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ARCHITECTURE FOR CLIMATE MONITORING FROM SPACE

(Submitted by the Secretariat)

Summary and Purpose of Document

This document recalls the on-going activities related to the development of an Architecture for Climate Monitoring from Space and the discussions held at CM-12 on this subject.

This is provided, on one hand, as a background for ET-SAT discussions on the Vision of WIGOS Space-Based Components in 2040 and, on the other hand, for consideration of how ET-SAT can best contribute to advance the development of the Architecture.

ACTION PROPOSED

The Expert Team is invited to:

- Note the on-going activities related to the Climate Architecture
- Discuss a way forward for defining the space-based system and FCDR components of an Architecture for Climate Monitoring from Space;
- Include appropriate high-level considerations of the physical Architecture for Climate Monitoring from Space in its contribution to the Vision of WIGOS Space-based Components in 2040.

REFERENCES:

- WMO/CGMS Workshop on Continuity and Architecture Requirements for Climate Monitoring, Geneva, 13-14/11/2011
- Resolution 19 (Cg-XVI) Development of an Architecture for Climate Monitoring from Space
- Strategy towards an Architecture for Climate Monitoring from Space, M.Dowell et al., 2013

ARCHITECTURE FOR CLIMATE MONITORING FROM SPACE

1. BACKGROUND

- Initial discussions on the need for an Architecture for Climate Monitoring from Space were held at the 10th Consultative Meeting on High-level Policy on Satellite Matters (CM-10) in January 2010.

- A workshop on Continuity and Architecture Requirements for Climate Monitoring was jointly convened by WMO and GCOS on 13-14 January 2011. At this workshop the WMO Secretariat presented the outline of an architecture, a gap analysis of actual and planned satellite observations for GCOS Essential Climate Variables (ECVs), and early considerations on Continuity and contingency requirements for climate monitoring from space.

- The report on Strategy towards the Development of an Architecture for Climate Monitoring from Space was completed in 2012 and published early 2013 by ESA, on behalf of the writing team composed of CEOS, CGMS and WMO Secretariat members.

- ET-SAT-8, in May 2013, recommended an inventory of Fundamental Climate Data Records (FCDRs) in addition to the current ECV inventory, and highlighted that long-term continuity should be addressed not only in terms of avoiding gaps between similar sensors, but rather in terms of comparability of consecutive sensors to enable deriving consistent ECV products.

- CGMS and CEOS have endorsed in July and October 2013, respectively, the Terms of Reference of a Joint Working Group on Climate, which had its first meeting on 5-7 March 2014 in Darmstadt, Germany, and subsequent virtual meetings. At that meeting, a presentation was given on the study, reviewed by ET-SAT, of the availability of Fundamental Climate Data Records (FCDRs) from past, present and future satellite missions from CGMS members for inclusion in the architecture.

- A report on Progress and Future Plans for the Architecture for Climate Monitoring from Space was presented at CM-12, in June 2014, by the Chairman of the Joint Working Group.

2. CM-12 DISCUSSIONS

2.1. Scope of the Architecture

The Architecture is an effort aiming to provide a structured and comprehensive view of what Climate Data Records are available from Earth Observation satellites, to create the conditions for delivering further Climate Data Records (CDRs) through best use of existing data holdings, and to optimize the planning of future satellite missions and constellations in order to expand existing and planned CDRs, addressing possible gaps of coverage or record length (CDRs encompass FCDRs as well as ECV data records). The Architecture is thus an end-to-end approach which spans over several “pillars”, from remote sensing, to climate data record creation and preservation, and to climate applications in support of decision making.

The Architecture also provides a foundation for the Observations and Monitoring pillar of the Global Framework for Climate Services (GFCS), thus sustaining the provision of near real time monitoring for climate services at the global, regional and national scales. While it is a responsibility of governments to strengthen and sustain their long-term national space programmes to meet global, regional and national climate monitoring and service needs, the role of international organizations

like WMO is to further enhance international collaboration towards the development of a physical space architecture, to facilitate free and open data and products access and exchange from satellites, and to promote collaboration of space agencies with user communities for realizing economical and societal benefits through climate services. In this regard, WMO through its Space Programme acts as a bridge between users and satellite operators.

2.2. Progress of the Joint Working Group on Climate

The Group's work plan includes:

- Developing an inventory of ECV climate data records held by agencies, as part of the "physical" Architecture and to allow for analysing gaps and developing actions to mitigate the gaps;
- Case studies linking climate data records to societal applications and policy decisions; examples of climate services in the GFCS priority areas (this is progressing in particular through actions from the WMO IPET-SUP);
- Reporting and engaging with GCOS and UNFCCC, and proposed use of the ECV inventory approach to incorporate in-situ data holdings as well.

CM-12 acknowledged the work of the Joint Working Group, the importance of an effective collaboration between CEOS, CGMS and WMO and the particular role of WMO to support the user-provider dialogue.

The comment was also made that in order to respond to the request from Congress, the physical architecture should not limited to an inventory of ECV datasets, but rather build on such an inventory to develop a full-scale "virtual climate constellation". This is however not included in the Group's three-year work plan. The Working Group is thus unlikely to deliver solid outcomes in terms of an end-to-end architecture by the time of the 17th World Meteorological Congress (Cg-17) in May 2015.

2.3. Agencies reports

Reports were presented to CM-12 by ESA on the Climate Change Initiative, and by Environment Canada, on the Polar Communications and Weather (PCW) mission as examples of different kinds of contributions to the implementation of the architecture.

2.4. Data policy considerations

Three particular principles were stressed, out of the eight principles for establishing the GFCS:

- public data and products should be seen as a public good;
- climate services are necessary to address the safety of population;
- climate data are also important for their impact on economic growth.

An underlying principle of Resolutions 40 and 25 is that the data necessary to support safety and security are to be exchanged as "essential" data. This has direct implications on climate data, as the availability of data determines the ability to monitor and forecast climate including anomalies that affect the safety of population.

CM-12 noted a broad recognition of the need for international exchange of observation data required for climate monitoring and services. It recommended informing officially the space agencies of the EC draft resolution (EC-66/Doc.3.2.(1)) in this regard, and inviting feedback in order to inform the upcoming Congress deliberations taking into account the data policy practices of space agencies for climate data. The climate data policy should not only focus on ECVs, which

are related to climate relevant geophysical products, but also on the preservation and sharing of Level 1 (instrument-level) data, to secure the possibility of further reprocessing.

CM-12 also stressed the need for seamless continuity of satellite programmes to support climate monitoring and climate applications; this should be advocated in reference to the socio-economic benefit of climate applications.

3. CONCLUSION

The ET-SAT is invited to discuss a way forward for defining the space-based system and FCDR components of an Architecture for Climate Monitoring from Space, bearing in mind that this activity is not currently foreseen by the CEOS-CGMS Joint Working Group on Climate.

ET-SAT is invited to include appropriate high-level considerations for the physical architecture in its contribution to the Vision of WIGOS Space-based Components in 2040, taking into account earlier discussions reported above, such as: continuity/contingency and comparability issues, reference sensors and traceability, etc.

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