

Subsurface Temperature

ESSENTIAL CLIMATE VARIABLE (ECV) FACTSHEET



ECV IN BRIEF

Domain: Ocean
Subdomain: Physical
Scientific Area: Energy and Temperature
Products: Interior Temperature



Subsurface Temperature

Subsurface temperature is a fundamental variable that is required to monitor variability and change in the physical environment of the ocean, energy flows, climate patterns and sea level. Many other physical variables are derived from subsurface temperature along with subsurface salinity, including subsurface density, geostrophic circulation, heat transport and steric sea level. Heat uptake by the global ocean accounts for more than 90% of the excess heat trapped in the Earth system in the past few decades. This ocean heat uptake helps to mitigate surface warming but, in turn, increases the global ocean volume through thermal expansion, and thus results in global-mean sea-level rise, accounting for about one third of the increase observed over the past few decades.

ECV Product¹

PRODUCT	DEFINITION	REQUIREMENTS				
		FREQ.	RESOLUTION	REQUIRED MEASUREMENT UNCERTAINTY	STABILITY	STANDARDS/ REFERENCES
INTERIOR TEMPERATURE	Seawater temperature measured with depth (degrees celsius/kelvin)	Hourly to monthly	1-10km	0.01K	Not specified	See EOV Specification Sheet at www.goosoccean.org/eov

Data Sources²

- ▶ The Global Temperature and Salinity Profile Programme (GTSP)
https://www.nodc.noaa.gov/GTSP/access_data/index.html

¹ Current Products and Requirements as in the Implementation Plan 2016 (GCOS-200). GCOS is reviewing and will update the requirements until 2022. More information on: gcos.wmo.int and climatedata.wmo.int.

- ▶ World Ocean Database, National Center for Environmental Information (NCEI)
<https://www.nodc.noaa.gov/OC5/SELECT/dbsearch/dbsearch.html>
- ▶ Coriolis
<http://www.coriolis.eu.org>
- ▶ International Quality-controlled Ocean Database (IQuOD)
<http://www.iquod.org>

Ocean Heat Content

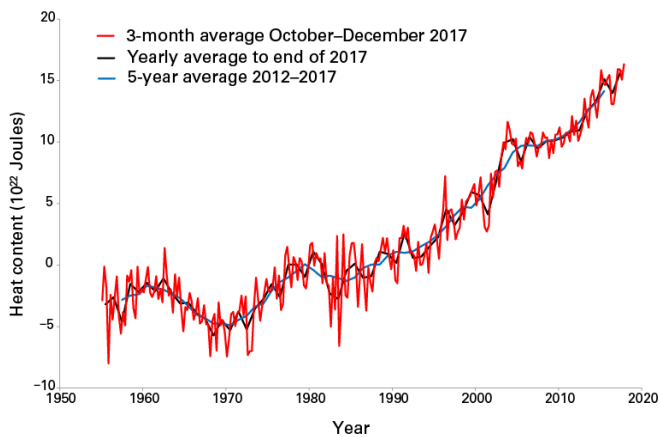


Figure 1: Global Ocean Heat Content Change ($\times 10^{22}$ J) for the 0-700 metre layer: three-monthly means (red), and annual (black) and 5-year (blue) running means, from the US National Oceanic and Atmospheric Administration (NOAA) dataset. Prepared by WMO using data from the NOAA National Centers for Environmental Information.

Source: WMO Statement on the state of the global climate in 2017

(http://library.wmo.int/opac/index.php?lvl=notice_display&id=20220#.WrOjC67iVEY).

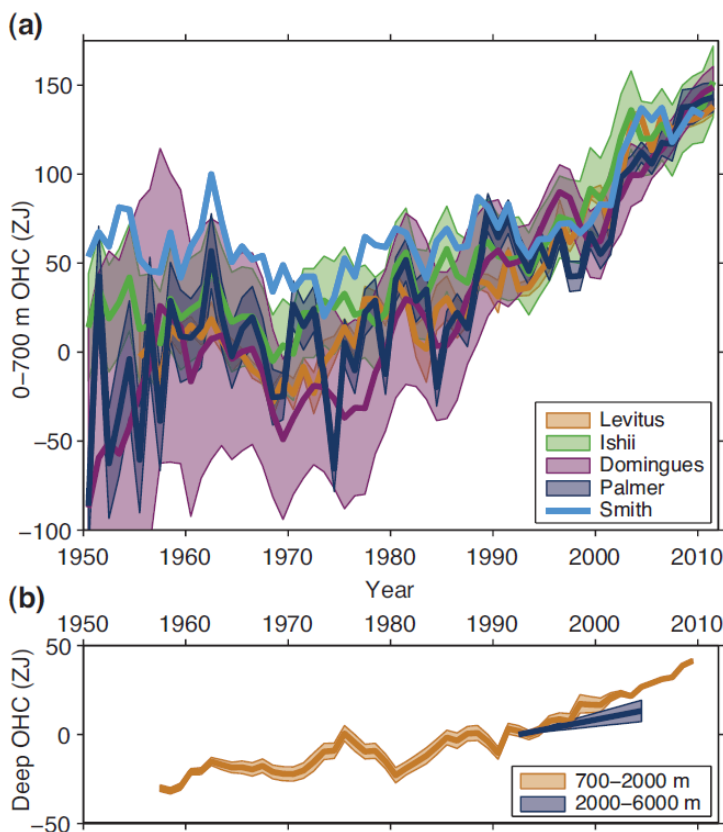


Figure 2: (a) Observation-based estimates of annual global mean upper (0 to 700m) ocean heat content in ZJ (1 ZJ = 1021 Joules) updated from (see legend): Levitus et al. (2012), Ishii and Kimoto (2009), Domingues et al. (2008), Palmer et al. (2007) and Smith and Murphy (2007). Uncertainties are shaded and plotted as published (at the one standard error level, except one standard deviation for Levitus, with no uncertainties provided for Smith). Estimates are shifted to align for 2006–2010, 5 years that are well measured by Argo, and then plotted relative to the resulting mean of all curves for 1971, the starting year for trend calculations.

(b) Observation-based estimates of annual 5-year running mean global mean mid-depth (700 to 2000 m) ocean heat content in ZJ (Levitus et al., 2012) and the deep (2000 to 6000 m) global ocean heat content trend from 1992 to 2005 (Purkey and Johnson, 2010), both with one standard error uncertainties shaded (see legend).

Reference: IPCC 5th Assessment Report, WG1 Ch3. Ocean Observations.

² This list provides sources for openly accessible data sets with worldwide coverage for which metadata is available. It is curated by the respective GCOS ECV Steward(s). The list does not claim to be complete. Anyone with a suitable dataset who would like it to be added to this list should contact GCOS.