Comments from Public Consultation on ECV Requirements 13/01 – 13/03 2020 for:

# General Comments

## ECV Product: Ocean heat content

### Comment 1

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| Author: Benoit Meyssignac | Email: benoit.meyssignac@gmail.com |
| I am surprised by the absence of any requirements on the monitoring for ocean heat content (OHC) changes (and for the Earth energy Imbalance which is composed at >90% by OHC changes) . Although the need for precise monitoring of OHC changes is clearly expressed in the WCRP GEWEX/GDAP core project, the WCRP CLIVAR core project and the WCRP grand challenge on regional sea level and coastal impacts.  Over the past 5 to 10 years several techniques have emerged to estimate OHC which are based on  1) the monitoring of ocean interior temperature  2) the monitoring of thermosteric sea level by combining satellite altimetry and space gravimetry (from GRACE)  3)the monitoring of the oxygen in the ocean  4) the monitoring of the propagation speed of the internal waves    To get consistent requirements for the OHC monitoring through this large number of measurment techniques, I suggest to derive high level requirements for the monitoring of ocean heat content changes. This approach will provide further guidelines for the requirements on lower level variables such as interior temperature, sea level, gravity field etc to meet the need in OHC monitoring  Benoit Meyssignac | |

## ECV Product: Permafrost extent

### Comment 1

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| In addition to the parameters listed in GCOS-200, GCOS-107 mentions permafrost extent. It corresponds to the aerial fraction within an area at which the definition for the existence of permafrost (ground temperature < 0 ºC for two consecutive years) is fulfilled. The characterization of the permafrost extent in terms of aerial coverage has been employed for decades in the permafrost community, e.g. in the classic IPA permafrost map displaying classes of continuous, discontinuous, sporadic and isolated permafrost. No specific requirements for permafrost extent are available through GCOS to date. Permafrost extent is, however, the sole target parameter listed in the WMO RRR database ([https://www.wmo-sat.info/oscar/variables/view/124](https://www.google.com/url?q=https%3A%2F%2Fwww.wmo-sat.info%2Foscar%2Fvariables%2Fview%2F124&sa=D&sntz=1&usg=AFQjCNGlC-uFp-boIr0tnCwFBEjLglBppQ)), where differing requirements are listed for the application areas Hydrology and Climate-TOPC. Temporal resolution requirements are very high (target 6 hours), reflecting the velocity of atmospheric processes and so the drivers in modelling or the dynamics of seasonally frozen soil (e.g., to account for the number of freezing and thawing days). However, permafrost is a sub-surface property and the relationships between the frozen ground and the relevant climatic elements, are complex. The source of the WMO RRR requirements is unknown and they have been so far not confirmed in published user surveys regarding permafrost.  Permafrost extent has been further identified as a target parameter for a potential future satellite mission within the framework of Copernicus (Duchossois et al. 2018). Horizontal resolution requirements have been defined with threshold 10 m and goal 1 m. Temporal resolution has been defined with 10 years as threshold and 1 year as target. Accuracy should be 85% and 95% respectively. Permafrost extent has been also included as required parameter in the report with 1m - 10m (local) and 100m (circumpolar) required horizontal resolution and annual temporal resolution. Further on, permafrost extent with respect to satellite observations is discussed in NRC (2014) and Bartsch et al. (2014, 2016, 2019).  It is therefore suggested to also **include permafrost extent as additional product** (see table 1) and to further reconcile relevant existing user requirement collection activities.  **Table 1:**Suggestions for new Permafrost associated product: Permafrost extent   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Name** | Permafrost extent | | | | | | **Definition** | Fraction of permafrost-underlain area within a grid cell's horizontal area. Permafrost is subsurface earth material that remains continuously at or below 0°C throughout at least two consecutive years, usually for extended time periods up to many millennia. | | | | | | **Unit** | fraction | | | | | | **Note** | The requirements for permafrost extent reflect the determination through models which use relevant satellite observations as input in the context of permafrost monitoring | | | | | | **Requirements** | | | | | | | **Item needed** | **Unit** | **Metric** | **[1]** | **Value** | **Derivation and References and Standards** | | **Horizontal Resolution** | m | Size of grid cell | G | 1 | Expert survey results documented in Duchossois et al.( 2018) and in NRC (2014) | | B | 10 | Expert survey results documented in NRC (2014) | | T | 100 | Expert survey results documented in NRC (2014) | | **Vertical Resolution** |  |  | G |  |  | | B |  |  | | T |  |  | | **Temporal Resolution** | years |  | G | 1 | Expert survey results documented in Duchossois et al. (2018) | | B |  |  | | T | 10 | Expert survey results documented in Duchossois et al. (2018) | | **Timeliness** |  |  | G |  |  | | B |  |  | | T |  |  | | **Required Measurement Uncertainty** | % | Accuracy | G | 95 | Expert survey results documented in Duchossois et al. (2018) | | B |  |  | | T | 85 | Expert survey results documented in Duchossois et al. (2018) | | **Stability** |  |  | G |  |  | | B |  |  | | T |  |  | | **Standards and References** |  | | | | | | **Adaptation and Extremes** | | | | | | |  | Relevant? (Yes/No) | Sugg. Req. sufficient? (Yes/No) | Explanation | | | | **Adaptation[2]** | Yes | Yes | Permafrost degradation, due to thawing and ice-loss, induces drastic changes in Arctic environment, and emerging hazards in high mountain ranges. | | | | **Extremes[3]** | Yes | No | Summer heat waves induce enhanced deepening of the active layer, and possible ice-loss in the upper permafrost. The direct link between summer heat waves and rock fall frequency is well established. Timeliness of temperature reporting must be improved for sites of interest for hazard monitoring. | | |   **References in addition to GCOS documents**    Bartsch, Annett; Allard, Michel; Biskaborn, Boris Kolumban; Burba, George; Christiansen, Hanne H; Duguay, Claude R; Grosse, Guido; Günther, Frank; Heim, Birgit; Högström, Elin; Kääb, Andreas; Keuper, Frida; Lanckman, Jean-Pierre; Lantuit, Hugues; Lauknes, Tom Rune; Leibman, Marina O; Liu, Lin; Morgenstern, Anne; Necsoiu, Marius; Overduin, Pier Paul; Pope, Allen; Sachs, Torsten; Séjourné, Antoine; Streletskiy, Dmitry A; Strozzi, Tazio; Ullmann, Tobias; Ullrich, Matthias S; Vieira, Goncalo; Widhalm, Barbara (2014):  Requirements for monitoring of permafrost in polar regions - A community white paper in response to the WMO Polar Space Task Group (PSTG), Version 4, 2014-10-09., 20 pp,  <https://doi.pangaea.de/10013/epic.45648.d001>    Bartsch, A.; Grosse, G.; Kääb, A.; Westermann, S.; Strozzi, T.; Wiesmann, A.; Duguay, C.; Seifert, F. 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## ECV Product: ECVs in mountain research

### Comment 1

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| Author: MRI Scnatweb | Email: mountainresearchinitiative@gmail.com |
| General comment on ECVs on mountains submitted by Mountain Research Initiative (GEO GNOME co-lead)  Addressing the importance of climate as one key driver of environmental change in mountains, with relevant consequences for social-ecological systems, is a key activity of the Group on Earth Observations Global Network for Observations and Information in Mountain Environments (GEO GNOME). In June 2019 GEO GNOME convened a workshop to discuss, identify and select ECVs relevant for the monitoring and better understanding of “mountain climate change”. The WMO/GCOS existing catalogue of ECVs was used as initial basis for compiling our list of essential mountain variables. We identified a total of 88 ECV products categorised under 46 ECVs that are important for the understanding and monitoring of at least one key mountain process in anthroposphere, cryosphere, hydrosphere or biosphere (following the GCOS categories for Land). 70 of these 88 identified ECV products are already existing GCOS ECVs.  Due to the complex terrain and steep gradients, adequate spatial and temporal resolution of the data are crucial in mountain context. For the mountain research community, ECVs are an important means to be able to integrate different forms of data - be it in-situ or EO satellite data or modelling data.  In addition to this general comment we will indicate more detailed data requirements for a sub set of identified ECV products in separate comments to the corresponding ECV products in this consultation. Although the data requirements in mountain context were only addressed for a subset of the selected ECVs, we look forward to exploring these in more detail in the near future.  More information and some preliminary results of this workshop are available online here: https://mountainresearchinitiative.org/news-page-all/129-mri-news/2399-selecting-essential-climate-variables-for-mountain-observations. Detailed results will be published in a peer-reviewed paper later this year. When these results are published, we’ll be be happy to share them and exchange with GCOS and we welcome further exchange after this public consultation. Please follow the MRI homepage or contact mri@mountainresearchinitiative.org for any updates on this project. | |

## ECV Product: Energy and water flows in the climate system

### Comment 1

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| A separate table is presented for each variable. However a key role of GCOS is to constrain and detect large scale variations in the climate system, which would be maifested in changes to large scale heat and water budgets. There is no point measuring one component of such budgets to very high precision/accuracy, if other components are not measured to compatible accuracy or at all. So I would like to emphasise the need for a 'system view' to be taken of this. For example: to what accuracy do we need to measure surface heat fluxes, ocean heat content and horizontal transports, in order to close a basin scale ocean heat budget to a given accuracy? This would help ensure that the global observing system develops at a rate that is balanced and compatible with scientific usefulness.  If there is one budget variable that is particularly difficult to constrain, then it can be diagnosed as a residual if the others are measured compatibly.  Thanks. Richard Wood, Met Office Hadley Centre | |

### Comment 2

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| Author: Richard Wood | Email: richard.wood@metoffice.gov.uk |
| Related to the above, I think it is timely to bring into the ECVs the measurement of ocean heat, mass and water transports across key sections. This has become technically feasible over recent years: RAPID has led the way in this and is a mature system, while OSNAP and SAMBA are developing fast. There is an opportunity here to constrain large scale dynamics of the climate system in a way that climate scientists have been dreaming of since the early 1980s (proposed CAGE experiment, which was just not technically feasible at the time).  Richard Wood, Met Office Hadley Centre. | |

## ECV Product: Vegetation related ECVs - cross-comparison and land surface / earth system model evaluation

### Comment 1

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| It would be useful to ensure there is some degree of overlap in both the spatial and temporal scales of data for all vegetation related ECVs (AGB, Evaporation from land, FAPAR, Land cover, LAI...), to ensure data and uncertainties are directly cross-comparable and multiple ECVs are easily used together for land surface / earth system model evaluation of modelled vegetation. | |

## ECV Product: Uncertainty Metrics

### Comment 1

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| Author: Christophe Waldmann | Email: Click here to enter text. |
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