pretoria)	EUMETSAT

A2.2 Capacity Building Tools

Training activities are regionally-based through online courses or a blend of face-to-face and distant learning modules, using, *inter alia*, a virtual repository of training material (including the Environmental Satellite Resource Centre) and the online course management system Moodle. Centres of Excellence maintain topical regional focus groups which meet regularly largely using webconferencing tools.

Regional 'event weeks' consisting of a series of expert-led online sessions on a specific theme (e.g., aviation, dust, Mediterranean weather) are open to participants from all over the world. These events provide an opportunity for the exchange of expertise and the establishment and strengthening of communication between professionals of meteorology from different regions.

Regional Focus Groups are online sessions organised by VLab CoEs, where participants (e.g., students, trainers, researchers, practitioners) get together on a regular basis to discuss a chosen topic on satellite imagery and products. Topics are usually presented by a trainer and then discussed with the participants who have the opportunity to ask questions and add comments, new ideas and suggestions. These online sessions have proved to widen the access to training events and training resources to countries within the regional area of VLab CoEs. The benefits of these events are numerous, most importantly that these learning activities are representative of a practice-based culture, strengthening regional collaboration amongst professionals.

A2.3 Strategy and Plans:

The VLab currently focuses on providing training and training resources for NMHS staff, noting that this includes a diversity of profiles from core synoptic weather forecasting to a range of applications in related fields, as the activities of operational services tend to expand. It will be necessary to provide training that exploits the full potential of satellite data and products from both operational *and* several R&D satellites and, in so doing, prepare the various user communities for the next generation of spaceborne Earth observing systems. According to its 5-year strategy 2008-2013, the VLab has the following aims:

Based on currently available expertise in the VLab network, to provide training on:

- Satellite remote sensing (physical basics and principles);
- Meteorology (convective systems, heavy rain and floods, storms, impacts on transport);
- Climate (inter-calibration, radiation budget, ocean and cryosphere, aerosols and ozone);
- Hydrometeorological disasters (fire, wind-related).

Where regional requirements are identified, VLab activities could be widened to support training related to:

- Ocean applications (marine meteorology);
- Land applications;
- Hydrology and water management;
- Atmospheric chemistry and air quality;
- Environmental monitoring.

It is further envisaged to (i) expand the number of Centre of Excellence, with sponsorship from additional satellite agencies, to (ii) provide training in support of more GEO societal benefit areas, and to (iii) comply with the evolving requirements in the "Guidelines for the Education and Training of Personnel in Meteorology and Operational Hydrology" (WMO-No. 258).

A2.4 Main Issues

Many VLab participating Centres have expressed the need to:

- Leverage national/regional resources and skills related to satellite remote sensing;
- Better liaison with academia (scientists, lecturers, students) nationally and internationally, including the exchange of staff;
- Reach out and learn from satellite application areas beyond satellite meteorology;
- Learn more about incorporate R&D satellite data in their operational environment;

- Overcome institutional barriers at the national level (e.g., between the national meteorological service and universities);
- Have larger bandwidth available for effective participation in online training.

A3. Expected Benefits

Expected benefits for VLab from partnering with COSPAR include:

- Collaboration of VLab and COSPAR host institutions, and partner satellite agencies, in organizing capacity building events, with a focus on developing countries;
- Leveraging national resources and liaising academic institutions with VLab institutions;
- Involvement of COSPAR workshop lecturers in VLab training events;
- Access to COSPAR workshop material (i.e., region-specific training material in EO science beyond current VLab topics which are currently largely satellite meteorology and marine meteorology);
- Support by COSPAR to meetings and events of VLab CoEs (mainly in-kind).

Expected benefits for COSPAR from partnering with VLab include:

- Use of virtual infrastructure (tools, training resources);
- Use of education/training material in COSPAR workshops;
- Uptake of research results in operational environments;
- Linkage to operational environments through fellowships of scientists in host institutions (e.g., ECMWF);
- Promote event weeks to COSPAR community;
- Promote liaison between institutions through workshop proposals to COSPAR;
- Participation of regional CoEs in COSPAR workshops (as lecturers);
- Participation of students associated with VLab institutions in COSPAR;
- Support by WMO to COSPAR meetings (mainly in-kind).