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

# Subsurface temperature

## ECV Product: Interior temperature

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Name** | Interior temperature | | | | |
| **Definition** | Seawater temperature measured with depth (degrees celsius/kelvin) | | | | |
| **Unit** | k | | | | |
| **Note** |  | | | | |
| **Requirements** | | | | | |
| **Item needed** | **Unit** | **Metric** | **[1]** | **Value** | **Derivation and References and Standards** |
| **Horizontal Resolution** | km |  | G | Upper ocean (<2000m): 1  Deep ocean (>2000m): 10  Coastal: 1 |  |
| B | Upper ocean (<2000m): 6  Deep ocean (>2000m): 100 |  |
| T | Upper ocean (<2000m): 300  Deep ocean (>2000m): 500  Coastal: 10 |  |
| **Vertical Resolution** | m |  | G | Upper ocean (<2000m): 1 |  |
| B | Upper ocean (<2000m): 2 |  |
| T | Upper ocean (<2000m): 10 |  |
| **Temporal Resolution** |  |  | G | Upper ocean (<2000m): daily  Deep ocean (>2000m): daily  Coastal: hourly |  |
| B | Upper ocean (<2000m): 10 days  Deep ocean (>2000m): 15 days |  |
| T | Upper ocean (<2000m): monthly  Deep ocean (>2000m): monthly  Coastal: monthly |  |
| **Timeliness** |  |  | G |  |  |
| B |  |  |
| T |  |  |
| **Required Measurement Uncertainty** | k |  | G | Upper ocean (<2000m): 0.001  Deep ocean (>2000m): 0.001 |  |
| B | Upper ocean (<2000m): 0.01  Deep ocean (>2000m):0.002 |  |
| T | Upper ocean (<2000m): 0.1  Deep ocean (>2000m):0.01  Coastal: 0.1 |  |
| **Stability** |  |  | G |  |  |
| B |  |  |
| T |  |  |
| **Standards and References** |        Johnson et al (2015): Informing Deep Argo Array Design Using Argo and Full-Depth Hydrographic Section Data; <https://journals.ametsoc.org/doi/full/10.1175/JTECH-D-15-0139.1>       ; 5 x 5 degree array proposed with 15-day repeat cycle. Estimated reduction of sub-2000 m OHC error in decadal trends from +/- 17 TW to +/- 3 TW.         Palmer et al (2010): Future Observations for Monitoring Global Ocean Heat Content; <http://www.oceanobs09.net/proceedings/cwp/Palmer-OceanObs09.cwp.68.pdf>; Table 1 in the paper includes GCOS Observation Requirements in WMO/CEOS Database for upper ocean temperature and salinity         Abraham et al (2013): A review of global ocean temperature observations: Implications for ocean heat content estimates and climate change; <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/rog.20022>; Review of the historical tempeature measurements and comparison of estimated rates of OHC change. I can't see any recommended sampling characteristics or sensor accuracies (based on a quick scan of the document).         Desbruyeres et al (2017) : Global and Full-Depth Ocean Temperature Trends during the Early Twenty-First Century from Argo and Repeat Hydrography; <https://journals.ametsoc.org/doi/full/10.1175/JCLI-D-16-0396.1>; "Estimate of global ocean heat uptake of  0.71 ± 0.09 W m−2 during 2006-2014 with < 2000m layer accounting for 90% of the observed change. | | | | |
| **Adaptation and Extremes** | | | | | |
|  | Relevant? (Yes/No) | Sugg. Req. sufficient? (Yes/No) | Explanation | | |
| **Adaptation[2]** |  |  |  | | |
| **Extremes[3]** |  |  |  | | |

[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: Rachel Killick | Email: rachelewarren91@gmail.com |
| Most of these comments are based on answers from a recent user requirements survey for the Met Office Hadley Centre EN4 database and relate to both subsurface temperature and subsurface salinity:  Timeliness: Less than one month lag is good for allowing validation of NRT products. Providing preliminary files even before the month is complete has been asked for by a few users.  Over 25% of users use the monthly updates for either sea\_water\_potential\_temperature or salinity.  No users expressed concern with the monthly resolution of the dataset, although the profile data themselves are higher resolution.  Temporal resolution: When asked if they wanted very high resolution data averaged (typically data reporting at a frequency greater than one value per hour at the exact location e.g. from a buoy) the majority of users said yes (37 out of 56), of the 37, 21 wanted daily averages/sub-samples with fewer wanting 6-hourly or hourly averages.  Horizontal resolution (for gridded analyses): currently these are served in 1 by 1 degree grid boxes, only 12 respondents said this had prevented them working with the data, of these, 8 said that a 0.25 degree resolution would be better and this is still larger than the threshold 10km resolution given here.  Vertical resolution: It is beneficial to have high resolution near the surface where data change more rapidly. (e.g. measurements every 1m).  Uncertainties: 28 people were unsure if they would use measurement uncertainties provided with profile data, but a further 38 answered that they would be very likely or quite likely to use them, with only 10 answering quite unlikely or very unlikely. The most common reasons given for using these uncertainties were for use in explaining scientific results and to enable users to propagate uncertainties in averages and other derived quantities. | |

### Comment 2

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| --- | --- |
| Author: ECMWF | Email: ecresgcosreqs@gmail.com |
| See below Table | |

|  |  |  |  |  |  |
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| **Definition** | Seawater temperature measured with depth (degrees celsius/kelvin) | | | | |
| **Unit** | k | | | | |
| **Note** |  | | | | |
| **Requirements** | | | | | |
| **Item needed** | **Unit** | **Metric** | **[1]** | **Value** | **Derivation and References and Standards** |
| **Horizontal Resolution** | km |  | G | Upper ocean (<2000m): 1  Deep ocean (>2000m): 10  Coastal: 1 | COMMENT: These values seem very excessive. They could be reduced by an order of magnitude. |
| B | Upper ocean (<2000m): 6  Deep ocean (>2000m): 100 |  |
| T | Upper ocean (<2000m): 300  Deep ocean (>2000m): 500  Coastal: 10 |  |
| **Vertical Resolution** | m |  | G | Upper ocean (<2000m): 1 |  |
| B | Upper ocean (<2000m): 2 |  |
| T | Upper ocean (<2000m): 10 |  |
| **Temporal Resolution** |  |  | G | Upper ocean (<2000m): hourly  Deep ocean (>2000m): daily  Coastal: hourly |  |
| B | Upper ocean (<2000m): 1 days |  |

|  |  |
| --- | --- |
| Deep ocean (>2000m): 2 days |  |
| T | Upper ocean (<2000m): weekly  Deep ocean (>2000m): weekly  Coastal: daily |  |
| **Timeliness** |  |  | G | hours |  |
| B | daily |  |
| T | monthly |  |
| **Required Measurement Uncertainty** | k |  | G | Upper ocean (<2000m): 0.01  Deep ocean (>2000m): 0.005 |  |
| B |  |  |
| T | Upper ocean (<2000m): 0.1  Deep ocean (>2000m):0.01  Coastal: 0.1 |  |
| **Stability** |  |  | G |  |  |
| B |  |  |
| T |  |  |
| **Standards and References** |        Johnson et al (2015): Informing Deep Argo Array Design Using Argo and Full-Depth Hydrographic Section Data; <https://journals.ametsoc.org/doi/full/10.1175/JTECH-D-15-0139.1>       ; 5 x 5 degree array proposed with 15-day repeat cycle. Estimated reduction of sub-2000 m OHC error in decadal trends from +/- 17 TW to +/- 3 TW.         Palmer et al (2010): Future Observations for Monitoring Global Ocean Heat Content; <http://www.oceanobs09.net/proceedings/cwp/Palmer-OceanObs09.cwp.68.pdf>; Table 1 in the paper includes GCOS Observation Requirements in WMO/CEOS Database for upper ocean temperature and salinity         Abraham et al (2013): A review of global ocean temperature observations: Implications for ocean heat content estimates and climate change; <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/rog.20022>; Review of the historical tempeature measurements and comparison of estimated rates of OHC change. I can't see any recommended sampling characteristics or sensor accuracies (based on a quick scan of the document).         Desbruyeres et al (2017) : Global and Full-Depth Ocean Temperature Trends during the Early Twenty-First Century from Argo and Repeat Hydrography; <https://journals.ametsoc.org/doi/full/10.1175/JCLI-D-16-0396.1>; "Estimate of global ocean heat uptake of  0.71 ± 0.09 W m−2 during 2006-2014 with < 2000m layer accounting for 90% of the observed change. | | | | |
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