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

# Clouds

## ECV Product: Cloud cover

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | Cloud Cover | | | | |
| **Definition** | 2D field of fraction of sky filled by cloud | | | | |
| **Unit** | % | | | | |
| **Note** | These requirements include: Global, continental, and regional Climate monitoring, feedback and improved knowledge about the interaction between clouds, aerosols and atmospheric gases | | | | |
| **Requirements** | | | | | |
| **Item needed** | **Unit** | **Metric** | **[1]** | **Value** | **Derivation and References and Standards** |
| **Horizontal Resolution** | km |  | G | 25 | To perform continental and regional climate monitoring higher spatial resolution is needed |
| B | 100 | To perform continental and regional climate monitoring higher spatial resolution is needed |
| T | 500 | Global climate monitoring is performed on a monthly time scale with an averaged global number for which ~500 km for horizontal resolution is sufficient. |
| **Vertical Resolution** | N/A |  | G |  |  |
| B |  |  |
| T |  |  |
| **Temporal Resolution** | hr |  | G | 1 | To resolve the diurnal cycle for all kinds of clouds on the global scale and investigating cloud related climate feedbacks which are e.g. connected to rainfall, surface temperature, convection demand a temporal observing resolution of hourly to daily. |
| B | 24 | Performing climate monitoring of clouds on the global scale, a daily to monthly observing cycle will be sufficient. |
| T | 720 |  |
| **Timeliness** | hr |  | G | 1 |  |
| B | 3 |  |
| T | 12 |  |
| **Required Measurement Uncertainty** | % | As metric the uncertainty (RMS) is chosen which is given for 1-sigma | G | 1 | Breakthrough is estimated with a factor of 2 times the goal value, whereas the threshold is calculated with a factor of 4 times the goal value. |
| B | 2 |
| T | 4 |
| **Stability** | %/decade |  | G | 0.03 | Ohring et al. 2005  Breakthrough is estimated with a factor of 2 times the goal value, whereas the threshold is calculated with a factor of 4 times the goal value. |
| B | 0.06 |
| T | 0.012 |
| **Standards and References** |  | | | | |
| **Adaptation and Extremes** | | | | | |
|  | Relevant? (Yes/No) | Sugg. Req. sufficient? (Yes/No) | Explanation | | |
| **Adaptation[2]** |  |  | Reviewers are invited to suggest answers for these fields | | |
| **Extremes[3]** |  |  | Reviewers are invited to suggest answers for these fields | | |

[1]Goal (G); Breakthrough (B) (not mandatory, more as one possible); Threshold (T), for definitions see [Guidelines](http://tiny.cc/ecv-review" \t "_blank)

[2] Is the ECV Product directly relevant to support Climate Adaptation?

[3] Can the ECV Product be used to monitor climate extremes or aspects of extremes?

### Comment 1

|  |  |
| --- | --- |
| Author: Toshinori AOYAGI | Email: aoyagi.toshinori@gmail.com |
| Threshold value for the Stability should be 0.12 according to the explanation "the threshold is calculated with a factor of 4 times the goal value". | |

### Comment 2

|  |  |
| --- | --- |
| Author: Wilberforce Kikwasi - Tanzania Met Authority | Email: wkikwasi@gmail.com |
| The goal value for horizontal resolution is suggested to go at least 10Km in order to resolve convective clouds especially in tropics.  Note that The observation by JMA is supported | |

### Comment 3

|  |  |
| --- | --- |
| Author: Jan Fokke Meirink | Email: janfokkemeirink@gmail.com |
| - General comment on timeliness: is this needed for climate applications?  - Uncertainty: 'metric is RMS for 1-sigma'. This does not correspond to the new guidelines, which suggest 2 sigma.  - Both the breakthrough and goal uncertainty (2% and 1%, respectively) appear very strict if they indeed refer to RMS (from CM SAF experience not achievable with (passive imager) satellite observations). For bias these requirements would be more realistic.  - Stability goal of 0.03%/decade looks like a typo. Ohring suggests 0.3%/decade (which is already very strict). | |

### Comment 4

|  |  |
| --- | --- |
| Author: Karl-Göran Karlsson | Email: karlg.karlsson@gmail.com |
| I have a problem with the following definition of uncertainty:  "Uncertainty replaces the deprecated terms of accuracy and precision which, erroneously, implicitly pre-suppose that the true state of the measurand is known / knowable."  This is not understandable from a logical point of view. If we have nothing that can represent the truth, then how can we judge if we fulfill requirements or not? Sounds impossible to use these requirements unless very detailed instructions are given. Please explain how requirements shall be used and what is really our reference (if any)?  To assume that all effects on uncertainty can be modelled is dangerous. The only reasonable way is to use both modelling efforts and reference observations. | |

## ECV Product: Cloud Liquid Water Path

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | Cloud Liquid Water Path | | | | |
| **Definition** | Total amount of liquid water in depth from top of cloud to surface | | | | |
| **Unit** | g/m2 | | | | |
| **Note** | These requirements include: Global, continental, and regional Climate monitoring, feedback and improved knowledge about the interaction between clouds, aerosols and atmospheric gases. | | | | |
| **Requirements** | | | | | |
| **Item needed** | **Unit** | **Metric** | **[1]** | **Value** | **Derivation and References and Standards** |
| **Horizontal Resolution** | km |  | G | 25 | To perform continental and regional climate monitoring higher spatial resolution is needed |
| B | 100 | To perform continental and regional climate monitoring higher spatial resolution is needed |
| T | 500 | Global climate monitoring is performed on a monthly time scale with an averaged global number for which ~500 km for horizontal resolution is sufficient. |
| **Vertical Resolution** | N/A |  | G |  |  |
| B |  |  |
| T |  |  |
| **Temporal Resolution** | hr |  | G | 1 | To resolve the diurnal cycle for all kinds of clouds on the global scale and investigating cloud related climate feedbacks which are e.g. connected to rainfall, surface temperature, convection demand a temporal observing resolution of hourly to daily. |
| B | 24 | Performing climate monitoring of clouds on the global scale, a daily to monthly observing cycle will be sufficient. |
| T | 720 |  |
| **Timeliness** | hr |  | G | 1 |  |
| B | 3 |  |
| T | 12 |  |
| **Required Measurement Uncertainty** | kg/m² | As metric the uncertainty (RMS) is chosen which is given for 1-sigma | G | 0.025 | Breakthrough is estimated with a factor of 2 times the goal value, whereas the threshold is calculated with a factor of 4 times the goal value. |
| B | 0.05 |
| T | 0.1 |
| **Stability** | kg/m²/decade |  | G | 0.005 | Ohring et al. 2005  Breakthrough is estimated with a factor of 2 times the goal value, whereas the threshold is calculated with a factor of 4 times the goal value. |
| B | 0.01 |
| T | 0.02 |
| **Standards and References** | Ohring et al. 2005 | | | | |
| **Adaptation and Extremes** | | | | | |
|  | Relevant? (Yes/No) | Sugg. Req. sufficient? (Yes/No) | Explanation | | |
| **Adaptation[2]** |  |  | Reviewers are invited to suggest answers for these fields | | |
| **Extremes[3]** |  |  | Reviewers are invited to suggest answers for these fields | | |

[1]Goal (G); Breakthrough (B) (not mandatory, more as one possible); Threshold (T), for definitions see [Guidelines](http://tiny.cc/ecv-review" \t "_blank)

[2] Is the ECV Product directly relevant to support Climate Adaptation?

[3] Can the ECV Product be used to monitor climate extremes or aspects of extremes?

NO COMMENT

## ECV Product: Cloud Ice Water Path

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | Cloud Ice Water Path | | | | |
| **Definition** | Total amount of ice water in depth from top of cloud to surface | | | | |
| **Unit** | g/m2 | | | | |
| **Note** | These requirements include: Global, continental, and regional Climate monitoring, feedback and improved knowledge about the interaction between clouds, aerosols and atmospheric gases. | | | | |
| **Requirements** | | | | | |
| **Item needed** | **Unit** | **Metric** | **[1]** | **Value** | **Derivation and References and Standards** |
| **Horizontal Resolution** | km |  | G | 25 | To perform continental and regional climate monitoring higher spatial resolution is needed |
| B | 100 | To perform continental and regional climate monitoring higher spatial resolution is needed |
| T | 500 | Global climate monitoring is performed on a monthly time scale with an averaged global number for which ~500 km for horizontal resolution is sufficient. |
| **Vertical Resolution** | N/A |  | G |  |  |
| B |  |  |
| T |  |  |
| **Temporal Resolution** | hr |  | G | 1 | To resolve the diurnal cycle for all kinds of clouds on the global scale and investigating cloud related climate feedbacks which are e.g. connected to rainfall, surface temperature, convection demand a temporal observing resolution of hourly to daily. |
| B | 24 | Performing climate monitoring of clouds on the global scale, a daily to monthly observing cycle will be sufficient. |
| T | 720 |  |
| **Timeliness** | hr |  | G | 1 |  |
| B | 3 |  |
| T | 12 |  |
| **Required Measurement Uncertainty** | g/m² | As metric the uncertainty (RMS) is chosen which is given for 1-sigma | G | 25 | Breakthrough is estimated with a factor of 2 times the goal value, whereas the threshold is calculated with a factor of 4 times the goal value. |
| B | 50 |
| T | 100 |
| **Stability** | g/m²/decade |  | G | 5 | Ohring et al. 2005  Breakthrough is estimated with a factor of 2 times the goal value, whereas the threshold is calculated with a factor of 4 times the goal value. |
| B | 10 |
| T | 20 |
| **Standards and References** | Ohring et al. 2005 | | | | |
| **Adaptation and Extremes** | | | | | |
|  | Relevant? (Yes/No) | Sugg. Req. sufficient? (Yes/No) | Explanation | | |
| **Adaptation[2]** |  |  | Reviewers are invited to suggest answers for these fields | | |
| **Extremes[3]** |  |  | Reviewers are invited to suggest answers for these fields | | |

[1]Goal (G); Breakthrough (B) (not mandatory, more as one possible); Threshold (T), for definitions see [Guidelines](http://tiny.cc/ecv-review" \t "_blank)

[2] Is the ECV Product directly relevant to support Climate Adaptation?

[3] Can the ECV Product be used to monitor climate extremes or aspects of extremes?

### Comment 1

|  |  |
| --- | --- |
| Author: Jan Fokke Meirink | Email: janfokkemeirink@gmail.com |
| Shouldn't SI units kg/m2 be used here, as for LWP? | |

## ECV Product: Cloud Drop Effective Radius

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | Cloud Drop Effective Radius | | | | |
| **Definition** | Ratio of integral of water droplets size distribution in volume divided by integral in area (µm) | | | | |
| **Unit** | µm | | | | |
| **Note** | These requirements include: Global, continental, and regional Climate monitoring, feedback and improved knowledge about the interaction between clouds, aerosols and atmospheric gases. | | | | |
| **Requirements** | | | | | |
| **Item needed** | **Unit** | **Metric** | **[1]** | **Value** | **Derivation and References and Standards** |
| **Horizontal Resolution** | km |  | G | 25 | To perform continental and regional climate monitoring higher spatial resolution is needed |
| B | 100 | To perform continental and regional climate monitoring higher spatial resolution is needed |
| T | 500 | Global climate monitoring is performed on a monthly time scale with an averaged global number for which ~500 km for horizontal resolution is sufficient. |
| **Vertical Resolution** | N/A |  | G |  |  |
| B |  |  |
| T |  |  |
| **Temporal Resolution** | hr |  | G | 1 | To resolve the diurnal cycle for all kinds of clouds on the global scale and investigating cloud related climate feedbacks which are e.g. connected to rainfall, surface temperature, convection demand a temporal observing resolution of hourly to daily. |
| B | 24 | Performing climate monitoring of clouds on the global scale, a daily to monthly observing cycle will be sufficient. |
| T | 720 |  |
| **Timeliness** | hr |  | G | 1 |  |
| B | 3 |  |
| T | 12 |  |
| **Required Measurement Uncertainty** | µm | As metric the uncertainty (RMS) is chosen which is given for 1-sigma | G | 1/0,5 | Breakthrough is estimated with a factor of 2 times the goal value, whereas the threshold is calculated with a factor of 4 times the goal value.  Water/ice |
| B | 1/2 |
| T | 2/4 |
| **Stability** | µm /decade |  | G | 0.1/0.05 | Ohring et al. 2005  Breakthrough is estimated with a factor of 2 times the goal value, whereas the threshold is calculated with a factor of 4 times the goal value.  Water/ice |
| B | 0.1/0.2 |
| T | 0.2/0.4 |
| **Standards and References** | Ohring et al. 2005 | | | | |
| **Adaptation and Extremes** | | | | | |
|  | Relevant? (Yes/No) | Sugg. Req. sufficient? (Yes/No) | Explanation | | |
| **Adaptation[2]** |  |  | Reviewers are invited to suggest answers for these fields | | |
| **Extremes[3]** |  |  | Reviewers are invited to suggest answers for these fields | | |

[1]Goal (G); Breakthrough (B) (not mandatory, more as one possible); Threshold (T), for definitions see [Guidelines](http://tiny.cc/ecv-review" \t "_blank)

[2] Is the ECV Product directly relevant to support Climate Adaptation?

[3] Can the ECV Product be used to monitor climate extremes or aspects of extremes?

### Comment 1

|  |  |
| --- | --- |
| Author: Jan Fokke Meirink | Email: janfokkemeirink@gmail.com |
| - It's not exactly clear how these requirements can be traced back to Ohring et al. (who give percentages).  - The requirements appear to be too strict and not achievable.  - The 'goal' requirements for water and ice appear to be reversed.  - Suggest to specify that CRE refers to the cloud top. | |

## ECV Product: Cloud Optical Depth

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | Cloud Optical Depth | | | | |
| **Definition** | Effective depth of a cloud from the viewpoint of radiation extinction. OD = exp(-K.Δz) where K is the extinction coefficient [km-1 ], Δz the vertical path [km] between the base and the top of the cloud and the reference wavelength to be specified in the metadata. | | | | |
| **Unit** | dimensionless | | | | |
| **Note** | These requirements include: Global, continental, and regional Climate monitoring, feedback and improved knowledge about the interaction between clouds, aerosols and atmospheric gases. | | | | |
| **Requirements** | | | | | |
| **Item needed** | **Unit** | **Metric** | **[1]** | **Value** | **Derivation and References and Standards** |
| **Horizontal Resolution** | km |  | G | 25 | To perform continental and regional climate monitoring higher spatial resolution is needed |
| B | 100 | To perform continental and regional climate monitoring higher spatial resolution is needed |
| T | 500 | Global climate monitoring is performed on a monthly time scale with an averaged global number for which ~500 km for horizontal resolution is sufficient. |
| **Vertical Resolution** | N/A |  | G |  |  |
| B |  |  |
| T |  |  |
| **Temporal Resolution** | hr |  | G | 1 | To resolve the diurnal cycle for all kinds of clouds on the global scale and investigating cloud related climate feedbacks which are e.g. connected to rainfall, surface temperature, convection demand a temporal observing resolution of hourly to daily. |
| B | 24 | Performing climate monitoring of clouds on the global scale, a daily to monthly observing cycle will be sufficient. |
| T | 720 |  |
| **Timeliness** | hr |  | G | 1 |  |
| B | 3 |  |
| T | 12 |  |
| **Required Measurement Uncertainty** | dimensionless | As metric the uncertainty (RMS) is chosen which is given for 1-sigma | G | 0.1 | Breakthrough is estimated with a factor of 2 times the goal value, whereas the threshold is calculated with a factor of 4 times the goal value. |
| B | 0.2 |
| T | 0.4 |
| **Stability** | /decade |  | G | 0.02 | Ohring et al. 2005  Breakthrough is estimated with a factor of 2 times the goal value, whereas the threshold is calculated with a factor of 4 times the goal value. |
| B | 0.04 |
| T | 0.08 |
| **Standards and References** | Ohring et al. 2005 | | | | |
| **Adaptation and Extremes** | | | | | |
|  | Relevant? (Yes/No) | Sugg. Req. sufficient? (Yes/No) | Explanation | | |
| **Adaptation[2]** |  |  | Reviewers are invited to suggest answers for these fields | | |
| **Extremes[3]** |  |  | Reviewers are invited to suggest answers for these fields | | |

[1]Goal (G); Breakthrough (B) (not mandatory, more as one possible); Threshold (T), for definitions see [Guidelines](http://tiny.cc/ecv-review" \t "_blank)

[2] Is the ECV Product directly relevant to support Climate Adaptation?

[3] Can the ECV Product be used to monitor climate extremes or aspects of extremes?

### Comment 1

|  |  |
| --- | --- |
| Author: Jan Fokke Meirink | Email: janfokkemeirink@gmail.com |
| - It's not exactly clear how these requirements can be traced back to Ohring et al. (who give percentages).  - The requirements appear to be much too strict. For example, clouds with COD 0.1-0.2 (listed here as b-g uncertainty) cannot be detected by passive imagery in general. | |

## ECV Product: Cloud Top Temperature

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | Cloud Top Temperature | | | | |
| **Definition** | Temperature of the top of the cloud (highest cloud in case of multi-layer clouds) | | | | |
| **Unit** | K | | | | |
| **Note** | These requirements include: Global, continental, and regional Climate monitoring, feedback and improved knowledge about the interaction between clouds, aerosols and atmospheric gases. | | | | |
| **Requirements** | | | | | |
| **Item needed** | **Unit** | **Metric** | **[1]** | **Value** | **Derivation and References and Standards** |
| **Horizontal Resolution** | km |  | G | 25 | To perform continental and regional climate monitoring higher spatial resolution is needed |
| B | 100 | To perform continental and regional climate monitoring higher spatial resolution is needed |
| T | 500 | Global climate monitoring is performed on a monthly time scale with an averaged global number for which ~500 km for horizontal resolution is sufficient. |
| **Vertical Resolution** | N/A |  | G |  |  |
| B |  |  |
| T |  |  |
| **Temporal Resolution** | hr |  | G | 1 | To resolve the diurnal cycle for all kinds of clouds on the global scale and investigating cloud related climate feedbacks which are e.g. connected to rainfall, surface temperature, convection demand a temporal observing resolution of hourly to daily. |
| B | 24 | Performing climate monitoring of clouds on the global scale, a daily to monthly observing cycle will be sufficient. |
| T | 720 |  |
| **Timeliness** | hr |  | G | 1 |  |
| B | 3 |  |
| T | 12 |  |
| **Required Measurement Uncertainty** | K | As metric the uncertainty (RMS) is chosen which is given for 1-sigma | G | 1 | Breakthrough is estimated with a factor of 2 times the goal value, whereas the threshold is calculated with a factor of 4 times the goal value. |
| B | 2 |
| T | 4 |
| **Stability** | K/decade |  | G | 0.2 | Ohring et al. 2005  Breakthrough is estimated with a factor of 2 times the goal value, whereas the threshold is calculated with a factor of 4 times the goal value. |
| B | 0.4 |
| T | 0.8 |
| **Standards and References** | Ohring et al. 2005 | | | | |
| **Adaptation and Extremes** | | | | | |
|  | Relevant? (Yes/No) | Sugg. Req. sufficient? (Yes/No) | Explanation | | |
| **Adaptation[2]** |  |  | Reviewers are invited to suggest answers for these fields | | |
| **Extremes[3]** |  |  | Reviewers are invited to suggest answers for these fields | | |

[1]Goal (G); Breakthrough (B) (not mandatory, more as one possible); Threshold (T), for definitions see [Guidelines](http://tiny.cc/ecv-review" \t "_blank)

[2] Is the ECV Product directly relevant to support Climate Adaptation?

[3] Can the ECV Product be used to monitor climate extremes or aspects of extremes?

### Comment 1

|  |  |
| --- | --- |
| Author: Wilberforce Kikwasi - Tanzania Met Authority | Email: wkikwasi@gmail.com |
| The goal value for horizontal resolution is suggested to go at least 10 km in order to resolve convective clouds especially at country level in tropics. | |

## ECV Product: Cloud Top Height

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | Cloud Top Height | | | | |
| **Definition** | Height of the top of the cloud (highest cloud in case of multi-layer clouds | | | | |
| **Unit** | km | | | | |
| **Note** | These requirements include: Global, continental, and regional Climate monitoring, feedback and improved knowledge about the interaction between clouds, aerosols and atmospheric gases.  3-D cloud top information are requiredwhere possible. This can be achieved via a combination of cloud optical depth vs cloud top height histograms | | | | |
| **Requirements** | | | | | |
| **Item needed** | **Unit** | **Metric** | **[1]** | **Value** | **Derivation and References and Standards** |
| **Horizontal Resolution** | km |  | G | 25 | To perform continental and regional climate monitoring higher spatial resolution is needed |
| B | 100 | To perform continental and regional climate monitoring higher spatial resolution is needed |
| T | 500 | Global climate monitoring is performed on a monthly time scale with an averaged global number for which ~500 km for horizontal resolution is sufficient. |
| **Vertical Resolution** | N/A |  | G |  |  |
| B |  |  |
| T |  |  |
| **Temporal Resolution** | hr |  | G | 1 | To resolve the diurnal cycle for all kinds of clouds on the global scale and investigating cloud related climate feedbacks which are e.g. connected to rainfall, surface temperature, convection demand a temporal observing resolution of hourly to daily. |
| B | 24 | Performing climate monitoring of clouds on the global scale, a daily to monthly observing cycle will be sufficient. |
| T | 720 |  |
| **Timeliness** | hr |  | G | 1 |  |
| B | 3 |  |
| T | 12 |  |
| **Required Measurement Uncertainty** | km | As metric the uncertainty (RMS) is chosen which is given for 1-sigma | G | 0.15 | Breakthrough is estimated with a factor of 2 times the goal value, whereas the threshold is calculated with a factor of 4 times the goal value. |
| B | 0.3 |
| T | 0.6 |
| **Stability** | km/decade |  | G | 0.03 | Ohring et al. 2005  Breakthrough is estimated with a factor of 2 times the goal value, whereas the threshold is calculated with a factor of 4 times the goal value. |
| B | 0.06 |
| T | 0.012 |
| **Standards and References** |  | | | | |
| **Adaptation and Extremes** | | | | | |
|  | Relevant? (Yes/No) | Sugg. Req. sufficient? (Yes/No) | Explanation | | |
| **Adaptation[2]** |  |  | Reviewers are invited to suggest answers for these fields | | |
| **Extremes[3]** |  |  | Reviewers are invited to suggest answers for these fields | | |

[1]Goal (G); Breakthrough (B) (not mandatory, more as one possible); Threshold (T), for definitions see [Guidelines](http://tiny.cc/ecv-review" \t "_blank)

[2] Is the ECV Product directly relevant to support Climate Adaptation?

[3] Can the ECV Product be used to monitor climate extremes or aspects of extremes?

### Comment 1

|  |  |
| --- | --- |
| Author: Bruce Ingleby | Email: bruce.ingleby@ecmwf.int |
| There should be an entry for cloud base height too! | |

### Comment 2

|  |  |
| --- | --- |
| Author: Toshinori Aoyagi (JMA) | Email: aoyagi.toshinori@gmail.com |
| Threshold value for the Stability should be 0.12 according to the explanation "the threshold is calculated with a factor of 4 times the goal value". | |