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

# Ozone

## ECV Product: Ozone Mixing Ratios in the Upper Troposphere/ Lower Stratosphere (UTLS)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | Ozone Mixing Ratios in the Upper Troposphere/ Lower Stratosphere (UTLS) | | | | |
| **Definition** | 3D field of O3 mixing ratios (mole fractions in dry air) in the upper troposphere/ lower stratosphere (UTLS) | | | | |
| **Unit** | % (directly transferrable to mixing ratios, mol/mol) | | | | |
| **Note** | The team of ozone experts unanimously agreed that the uncertainty and stability requirements for each of these ozone data products should be expressed as % and %/decade in the tables. Defining requirements in units of mixing ratios or Dobson Units would require each uncertainty and stability requirement be a wide range of values. We therefore found it more definitive and intuitive that each table entry is one number in % or %/decade.  To help translate the requirements in % or %/decade to absolute units we have put a footnote beneath each table that quantitatively describes the wide range of mixing ratios or Dobson Units corresponding to that data product. This helps to explain why the requirements in the tables are not expressed in units of mixing ratio or DU. Requirements in absolute units are easily calculated by multiplying the % (or %/decade) in the table by the mixing ratio or DU ranges in the footnotes. | | | | |
| **Requirements** | | | | | |
| **Item needed** | **Unit** | **Metric** | **[1]** | **Value** | **Derivation and References and Standards** |
| **Horizontal Resolution** | km |  | G | 20 | 1, 2, 3, 4,5 |
| B | 50 |
| T | 100 |
| **Vertical Resolution** | km |  | G | 0.5 | 1,2,3,4,5 |
| B | 1 |
| T | 3 |
| **Temporal Resolution** | days |  | G | 1 | 1, 2, 3, 4,5 |
| B | 2-3 |
| T | 7 |
| **Timeliness** | days |  | G | 1 |  |
| B | 7 |  |
| T | 30 |  |
| **Required Measurement Uncertainty** | % |  | G | 2 | 1, 2, 3, 4,5  aRequirements for uncertainty (%) and stability (%/decade) translate o wide mixing ratio requirement ranges based on a 50 ppb to 3 ppm range of ozone mixing ratios in the UTLS. |
| B | 5 |
| T | 10 |
| **Stability** | %/decade |  | G | 1 | 1, 2, 3, 4,5  Requirements for uncertainty (%) and stability (%/decade) translate to wide mixing ratio requirement ranges based on a 50 ppb to 3 ppm range of ozone mixing ratios in the UTLS. |
| B | 2 |
| T | 3 |
| **Standards and References** | 1.        Ozone Climate Change Initiative User Requirements Document  <http://cci.esa.int/sites/default/files/filedepot/incoming/Ozone_cci_urd_v3.0_final.pdf>    2.        WMO (World Meteorological Organization), Stratospheric Ozone Changes and Climate in Scientific Assessment of Ozone Depletion: 2018, Global Ozone Research and Monitoring Project–Report No. 58, 588 pp., Geneva, Switzerland, 2018.  <https://www.esrl.noaa.gov/csd/assessments/ozone/2018/downloads/Chapter5_2018OzoneAssessment.pdf>    3.        Climate Monitoring User Group CCI Requirements Baseline Documents  <http://ensembles-eu.metoffice.com/cmug/CMUG_PHASE_2_D1.1_Requirements_v0.6.pdf>    4.        WMO (World Meteorological Organization), Update on Global Ozone: Past, Present and Future  in Scientific Assessment of Ozone Depletion: 2018, Global Ozone Research and Monitoring Project–Report No. 58, 588 pp., Geneva, Switzerland, 2018. <https://www.esrl.noaa.gov/csd/assessments/ozone/2018/downloads/Chapter3_2018OzoneAssessment.pdf>    5.        Gaudel, A., et al. (2018), Tropospheric Ozone Assessment Report: Present-day distribution and trends of tropospheric ozone relevant to climate and global atmospheric chemistry model evaluation, Elem. Sci. Anth., 6(1), 39, <https://doi.org/10.1525/elementa.291> | | | | |
| **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)

[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: Shinya Kobayashi | Email: shn.kobayashi@gmail.com |
| \* Temporal Resolution  Taking account of a large diurnal variation in the stratospheric ozone concentrations (Damadeo et al. 2018, Sakazaki et al. 2015), I think that it would be better to aim at a more frequent sampling (say, 6 hourly) as a Goal requirment for temporal resolution.  Damadeo et al., 2018: The impact of nonuniform sampling on stratospheric ozone trends derived from occultation instruments. Atmos. Chem. Phys., 18, 535-554. https://doi.org/10.5194/acp-18-535-2018.  Sakazaki et al., 2015: Sunset–sunrise difference in solar occultation ozone measurements (SAGEII, HALOE, and ACE–FTS) and its relationship to tidal vertical winds. Atmos. Chem. Phys., 15, 829-843. https://doi.org/10.5194/acp-15-829-2015 | |

### Comment 2

|  |  |
| --- | --- |
| Author: Shinya Kobayashi | Email: shn.kobayashi@gmail.com |
| \* Timeliness  Same as Ozone Total Column. | |

## ECV Product: Ozone Mixing Ratios in the Middle and Upper Stratosphere

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | Ozone Mixing Ratios in the Middle and Upper Stratosphere | | | | |
| **Definition** | 3D field of O3 mixing ratios (mole fractions in dry air) in the middle and upper straosphere | | | | |
| **Unit** | % (directly transferrable to mixing ratios, mol/mol) | | | | |
| **Note** | The team of ozone experts unanimously agreed that the uncertainty and stability requirements for each of these ozone data products should be expressed as % and %/decade in the tables. Defining requirements in units of mixing ratios or Dobson Units would require each uncertainty and stability requirement be a wide range of values. We therefore found it more definitive and intuitive that each table entry is one number in % or %/decade.  To help translate the requirements in % or %/decade to absolute units we have put a footnote beneath each table that quantitatively describes the wide range of mixing ratios or Dobson Units corresponding to that data product. This helps to explain why the requirements in the tables are not expressed in units of mixing ratio or DU. Requirements in absolute units are easily calculated by multiplying the % (or %/decade) in the table by the mixing ratio or DU ranges in the footnotes. | | | | |
| **Requirements** | | | | | |
| **Item needed** | **Unit** | **Metric** | **[1]** | **Value** | **Derivation and References and Standards** |
| **Horizontal Resolution** | km |  | G | 20 | 1, 2, 3, 4, |
| B | 100 |
| T | 500 |
| **Vertical Resolution** | km |  | G | 1 | 1,2,3,4, |
| B | 3 |
| T | 10 |
| **Temporal Resolution** | days |  | G | 1 | 1, 2, 3, 4, |
| B | 2-3 |
| T | 7 |
| **Timeliness** | days |  | G | 1 |  |
| B | 7 |  |
| T | 30 |  |
| **Required Measurement Uncertainty** | % |  | G | 5 | 1, 2, 3, 4,  Requirements for uncertainty (%) and stability (%/decade) translate to wide mixing ratio requirement ranges based on a 3 to 10 ppm range of ozone mixing ratios in the middle and upper stratosphere. |
| B | 10 |
| T | 15 |
| **Stability** | %/decade |  | G | <1 | 1, 2, 3, 4,  Requirements for uncertainty (%) and stability (%/decade) translate to wide mixing ratio requirement ranges based on a 3 to 10 ppm range of ozone mixing ratios in the middle and upper stratosphere. |
| B | 2 |
| T | 3 |
| **Standards and References** | 1.        Ozone Climate Change Initiative User Requirements Document  <http://cci.esa.int/sites/default/files/filedepot/incoming/Ozone_cci_urd_v3.0_final.pdf>    2.        WMO (World Meteorological Organization), Stratospheric Ozone Changes and Climate in Scientific Assessment of Ozone Depletion: 2018, Global Ozone Research and Monitoring Project–Report No. 58, 588 pp., Geneva, Switzerland, 2018.  <https://www.esrl.noaa.gov/csd/assessments/ozone/2018/downloads/Chapter5_2018OzoneAssessment.pdf>    3.        Climate Monitoring User Group CCI Requirements Baseline Documents  <http://ensembles-eu.metoffice.com/cmug/CMUG_PHASE_2_D1.1_Requirements_v0.6.pdf>    4.        WMO (World Meteorological Organization), Update on Global Ozone: Past, Present and Future  in Scientific Assessment of Ozone Depletion: 2018, Global Ozone Research and Monitoring Project–Report No. 58, 588 pp., Geneva, Switzerland, 2018. <https://www.esrl.noaa.gov/csd/assessments/ozone/2018/downloads/Chapter3_2018OzoneAssessment.pdf> | | | | |
| **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)

[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: Shinya Kobayashi | Email: shn.kobayashi@gmail.com |
| \* Temporal Resolution  Same as Ozone MR in the UTLS.  \* Timeliness  Same as Ozone Total Column. | |

## ECV Product: Ozone Mixing Ratios in the Troposphere

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | Ozone Mixing Ratios in the Troposphere | | | | |
| **Definition** | 3D field of O3 mixing ratios (mole fractions in dry air) in the troposphere | | | | |
| **Unit** | % (directly transferrable to mixing ratios, mol/mol) | | | | |
| **Note** | The team of ozone experts unanimously agreed that the uncertainty and stability requirements for each of these ozone data products should be expressed as % and %/decade in the tables. Defining requirements in units of mixing ratios or Dobson Units would require each uncertainty and stability requirement be a wide range of values. We therefore found it more definitive and intuitive that each table entry is one number in % or %/decade.  To help translate the requirements in % or %/decade to absolute units we have put a footnote beneath each table that quantitatively describes the wide range of mixing ratios or Dobson Units corresponding to that data product. This helps to explain why the requirements in the tables are not expressed in units of mixing ratio or DU. Requirements in absolute units are easily calculated by multiplying the % (or %/decade) in the table by the mixing ratio or DU ranges in the footnotes. | | | | |
| **Requirements** | | | | | |
| **Item needed** | **Unit** | **Metric** | **[1]** | **Value** | **Derivation and References and Standards** |
| **Horizontal Resolution** | km |  | G | 1 | 1, 2, 3, 4,5 |
| B | 5 |
| T | 13 |
| **Vertical Resolution** | km |  | G | 1 | 1,2,3,4,5 |
| B | 3 |
| T | 5 |
| **Temporal Resolution** | hr |  | G | 0.5 | 1, 2, 3, 4,5 |
| B | 1 |
| T | 24 |
| **Timeliness** | days |  | G | 1 |  |
| B | 7 |  |
| T | 30 |  |
| **Required Measurement Uncertainty** | % |  | G | 2 | 1, 2, 3, 4,5  Requirements for uncertainty (%) and stability (%/decade) translate to wide mixing ratio requirement ranges based on a 20 to 80 ppb range of ozone mixing ratios in the troposphere. |
| B | 5 |
| T | 10 |
| **Stability** | %/decade |  | G | <1 | 1, 2, 3, 4,5  Requirements for uncertainty (%) and stability (%/decade) translate to wide mixing ratio requirement ranges based on a 20 to 80 ppb range of ozone mixing ratios in the troposphere. |
| B | 2 |
| T | 3 |
| **Standards and References** | 1.        Ozone Climate Change Initiative User Requirements Document  <http://cci.esa.int/sites/default/files/filedepot/incoming/Ozone_cci_urd_v3.0_final.pdf>    2.        WMO (World Meteorological Organization), Stratospheric Ozone Changes and Climate in Scientific Assessment of Ozone Depletion: 2018, Global Ozone Research and Monitoring Project–Report No. 58, 588 pp., Geneva, Switzerland, 2018.  <https://www.esrl.noaa.gov/csd/assessments/ozone/2018/downloads/Chapter5_2018OzoneAssessment.pdf>    3.        Climate Monitoring User Group CCI Requirements Baseline Documents  <http://ensembles-eu.metoffice.com/cmug/CMUG_PHASE_2_D1.1_Requirements_v0.6.pdf>    4.        WMO (World Meteorological Organization), Update on Global Ozone: Past, Present and Future  in Scientific Assessment of Ozone Depletion: 2018, Global Ozone Research and Monitoring Project–Report No. 58, 588 pp., Geneva, Switzerland, 2018. <https://www.esrl.noaa.gov/csd/assessments/ozone/2018/downloads/Chapter3_2018OzoneAssessment.pdf>    5.        Gaudel, A., et al. (2018), Tropospheric Ozone Assessment Report: Present-day distribution and trends of tropospheric ozone relevant to climate and global atmospheric chemistry model evaluation, Elem. Sci. Anth., 6(1), 39, <https://doi.org/10.1525/elementa.291> | | | | |
| **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)

[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: Shinya Kobayashi | Email: shn.kobayashi@gmail.com |
| \* Timeliness  Same as Ozone Total Column. | |

### Comment 2

|  |  |
| --- | --- |
| Author: Martin Steinbacher | Email: martin.stonycreek@gmail.com |
| add reference to  Tarasick D., I. E. Galbally, O. R. Cooper, M. G. Schultz, G. Ancellet, T. Leblanc, T. J. Wallington, J. Ziemke, X. Liu, M. Steinbacher, J. Staehelin, C. Vigouroux, J. W. Hannigan, O. Garcia, G. Foret, P. Zanis, E. Weatherhead, I. Petropavlovskikh, H. Worden, M. Osman, J. Liu, K.-L. Chan, A. Gaudel, M. Lin, M. Granados-Munoz, A. M. Thompson, S. J. Oltmans, J. Cuesta, G. Dufour, V. Thouret, B. Hassler, T. Trickl, J. L. Neu, 2019. Tropospheric Ozone Assessment Report: Tropospheric ozone from 1877 to 2016, observed levels, trends and uncertainties, Elementa, 7 (39), https://doi.org/10.1525/elementa.376  in particular Chapter 6 "Conclusions and recommendations for design of a future global observational program", and Table 12  and to  GAW report #209, Guidelines for Continuous Measurements of Ozone in the Troposphere, https://library.wmo.int/index.php?lvl=notice\_display&id=14537  in particular Chapter 3.2 DQOs for key GAW goals  " To detect [...] tropospheric ozone trend, the combined measurement uncertainty must be approximately ± 1 nmol mol-1 (two sigma) or less." | |

## ECV Product: Ozone Stratospheric Column

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | Ozone Stratospheric Column | | | | |
| **Definition** | Total number of O3 molecules (per unit area) in a vertical column of the atmosphere from tropopause to stratopause | | | | |
| **Unit** | % (directly transferrable to Dobson units) | | | | |
| **Note** | The team of ozone experts unanimously agreed that the uncertainty and stability requirements for each of these ozone data products should be expressed as % and %/decade in the tables. Defining requirements in units of mixing ratios or Dobson Units would require each uncertainty and stability requirement be a wide range of values. We therefore found it more definitive and intuitive that each table entry is one number in % or %/decade.  To help translate the requirements in % or %/decade to absolute units we have put a footnote beneath each table that quantitatively describes the wide range of mixing ratios or Dobson Units corresponding to that data product. This helps to explain why the requirements in the tables are not expressed in units of mixing ratio or DU. Requirements in absolute units are easily calculated by multiplying the % (or %/decade) in the table by the mixing ratio or DU ranges in the footnotes.    This data product must consider additional uncertainties introduced by errors in tropopause heights and must definitively state which tropopause definition was used. | | | | |
| **Requirements** | | | | | |
| **Item needed** | **Unit** | **Metric** | **[1]** | **Value** | **Derivation and References and Standards** |
| **Horizontal Resolution** | km |  | G | 5 | 1, 2, 3, 4 |
| B | 20 |
| T | 100 |
| **Vertical Resolution** | N/A |  | G | N/A | N/A |
| B | N/A |
| T | N/A |
| **Temporal Resolution** | hr |  | G | 0.5 | 1, 2, 3, 4 |
| B | 1 |
| T | 24 |
| **Timeliness** | days |  | G | 1 |  |
| B | 7 |  |
| T | 30 |  |
| **Required Measurement Uncertainty** | % |  | G | 1 | 1, 2, 3, 4  Requirements for uncertainty (%) and stability (%/decade) translate to wide Dobson Unit requirement ranges based on a 150 to 450 DU range of ozone stratospheric columns. |
| B | 3 |
| T | 5 |
| **Stability** | %/decade |  | G | 1 | 1, 2, 3, 4  Requirements for uncertainty (%) and stability (%/decade) translate to wide Dobson Unit requirement ranges based on a 150 to 450 DU range of ozone stratospheric columns. |
| B | 2 |
| T | 3 |
| **Standards and References** | 1.        Ozone Climate Change Initiative User Requirements Document  <http://cci.esa.int/sites/default/files/filedepot/incoming/Ozone_cci_urd_v3.0_final.pdf>    2.        WMO (World Meteorological Organization), Stratospheric Ozone Changes and Climate in Scientific Assessment of Ozone Depletion: 2018, Global Ozone Research and Monitoring Project–Report No. 58, 588 pp., Geneva, Switzerland, 2018.  <https://www.esrl.noaa.gov/csd/assessments/ozone/2018/downloads/Chapter5_2018OzoneAssessment.pdf>    3.        Climate Monitoring User Group CCI Requirements Baseline Documents  <http://ensembles-eu.metoffice.com/cmug/CMUG_PHASE_2_D1.1_Requirements_v0.6.pdf>    4.        WMO (World Meteorological Organization), Update on Global Ozone: Past, Present and Future  in Scientific Assessment of Ozone Depletion: 2018, Global Ozone Research and Monitoring Project–Report No. 58, 588 pp., Geneva, Switzerland, 2018. <https://www.esrl.noaa.gov/csd/assessments/ozone/2018/downloads/Chapter3_2018OzoneAssessment.pdf> | | | | |
| **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)

[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: Ozone Tropospheric Column

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | Ozone Tropospheric Column | | | | |
| **Definition** | Total number of O3 molecules (per unit area) in a vertical column of the atmosphere from surface to the tropopause | | | | |
| **Unit** | % (directly transferrable to Dobson units) | | | | |
| **Note** | The team of ozone experts unanimously agreed that the uncertainty and stability requirements for each of these ozone data products should be expressed as % and %/decade in the tables. Defining requirements in units of mixing ratios or Dobson Units would require each uncertainty and stability requirement be a wide range of values. We therefore found it more definitive and intuitive that each table entry is one number in % or %/decade.  To help translate the requirements in % or %/decade to absolute units we have put a footnote beneath each table that quantitatively describes the wide range of mixing ratios or Dobson Units corresponding to that data product. This helps to explain why the requirements in the tables are not expressed in units of mixing ratio or DU. Requirements in absolute units are easily calculated by multiplying the % (or %/decade) in the table by the mixing ratio or DU ranges in the footnotes. | | | | |
| **Requirements** | | | | | |
| **Item needed** | **Unit** | **Metric** | **[1]** | **Value** | **Derivation and References and Standards** |
| **Horizontal Resolution** | km |  | G | 5 | 1, 2, 3, 4,5 |
| B | 20 |
| T | 50 |
| **Vertical Resolution** | N/A |  | G | N/A | N/A |
| B | N/A |
| T | N/A |
| **Temporal Resolution** | hr |  | G | 0.5 | 1, 2, 3, 4,5 |
| B | 1 |
| T | 24 |
| **Timeliness** | days |  | G | 1 |  |
| B | 7 |  |
| T | 30 |  |
| **Required Measurement Uncertainty** | % |  | G | 5 | 1, 2, 3, 4,5  Requirements for uncertainty (%) and stability (%/decade) translate to wide Dobson Unit requirement ranges based on a 20 to 45 DU range of ozone tropospheric columns. |
| B | 10 |
| T | 15 |
| **Stability** | %/decade |  | G | 1 | 1, 2, 3, 4,5  Requirements for uncertainty (%) and stability (%/decade) translate to wide Dobson Unit requirement ranges based on a 20 to 45 DU range of ozone tropospheric columns. |
| B | 2 |
| T | 3 |
| **Standards and References** | 1.        Ozone Climate Change Initiative User Requirements Document  <http://cci.esa.int/sites/default/files/filedepot/incoming/Ozone_cci_urd_v3.0_final.pdf>    2.        WMO (World Meteorological Organization), Stratospheric Ozone Changes and Climate in Scientific Assessment of Ozone Depletion: 2018, Global Ozone Research and Monitoring Project–Report No. 58, 588 pp., Geneva, Switzerland, 2018.  <https://www.esrl.noaa.gov/csd/assessments/ozone/2018/downloads/Chapter5_2018OzoneAssessment.pdf>    3.        Climate Monitoring User Group CCI Requirements Baseline Documents  <http://ensembles-eu.metoffice.com/cmug/CMUG_PHASE_2_D1.1_Requirements_v0.6.pdf>    4.        WMO (World Meteorological Organization), Update on Global Ozone: Past, Present and Future  in Scientific Assessment of Ozone Depletion: 2018, Global Ozone Research and Monitoring Project–Report No. 58, 588 pp., Geneva, Switzerland, 2018. <https://www.esrl.noaa.gov/csd/assessments/ozone/2018/downloads/Chapter3_2018OzoneAssessment.pdf>    5.        Gaudel, A., et al. (2018), Tropospheric Ozone Assessment Report: Present-day distribution and trends of tropospheric ozone relevant to climate and global atmospheric chemistry model evaluation, Elem. Sci. Anth., 6(1), 39, <https://doi.org/10.1525/elementa.291> | | | | |
| **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)

[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: Ozone Total Column

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | Ozone Total Column | | | | |
| **Definition** | Total number of O3 molecules (per unit area) in a vertical column of the atmosphere from surface to TOA | | | | |
| **Unit** | % (directly transferrable to Dobson units) | | | | |
| **Note** | The team of ozone experts unanimously agreed that the uncertainty and stability requirements for each of these ozone data products should be expressed as % and %/decade in the tables. Defining requirements in units of mixing ratios or Dobson Units would require each uncertainty and stability requirement be a wide range of values. We therefore found it more definitive and intuitive that each table entry is one number in % or %/decade.  To help translate the requirements in % or %/decade to absolute units we have put a footnote beneath each table that quantitatively describes the wide range of mixing ratios or Dobson Units corresponding to that data product. This helps to explain why the requirements in the tables are not expressed in units of mixing ratio or DU. Requirements in absolute units are easily calculated by multiplying the % (or %/decade) in the table by the mixing ratio or DU ranges in the footnotes. | | | | |
| **Requirements** | | | | | |
| **Item needed** | **Unit** | **Metric** | **[1]** | **Value** | **Derivation and References and Standards** |
| **Horizontal Resolution** | km |  | G | 5 | 1, 2, 3, 4 |
| B | 20 |
| T | 100 |
| **Vertical Resolution** | N/A |  | G | N/A | N/A |
| B | N/A |
| T | N/A |
| **Temporal Resolution** | hr |  | G | 0.5 | 1, 2, 3, 4 |
| B | 1 |
| T | 24 |
| **Timeliness** | daily |  | G | 1 |  |
| B | 7 |  |
| T | 30 |  |
| **Required Measurement Uncertainty** | % |  | G | 1 | 1, 2, 3, 4  Requirements for uncertainty (%) and stability (%/decade) translate to wide Dobson Unit requirement ranges based on a 200 to 500 DU range of ozone total columns. |
| B | 2 |
| T | 3 |
| **Stability** | %/decade |  | G | 1 | 1, 2, 3, 4  Requirements for uncertainty (%) and stability (%/decade) translate to wide Dobson Unit requirement ranges based on a 200 to 500 DU range of ozone total columns. |
| B | 2 |
| T | 3 |
| **Standards and References** | 1.        Ozone Climate Change Initiative User Requirements Document  <http://cci.esa.int/sites/default/files/filedepot/incoming/Ozone_cci_urd_v3.0_final.pdf>    2.        WMO (World Meteorological Organization), Stratospheric Ozone Changes and Climate in Scientific Assessment of Ozone Depletion: 2018, Global Ozone Research and Monitoring Project–Report No. 58, 588 pp., Geneva, Switzerland, 2018.  <https://www.esrl.noaa.gov/csd/assessments/ozone/2018/downloads/Chapter5_2018OzoneAssessment.pdf>    3.        Climate Monitoring User Group CCI Requirements Baseline Documents  <http://ensembles-eu.metoffice.com/cmug/CMUG_PHASE_2_D1.1_Requirements_v0.6.pdf>    4.        WMO (World Meteorological Organization), Update on Global Ozone: Past, Present and Future  in Scientific Assessment of Ozone Depletion: 2018, Global Ozone Research and Monitoring Project–Report No. 58, 588 pp., Geneva, Switzerland, 2018. <https://www.esrl.noaa.gov/csd/assessments/ozone/2018/downloads/Chapter3_2018OzoneAssessment.pdf> | | | | |
| **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)

[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: Shinya.Kobayash | Email: shn.kobayashi@gmail.com |
| \* Timeliness  Ozone data are used as a forcing field for near-real-time continuation of reanalysis as well. Therefore, I think that the timeliness requirements should be more stringent like 1 day for Breakthrough. | |

### Comment 2

|  |  |
| --- | --- |
| Author: Kazuto Suda | Email: kazuto.suda@gmail.com |
| I support the team of experts proposing % for the unit to indicate the required uncertainty and stability, as explained in the note. However, the unit just above the note should be consistent with the difinition, which is total number of molecules per unit area, regardless of transferrability to Dobson units. I am afraid that % (percent) for the unit at the top may be confusing, not consistent with the definition. | |