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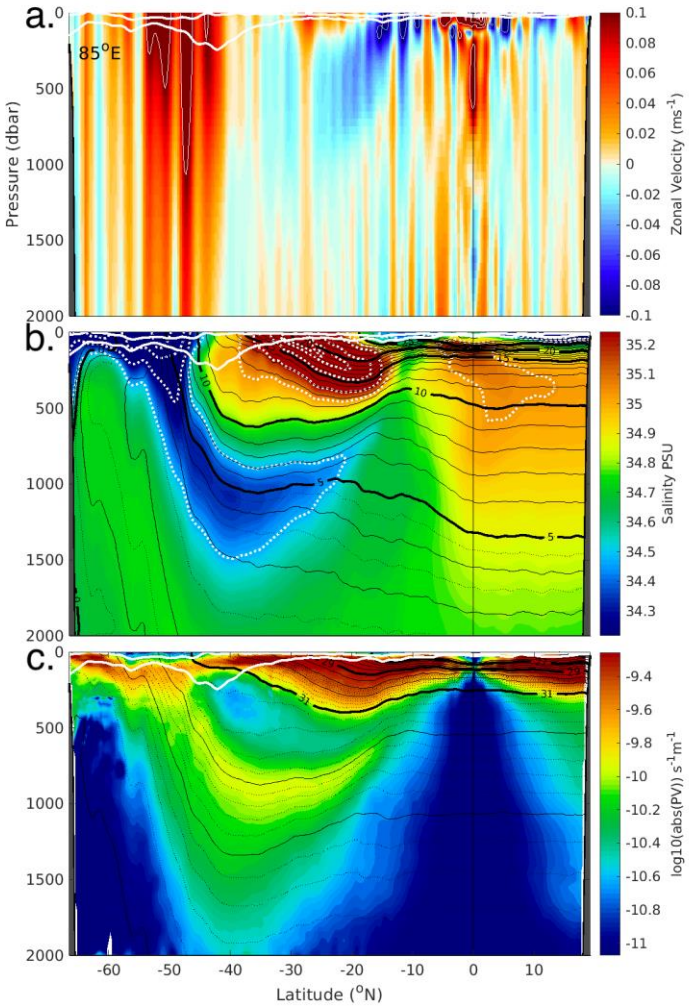
WHOAS Dataset Input Form

Title: Mesoscale Ocean Circulation Atlas
Data Type: netcdf file of gridded hydrographic properties and velocity field
Size of Data: 1.6GB
Version: 1.0
Version Date: 9/9/2022



Thumbnail: Atlas properties along 85°E in the Indian Ocean: a) zonal geostrophic velocity; b) temperature (contours) and salinity (colors); c) log10 of the absolute potential vorticity (colors) and σ_1 (contours). For absolute velocities greater than 0.1 m s^{-1}, contours are marked every 0.1 m s^{-1} . For salinity, dashed lines show the 90th, 95th, 98th percentiles to reveal the structure of the extreme property values. For temperature the contour interval is 1°C, moving to 0.5°C below 5°C (dashed lines). The ocean bottom is indicated by the grey fill area. The minimum and maximum seasonal mixed layers are also shown (thick white lines).
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Readme file: Readme files are mandatory for datasets. Please include Readme file when submitting the datasets.

Contributors	Affiliation	Role
Susan E Wijffels	Woods Hole Oceanographic Institution	Conceived of and built the Atlas. Contributed to collection of underpinning Argo data set
Geoffrey Gebbie		Helped with analysis and interpretation.
Pelle Robbins		Helped with analysis and interpretation. Contributed to collection of underpinning Argo data set

Abstract: Based on twenty years of Argo and ship/animal-borne/glider hydrographic profile data, we derive a new high resolution hydrographic Atlas and associated circulation field for the oceans above 2000 dbar. Satellite altimetric observations are used to explicitly regress out eddy noise in the fit, greatly reducing one of the major sources of noise. Geostrophic shears are found from the fitted geopotential anomaly fields. Ekman velocities are estimated using satellite wind stresses. Both Argo trajectory observations at 1000 dbar and surface drifter observations are used to reference geostrophic shears derived from the Atlas hydrography. Surface drifter velocities are analyzed with an additional wind-friction term to remove the wind-related flow. Agreement between the surface geostrophic (referenced to Argo trajectories) and drifter-based surface velocity is high at both large and mesoscales, lending confidence to the derived geostrophic circulation fields. The Atlas reveals standing mesoscale eddies and meanders in western boundary systems, and the braided jet structure of the Antarctic Circumpolar Current. In the interior, the upper ocean flow consists of a highly baroclinic large-scale Sverdrup flow and smaller scale (~200 km width) semi-zonal jets, which are more barotropic (low vertical shear) and have an average zonal width of around 2000 km. These semi-zonal jets are globally ubiquitous - found in all basins pole-to-pole. The many permanent mesoscale features of the mean general circulation contrasts with that predicted by theories of the large-scale flow in

Coverage: 80N to 80S; Average for 2000-2020; centered on January 1, 2010

Key words: ocean general circulation, mesoscales, climatology

Data Description: Statistically averaged hydrographic and absolute geostrophic velocity field, with associated standard error estimates. Averages are found using a local parametric fit to the mean, seasonal and linear trend as well as spatial gradient terms. Regions with no or high error estimates are infilled with values from Gourestski, *Ocean Sci., 14, 1127–1146, 2018* https://doi.org/10.5194/os-14-1127-2018. Infilling is marked where the standard error = -999.

Acquisition Description: This is a derived product based on the 2000-2020 Argo observations plus allied profiles from gliders, marine mammals and ships surveys.

Related Publications: Wijffels, S. E. , G. Gebbie and P. E. Robbins, 2024: Resolving the ubiquitous small-scale semi-permanent features of the general ocean circulation: a multiplatform observational approach. J. Physical Oceanography, XXX.XXXX

Parameters: List all parameters used

Parameter	Description	Units
PTMP_m	Sea Water Potential Temperature (EOS80)	Degrees Celsius
PSAL_m	Sea Water Practical Salinity (EOS80)	Practical Salinity Units

SIGMA1_m	Sea Water Potential Density Anomaly relative to 1000dbar (EOS80)	kgm^-3
UGEO_m	Eastward Ocean Geostrophic Velocity	ms^-1
VGEO_m	Northward Ocean Geostrophic Velocity	ms^-1
GPAN_m	Total Geopotential Height	m^2s^-2
PTMP_se	Standard Error of Sea Water Potential Temperature	Degrees Celsius
PSAL_se	Standard Error of Sea Water Practical Salinity	Practical Salinity Units
SIGMA1_se	Standard Error of Sea Water Potential Density Anomaly relative to 1000dbar	kgm^-3
UGEO_se	Standard Error of Eastward Ocean Velocity	ms^-1
VGEO_se	Standard Error of Northward Ocean Velocity	ms^-1
GPAN_se	Standard Error of Total Geopotential Height	m^2s^-2
PRES	Sea Water Pressure	Decibar
LATITUDE	Latitude	Degrees North
LONGITUDE	Longitude (relative to prime meridian)	Degrees East

Funding:

Funding Source	Award
National Science Foundation	NSF OCE 1830007
NOAA Global Ocean Monitoring and Observing	US Argo Consortium