Transient Tracers

ESSENTIAL CLIMATE VARIABLE (ECV) FACTSHEET

GLOBAL CLIMATE OBSERVING SYSTEM
KEEPING WATCH OVER OUR CLIMATE

WMO IOC International Science Council UN environment

ECV IN BRIEF

Domain:	Ocean
Subdomain:	Biogeochemical
Scientific Area:	Carbon Cycle and other GHGs
Products:	Interior Ocean CFC-12
	Interior Ocean CFC-11
	Interior Ocean SF6
	Interior Ocean Tritium
	Interior Ocean 3He
	Interior Ocean 14C
	Interior Ocean 39Ar

Transient Tracers

Transient tracers are man-made chemical compounds released to the atmosphere at known quantities that can be used in the ocean to quantify ventilation, transit time distribution and transport time-scales. Measurement of transient tracers in the subsurface ocean thus provides information on the time-scales since the ocean was ventilated, i.e. in contact with the atmosphere. A combination of these tracers provide the means to constrain the transit time distribution (TTD) of a water-mass that allows inference of concentrations or fates of other transient compounds, such as anthropogenic carbon or nitrous oxide.

ECV Product[1]

PRODUCT	DEFINITION	REQUIREMENTS				
		FREQ.	RES.	REQUIRED MEASUREMENT UNCERTAINTY	STABILITY	STANDARDS/ REFERENCES
Interior Ocean CFC-12	Concentration of CFC-12 gas in the water column [pmol kg^{-1}]	Annual to decadal	Every 20°	±1%	Annual to decadal	See EOV Specification Sheets: www.goosocean.org/eov
Interior Ocean CFC-11	Concentration of CFC-11 gas in the water column [pmol kg^{-1}]	Annual to decadal	Every 20°	±1%	Annual to decadal	www.goosocean.org/eov
Interior Ocean SF6	Concentration of SF_6 gas in the water column [fmol kg^{-1}]	Annual to decadal	Every 20°	±1%	Annual to decadal	www.goosocean.org/eov
Interior Ocean Tritium	Concentration of Tritium gas in the water column [TU (tritium units)]	Annual to decadal	Every 20°	±0.5%, 0.005 TU	Annual to decadal	www.goosocean.org/eov

[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.

Interior Ocean 3He	Concentration of δ^3He gas in the water column [δ^3He]	Annual to decadal	Every 20°	δ3He ±0.15%	Annual to decadal	www.goosocean.org/eov
Interior Ocean 14C	Concentration of ^{14}C in the water column [Δ^{14}C]	Annual to decadal	Every 20°	14C ±0.4%	Annual to decadal	www.goosocean.org/eov
Interior Ocean 39Ar	Concentration of 39-Argon gas in the water column [^{39}Ar pm (percent modern)]	Annual to decadal	Every 20°	14C ±0.4%	Annual to decadal	www.goosocean.org/eov

Data Sources[2]

- Global Ocean Data Analysis Project (GLODAPv2): http://glodap.info/
- CLIVAR and Carbon Hydrographic Data Office (CCHDO): http://cchdo.ucsd.edu/
- National Centers for Environmental Information Ocean Carbon Data System (NCEI OCADS): https://www.nodc.noaa.gov/ocads/
- PANGAEA: https://www.pangaea.de/

Transient Time Distribution (TTD)

Reference: Fine RA. (2011). Observations of CFCs and SF6 as ocean tracers. Annual review of marine science. 2011 Jan 15;3:173-95.

Source (27/03/2018): https://www.annualreviews.org/doi/abs/10.1146/annurev.marine.010908.163933

[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.