GLOBAL CLIMATE OBSERVING SYSTEM

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GCOS STEERING COMMITTEE

THIRTIETH SESSION

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Virtual Session

Implementation of GCOS in areas not addressed by WMO

1. Foreword

The GCOS Steering Committee, noting that some organizations making in situ observations are not affiliated with WMO, asked the GCOS Secretariat to consider how to ensure the recommendations and guidance of GCOS are implemented in those areas not currently addressed by WMO, namely parts of the cryosphere, oceans and biosphere[1].

2. Satellite Observations

TOPC notes that many of the terrestrial and oceanic ECVs are monitored by satellites coordinated by CEOS (Committee on Earth Observation Satellites). The GCOS Secretariat has provided a Supplement to the IP describing satellite relevant actions for consideration at the CEOS Plenary.

For example, the European Space Agency, through its Climate Change Initiative (ESA-CCI) monitors, among others, the following ECVs related to the cryosphere (ice sheets, glaciers, snow, permafrost), oceans (Ocean Colour, Sea Surface Temperature, Sea State, Sea Level, Surface Salinity) and biosphere (Biomass, Fire, Land Cover, Land Surface Temperature, LAI and FAPAR). Fruitful coordination with CEOS, as well as ESA and other Space Agencies is already in place.

3. Ocean

The connection to organizations making in situ observation is facilitated by the fact that both GCOS and the Global Ocean Observing System (GOOS) programmes are co-sponsored by WMO and IOC.

[1] ACTION SC 29/2 The GCOS steering committee asks the GCOS Secretariat to consider how to ensure the recommendations and guidance of GCOS are implemented in those areas not currently addressed by WMO (e.g. parts of the cryosphere, oceans and biosphere).

GOOS has been playing a central role in facilitating the development of the integrated sustained Global Ocean Observing System, where one of the three major application areas is climate. WMO is both a sponsor and partner of GOOS in this endeavour and the national met services are users of ocean data from this ocean observing system.

GOOS and GCOS are strongly connected. These connections have been recently re-considered in the framework of the Study Group on Ocean Observations and Infrastructure Systems (SG-OOIS), which was formed in 2020 after the disbandment of the Joint Commission for Oceanography and Marine Meteorology (JCOMM). SG-OOIS seeks for an improved governance in the context of WMO Governance Reform, including the proper links to GOOS, of those processes and value chains in WMO and co-sponsored systems that are impacted by ocean observations, spanning in-situ as well as space-based subsystems of WIGOS.[2] These considerations of proper links to GOOS include co-sponsored programmes like GCOS.

In the report presented by SG-OOIS at the INFCOM-2 Session in October 2022, it was recognized that OOPC provides a natural link to the WMO requirements gathering process for global climate monitoring requirements of surface and below surface ocean observations while AOPC takes care of the atmospheric component over the ocean. Atmospheric ECVs over the ocean are in practice monitored by oceanic networks that are managed by the Observations Coordination Group (OCG) under GOOS.

GCOS is co-sponsored by IOC, which means that GCOS, following the appropriate channels can also submit documents for consideration and endorsement by IOC Executive Council and IOC General Assembly. The Chair of the Standing Committee on Observing Networks (SC-ON) presented one document at INFCOM-2 with a recommendation urging members to take action to address the relevant actions that were included in GCOS Implementation Plan where National and Meteorological Services were the main implementers. This recommendation was approved. The GCOS Chair should present to the IOC Assembly those GCOS IP Actions that involve IOC members and IOC programmes and bodies like GOOS or IODE.

4. Cryosphere

For the Cryosphere, the link with WMO is ensured thought the improving relationships between GCOS and the Global Cryosphere Watch (GCW).

GCW works on the observing requirements (both in situ and satellite-based), standardization, best practices and improved access and exchange of data and information for cryospheric variables.

The Manual on the WMO Integrated Global Observing System (WIGOS) Annex VIII to the WMO Technical Regulations, 2021 edition (hereinafter referred to as "WIGOS Manual 2021"), invites "Members making observations for climate applications" to "observe some or all of the following ECVs" including "observations made by the observing component of the Global Cryosphere Watch: glaciers, ice sheets and ice shelves, permafrost, snow, sea ice". Even more, cryosphere components are defined as "solid precipitation, snow, glaciers and ice caps, ice sheets, ice shelves, icebergs, sea ice, lake ice, river ice, permafrost and seasonally frozen ground". This list fully covers the TOPC ECVs related to the cryosphere, namely: Glaciers, Ice Sheets and Shelves, Permafrost and Snow.

Furthermore, the WIGOS Manual 2021 stated that "Members operating stations of the GCW surface observing network shall apply GCW best practices and procedures".

Therefore, in order to address the GCOS-SC request 29/2, TOPC has been improving contacts with GCW to ensure a full alignment between GCOS activities in the cryosphere domain and the WMO and GCW related documentation and regulation. TOPC plans to formally have an ex

[2] SG-OOIS Full Report, September 2022, in Annex 2 to Decision 6.5.1(1)/1 (INFCOM-2)

officio member representing GCW. GCOS has invited the GCW chair to the GCOS Steering Committee meetings.

TOPC will continue to work with cryospheric observations that are not made by NHMS encouraging them to adopt the recommendations and guidance of GCOS and GCW.

5. Biosphere

The biosphere-related ECVs are: Above-Ground Biomass, Albedo, Fire, FAPAR, Land Cover, Land-Surface Temperature, Leaf Area Index, Soil Carbon.

The landscape of organizations making in situ observations in the terrestrial domain is complex and fragmented: there is not just one single entity, covering all different ECVs in the biosphere domain, to which refer to.

FAO (the Food and Agriculture Organization of the United Nations) addresses some of the ECVs in the biosphere domain, where there are linked with agriculture and forests: Above-Ground Biomass, Fire, Land Cover and Soil Carbon. It is undoubtedly an authoritative partner belonging to the UN family to collaborate with. Therefore, contacts have been established with relevant FAO offices (i.e. Climate Change Office and Geospatial Unit) since the second half of 2022. There is a mutual interest to develop joint activities on areas of common interest and those areas shall include also ECVs observations.

Fluxnet is an in situ global (and internationally recognized) network of micrometeorological sites that use eddy covariance method to measure the exchanges of carbon dioxide, water vapor and energy between terrestrial ecosystems and the atmosphere. In addition to the carbon, water and energy fluxes, it observes (directly or indirectly, as main or ancillary variables, fully or partially) among others the following ECVs: Above-Ground Biomass, Land Cover, LAI and Land-Surface Temperature (at least some of its products, like Sensible Heat Flux, Latent Heat Flux and Transpiration). TOPC will investigate the possibility to reinforce the relationships with the Fluxnet community in order to promote the distribution of GCOS recommendations and guidance.

The ECV Land surface temperature, particularly its products Soil Temperature[3], is part of the OSCAR database. Soil T is also addressed in the WMO Guide to Meteorological Instruments and Methods of Observation (WMO-No.8).

The Essential Variable framework established by the Group on Earth Observations (GEO) can also be an opportunity to be further explored, in addition to the formal relationships already ongoing.

Finally, the measurements of most of the biospheric ECVs from satellite sensors are rapidly improving and there are products available for global Land Cover, LAI, FAPAR, Albedo, Land-Surface Temperature, as well as Aboveground biomass and Fire. For these ECVs the collaboration with CEOS and other space agencies, already described in the previous paragraph "Satellite Observations", will be exploited.

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[3] Soil Temperature is a new ECV product temporarily included under the ECV Land-Surface Temperature. Its positioning will be subject to evaluation by the TOPC Panel and the GCOS Steering Committee.