

Draft reference process for assessment of the WGClimate ECV Inventory

The WGClimate is responsive to the GCOS WCV requirements provided in the GCOS 2010 implementation plan (GCOS-138; hereafter referred to as GCOS IP10) and the related satellite supplement (GCOS-154). The specific requirements for the ECVs that can be observed from satellites are given in the satellite supplement and were driven by user needs following the UN Framework Convention on Climate Change (UNFCCC). The relationship between these entities is shown schematically in figure 1.

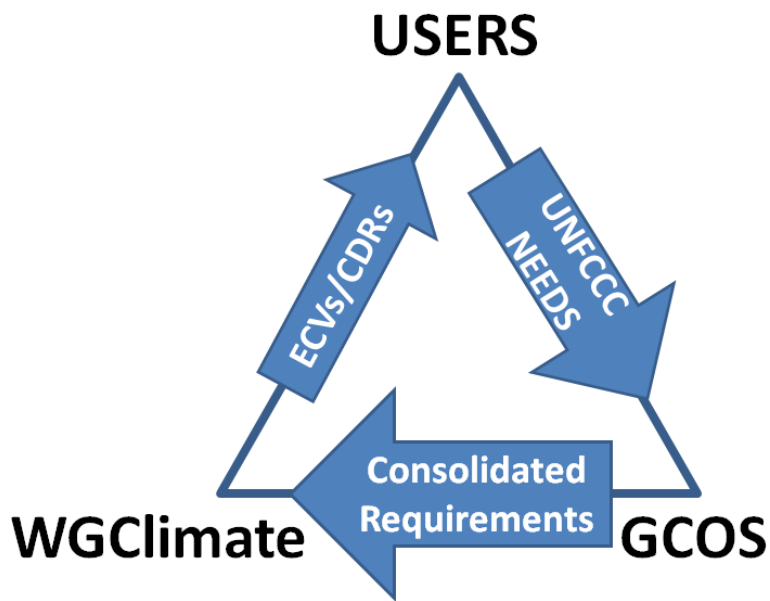


Figure 1. Flow of needs to requirements to the WGClimate.

ECVs can refer to a single geophysical variable, or a group of geophysical variables, and we refer to these as climate data records CDRs. CDRs are further defined as fundamental CDRs (the remote sensing observable) and the derived geophysical variable, also defined as a thematic CDR (TCDR). We limit the entries in the ECV inventory to only those ECV/TCDR pairs identified in GCOS-154 (see tables 2-4, TCDRs are the column labeled 'global products...'). Most importantly, the ECV questionnaire was based upon requesting input to answer the GCOS guidelines for data set preparation, aka GCOS-143. Thus, the metrics proposed for assessing each pillar of the climate monitoring architecture are based upon those guidelines.

Recall the 4 pillars of the climate monitoring architecture and related flow of information shown in figure 2.

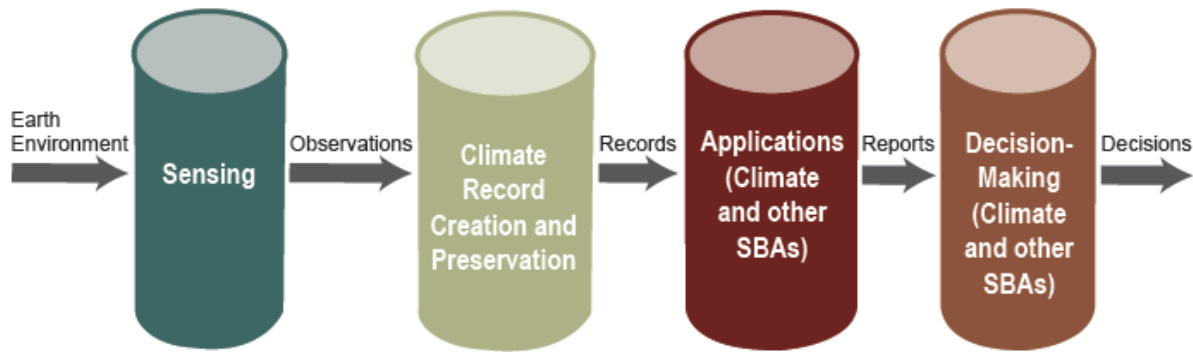


Figure 2. Four Pillars of the Climate Monitoring Architecture

The ultimate goal of an assessment against this architecture requires that we identify a metric, or metrics, to assess the quality of each pillar as well as the entire value chain against the GCOS requirements. The GCOS requirements, since they were motivated by the UNFCCC, are oriented to detection of signals on decadal to centennial times and space scales. This is our focus in this exercise.

Proposed assessment of existing ECV/CDRs

Each of the pillars of the climate monitoring architecture needs to be assessed. I propose that WGClimate members volunteer to conduct group assessments using the following metrics for each of the pillars. I have set aside $\frac{3}{4}$ of one day at the WGClimate meeting in March where we can break out into groups to do this. We can organize along the ECV themes atmosphere, ocean, terrestrial or another way if desired. Here are my proposed metrics to discuss and evaluate:

1. Pillar 1 – Sensing – The key characteristic in this pillar is what is the timespan or length of record? We want to evaluate the length, with a target of a high rating for 30 years or more as that is the WMO standard for a climate ‘normal’. So my thought is to normalize the record length by 30 years to get a numerical rating. Other pieces of interest, but secondary, include whether there is an FCRD produced and then the actual listing of satellite/instruments used. We can tie the latter, eventually, to the MIM and there hooks are in the ECV database to do this, however, we would need to extend a select number of MIM records back in time as MIM only goes back to 1985.
2. Pillar 2 – Climate Record Creation and Preservation – This is evaluated by using the ECV questionnaire answers to assess compliance with the GCOS data set guidelines (i.e., GCOS-143). There are 12 questions in the guideline and many of the questions are multi-part. Each answer in the ECV data base to each question was scanned for an answer of yes or if content was provided. If so, credit was given to answering the question (i.e., it was rated as compliant with

the guideline). The number of positive responses per questions was weighted by the total possible so each of the 12 questions has a normalized score of between 0-1. The total score thus for pillar 2 can range between 0 and 1 by taking the average for each of the 12 questions. This metric is being automated in the spreadsheet and we will have easy to work with results on this pillar shortly and be able to use this at the WGClimate meeting.

3. Pillar 3 – Application – In this case the application are the requirements for resolution (horizontal, vertical, and temporal), accuracy, and stability from GCOS-154 (aka the satellite supplement). In an ideal world, we could assess whether the ECV/CDR data base values entered meet or exceed the GCOS requirements. This is, however, not easily done because the GCOS requirements vary from achievable to aspirational in how the groups who formulated them proceeded. We should not try to re-formulate the existing requirements, nor the answers. What we need to do, I would propose with the WGClimate members, is come up with some ranking of progress in achieving the requirements or closeness to them. This needs to be a central discussion at the WGClimate meeting.

4. Pillar 4 – Decision-making – The ECV questionnaire did have a text box for entering application and the simple approach is to capture that. If an answer was supplied, the ECV is compliant and gets a value of 1. In the future, we can and will take the actual GCOS stated ‘benefits’ and ‘other applications’ and add them to a drop down menu for selection and add a text box for citation or other ‘proof’ demonstrating the application.

The idea is to compute these metrics for each ECV so they can be compared within an ECV. We can generate a few different graphs to illustrate various aspects of the assessment.

Pillar 1 graphic SENSING – time series showing period of record (working on a better time series plot...)

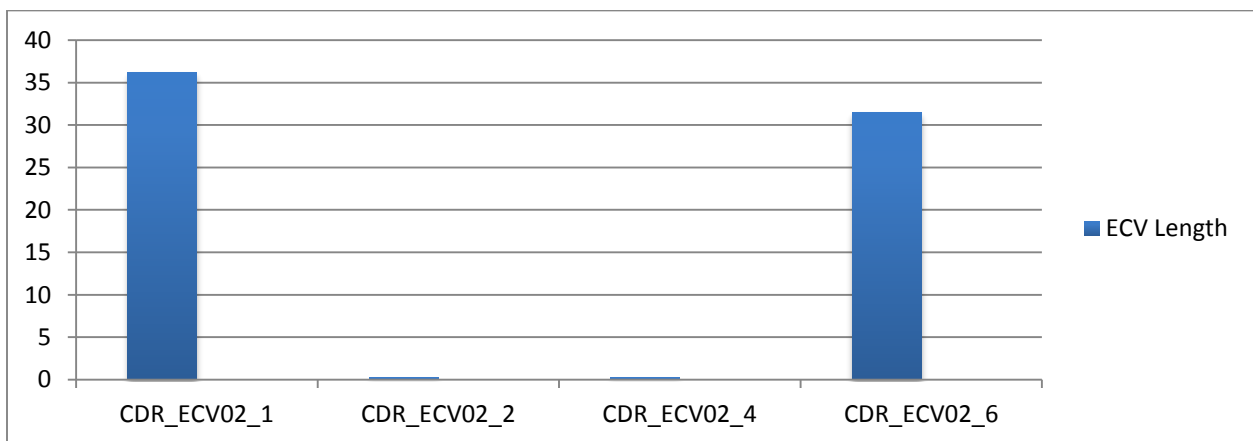


Figure 3. Sample record lengths for the 4 ECV/CDR of upper air temperature. A value of 0 indicates no information was given or there is an error in the data base. We are exploring whether there are some errors in this parameter and should have an update soon.

Pillar 2 graphic CLIMATE RECORD CREATION AND PRESERVATION – bar chart of score for each of the 12 GCOS guidelines per ECV (G-score where 1-12 are the questions and Gavg is the average total score for the 12 guidelines)

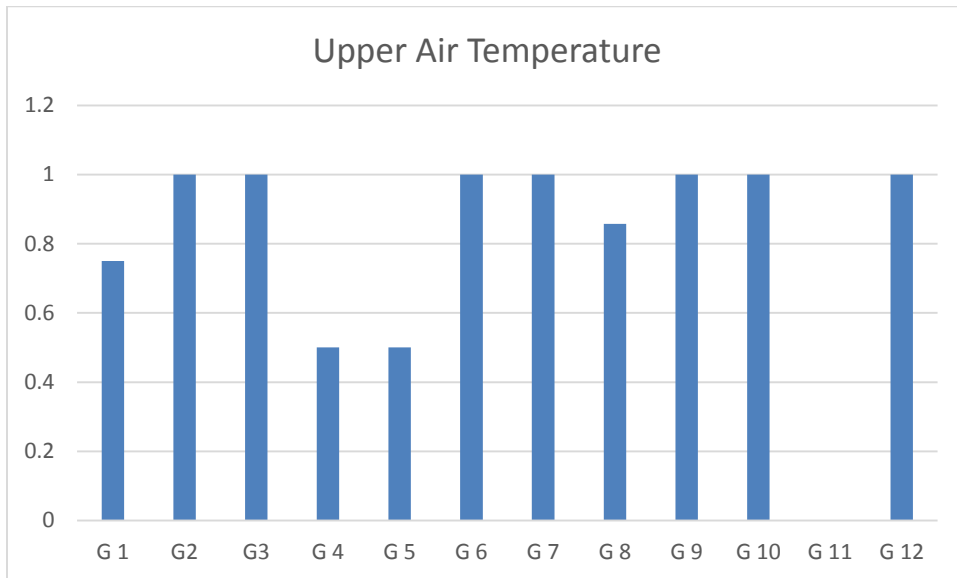


Figure 4. Actual compliance scores for each of the 12 GCOS Data set guideline questions for a single entry of upper air temperature. The average of all these 12 is given below as the GAVG.

Comparison of Climate Record Creation and Preservation (aka GAVG) scores for a given ECV (we'll clean up the titles to make them more informative...). We can also plot these as a function of agency so each agency can see where they need to do some work...

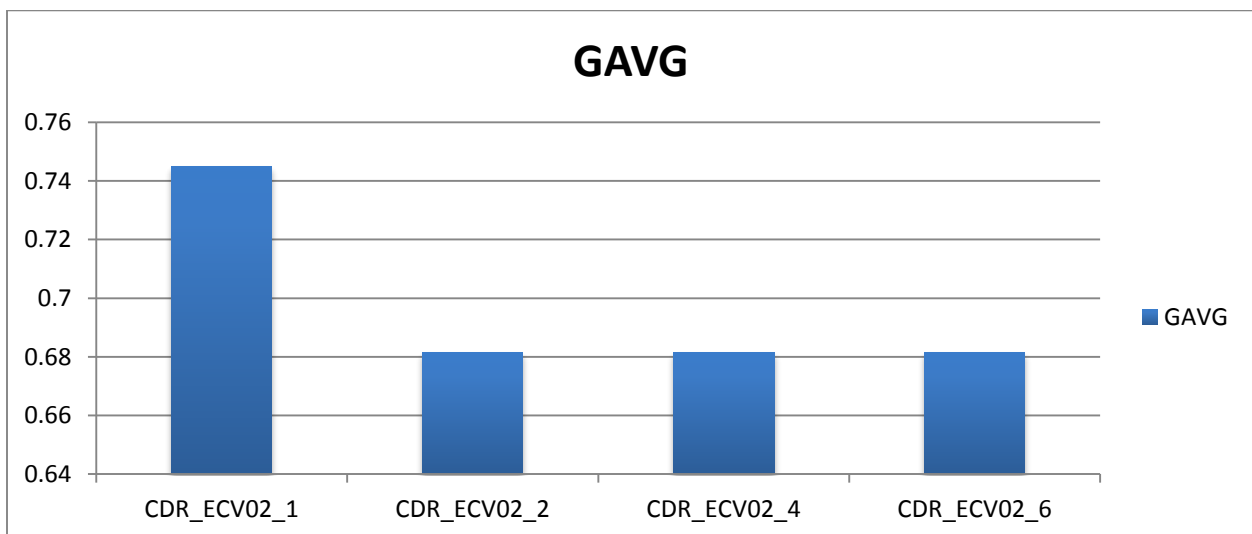


Figure 5. Average total compliance scores for the 4 ECV/CDR upper air temperature entries. This is the metric value of pillar 2 for these 4 ECV/CDRs.

Summary table of Pillar 3 requirements for a given ECV. Yes some did not report against the requirements, so they get a low score in both pillar 2 and 3. And this means that one of the first ‘gaps’ that needs to be addressed is a gap in information content in the ECV. The SEO and I did quite a bit of work trying to get this information, but there is still work to be done.

	Horizontal resolution	Vertical resolution	Temporal resolution	Accuracy	Stability	Resolution Rating
CDR_ECV02_1	50	5	30	0.25	0.025	1
CDR_ECV02_2	0	0	0	0	0	0
CDR_ECV02_4	0	0	0	0	0	0
CDR_ECV02_6	0	0	0	0	0	0

Figure 6. Values of Pillar 3 application for the 4 ECV/CDRs of upper air temperature. We checked and in this case the 3 records are missing these values. Hence, I would argue this should be a major feedback to agencies on gaps. The first gap is lack of info.

Pillar 4 – Is just a capture of the application information provided and they get credit if something was provided (aka compliance credit), thus –

	Utility Rating	Utility
CDR_ECV02_1	1	Monitoring Of Tropospheric Temperature
CDR_ECV02_2	1	This Dataset Supports Several Tcdrs (upper-air Temperature, Total Column Water Vapor, Profiles Of Water Vapor And Cloud Amount)
CDR_ECV02_4	1	Supports Multiple Tcdrs (upper-air Temperature, Total Column Water Vapor, Profiles Of Water Vapor, Cloud Amount)
CDR_ECV02_6	0	

Figure 7. This is simply a capture of the application information provided for each ECV/CDR. They simply get credit for having anything there. In the future we can greatly improve this.

So, this is the proposed first attempt as assessment and is actually quite a bit of useful information. We can argue endlessly about details, however simply capturing and compiling and making all this accessible is a major step forward.