

# Recent Changes in the Ventilation of the Southern Ocean

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Citation Report

#	ARTICLE	IF	CITATIONS
1	Nutrient variability in Subantarctic Mode Waters forced by the Southern Annular Mode and ENSO. <i>Geophysical Research Letters</i> , 2013, 40, 3419-3423.	4.0	31
2	Temporal variability of transformation, formation, and subduction rates of upper Southern Ocean waters. <i>Journal of Geophysical Research: Oceans</i> , 2013, 118, 6285-6302.	2.6	12
4	Estimating changes in ocean ventilation from early 1990s CFC-12 and late 2000s SF <sub>6</sub> measurements. <i>Geophysical Research Letters</i> , 2013, 40, 927-932.	4.0	28
5	The Antarctic Atmospheric Energy Budget. Part II: The Effect of Ozone Depletion and its Projected Recovery. <i>Journal of Climate</i> , 2013, 26, 9729-9744.	3.2	8
6	Up and down. <i>Nature Geoscience</i> , 2013, 6, 153-153.	12.9	0
7	Dynamics of the Southern Ocean Circulation. <i>International Geophysics</i> , 2013, 103, 471-492.	0.6	56
8	Interactive ozone and methane chemistry in GISS-E2 historical and future climate simulations. <i>Atmospheric Chemistry and Physics</i> , 2013, 13, 2653-2689.	4.9	150
9	Sensitivity of stratospheric dynamics to uncertainty in O <sub>3</sub> production. <i>Journal of Geophysical Research D: Atmospheres</i> , 2013, 118, 8984-8999.	3.3	3
10	West Antarctic Peninsula: An Ice-Dependent Coastal Marine Ecosystem in Transition. <i>Oceanography</i> , 2013, 26, 190-203.	1.0	249
11	The Marine Carbon Cycle and Ocean Carbon Inventories. <i>International Geophysics</i> , 2013, 103, 787-815.	0.6	11
12	Global Distribution and Formation of Mode Waters. <i>International Geophysics</i> , 2013, 103, 211-226.	0.6	27
13	Centennial-scale variability of the Southern Hemisphere westerly wind belt in the eastern Pacific over the past two millennia. <i>Climate of the Past</i> , 2014, 10, 1125-1144.	3.4	65
14	Quantifying the Summertime Response of the Austral Jet Stream and Hadley Cell to Stratospheric Ozone and Greenhouse Gases. <i>Journal of Climate</i> , 2014, 27, 5538-5559.	3.2	62
15	Delayed Southern Hemisphere Climate Change Induced by Stratospheric Ozone Recovery, as Projected by the CMIP5 Models. <i>Journal of Climate</i> , 2014, 27, 852-867.	3.2	71
16	Response of the Ocean Natural Carbon Storage to Projected Twenty-First-Century Climate Change. <i>Journal of Climate</i> , 2014, 27, 2033-2053.	3.2	46
17	Climate system response to stratospheric ozone depletion and recovery. <i>Quarterly Journal of the Royal Meteorological Society</i> , 2014, 140, 2401-2419.	2.7	127
18	Changes in the ventilation of the southern oceans. <i>Philosophical Transactions Series A, Mathematical, Physical, and Engineering Sciences</i> , 2014, 372, 20130269.	3.4	14
19	An observing system simulation for Southern Ocean carbon dioxide uptake. <i>Philosophical Transactions Series A, Mathematical, Physical, and Engineering Sciences</i> , 2014, 372, 20130046.	3.4	41

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20	The oceanic anthropogenic CO <sub>2</sub> sink: Storage, air-sea fluxes, and transports over the industrial era. <i>Global Biogeochemical Cycles</i> , 2014, 28, 631-647.	4.9	207
21	The Southern Ocean silicon trap: Data-constrained estimates of regenerated silicic acid, trapping efficiencies, and global transport paths. <i>Journal of Geophysical Research: Oceans</i> , 2014, 119, 313-331.	2.6	56
22	Southern Hemisphere extratropical circulation: Recent trends and natural variability. <i>Geophysical Research Letters</i> , 2015, 42, 5508-5515.	4.0	42
23	Upwelling in the Southern Ocean. <i>Physics Today</i> , 2015, 68, 27-32.	0.3	70
24	Transit time distributions and oxygen utilization rates from chlorofluorocarbons and sulfur hexafluoride in the Southeast Pacific Ocean. <i>Journal of Geophysical Research: Oceans</i> , 2015, 120, 3761-3776.	2.6	33
25	Southern Ocean isopycnal mixing and ventilation changes driven by winds. <i>Geophysical Research Letters</i> , 2015, 42, 10357.	4.0	32
26	Sustained growth of the Southern Ocean carbon storage in a warming climate. <i>Geophysical Research Letters</i> , 2015, 42, 4516-4522.	4.0	28
28	Decadal Patterns of Westerly Winds, Temperatures, Ocean Gyre Circulations and Fish Abundance: A Review. <i>Climate</i> , 2015, 3, 833-857.	2.8	10
29	Southern Ocean contributions to the Eastern Equatorial Pacific heat content during the Holocene. <i>Earth and Planetary Science Letters</i> , 2015, 424, 158-167.	4.4	17
30	Dominance of the Southern Ocean in Anthropogenic Carbon and Heat Uptake in CMIP5 Models. <i>Journal of Climate</i> , 2015, 28, 862-886.	3.2	432
31	Anomalous chlorofluorocarbon uptake by mesoscale eddies in the Drake Passage region. <i>Journal of Geophysical Research: Oceans</i> , 2015, 120, 1065-1078.	2.6	11
32	Stable isotopic signature of Southern Ocean deep water CO <sub>2</sub> ventilation. <i>Deep-Sea Research Part II: Topical Studies in Oceanography</i> , 2015, 118, 177-185.	1.4	6
33	Quantifying anthropogenic carbon inventory changes in the Pacific sector of the Southern Ocean. <i>Marine Chemistry</i> , 2015, 174, 147-160.	2.3	38
34	Light-Induced Redox Cycling of Iron: Roles for CO <sub>2</sub> Uptake and Release by Aquatic Ecosystems. <i>Aquatic Geochemistry</i> , 2015, 21, 65-80.	1.3	10
35	Observing multidecadal trends in Southern Ocean CO <sub>2</sub> uptake: What can we learn from an ocean model?. <i>Global Biogeochemical Cycles</i> , 2015, 29, 416-426.	4.9	35
36	Distributions, trends and inter-annual variability of nutrients along a repeat section through the Weddell Sea (1996-2011). <i>Marine Chemistry</i> , 2015, 177, 545-553.	2.3	20
37	Effects of stratospheric ozone depletion, solar UV radiation, and climate change on biogeochemical cycling: interactions and feedbacks. <i>Photochemical and Photobiological Sciences</i> , 2014, 14, 127-148.	2.9	53
38	Ozone depletion and climate change: impacts on UV radiation. <i>Photochemical and Photobiological Sciences</i> , 2014, 14, 19-52.	2.9	227

#	ARTICLE	IF	CITATIONS
39	Evaluating the use of 1D transit time distributions to infer the mean state and variability of oceanic ventilation. <i>Journal of Geophysical Research: Oceans</i> , 2016, 121, 6650-6670.	2.6	9
40	Impacts of Interactive Stratospheric Chemistry on Antarctic and Southern Ocean Climate Change in the Goddard Earth Observing System, Version 5 (GEOS-5). <i>Journal of Climate</i> , 2016, 29, 3199-3218.	3.2	36
41	Meteorology and oceanography of the Atlantic sector of the Southern Ocean—a review of German achievements from the last decade. <i>Ocean Dynamics</i> , 2016, 66, 1379-1413.	2.2	12
42	The formation of the ocean's anthropogenic carbon reservoir. <i>Scientific Reports</i> , 2016, 6, 35473.	3.3	46
43	Constraining Future Summer Austral Jet Stream Positions in the CMIP5 Ensemble by Process-Oriented Multiple Diagnostic Regression*. <i>Journal of Climate</i> , 2016, 29, 673-687.	3.2	33
44	Mechanisms of Southern Ocean Heat Uptake and Transport in a Global Eddy Climate Model. <i>Journal of Climate</i> , 2016, 29, 2059-2075.	3.2	56
45	Changes in Ocean Heat, Carbon Content, and Ventilation: A Review of the First Decade of GO-SHIP Global Repeat Hydrography. <i>Annual Review of Marine Science</i> , 2016, 8, 185-215.	11.6	183
46	Temporal changes in ventilation and the carbonate system in the Atlantic sector of the Southern Ocean. <i>Deep-Sea Research Part II: Topical Studies in Oceanography</i> , 2017, 138, 26-38.	1.4	13
47	Two decades of Pacific anthropogenic carbon storage and ocean acidification along Global Ocean Ship-based Hydrographic Investigations Program sections P16 and P02. <i>Global Biogeochemical Cycles</i> , 2017, 31, 306-327.	4.9	42
48	The export and fate of organic matter in the ocean: New constraints from combining satellite and oceanographic tracer observations. <i>Global Biogeochemical Cycles</i> , 2017, 31, 535-555.	4.9	165
49	The integral role of iron in ocean biogeochemistry. <i>Nature</i> , 2017, 543, 51-59.	27.8	482
50	A new look at ocean ventilation time scales and their uncertainties. <i>Journal of Geophysical Research: Oceans</i> , 2017, 122, 3771-3798.	2.6	27
51	Transit Time Distribution based on the ECCO-JPL Ocean Data Assimilation. <i>Journal of Marine Systems</i> , 2017, 167, 1-10.	2.1	3
52	Synchronous volcanic eruptions and abrupt climate change ~17.7 ka plausibly linked by stratospheric ozone depletion. <i>Proceedings of the National Academy of Sciences of the United States of America</i> , 2017, 114, 10035-10040.	7.1	58
53	Dependence of model-simulated response to ozone depletion on stratospheric polar vortex climatology. <i>Geophysical Research Letters</i> , 2017, 44, 6391-6398.	4.0	24
54	Decadal changes in Southern Ocean ventilation inferred from deconvolutions of repeat hydrographies. <i>Geophysical Research Letters</i> , 2017, 44, 5655-5664.	4.0	17
55	Fast and slow responses of Southern Ocean sea surface temperature to SAM in coupled climate models. <i>Climate Dynamics</i> , 2017, 48, 1595-1609.	3.8	85
56	Oxygen in the Southern Ocean From Argo Floats: Determination of Processes Driving Air-Sea Fluxes. <i>Journal of Geophysical Research: Oceans</i> , 2017, 122, 8661-8682.	2.6	38

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57	The signs of Antarctic ozone hole recovery. <i>Scientific Reports</i> , 2017, 7, 585.	3.3	72
58	A Model-Based Evaluation of the Inverse Gaussian Transit-Time Distribution Method for Inferring Anthropogenic Carbon Storage in the Ocean. <i>Journal of Geophysical Research: Oceans</i> , 2018, 123, 1777-1800.	2.6	13
59	Stratosphere-resolving CMIP5 models simulate different changes in the Southern Hemisphere. <i>Climate Dynamics</i> , 2018, 50, 2239-2255.	3.8	5
60	CMIP5 Diversity in Southern Westerly Jet Projections Related to Historical Sea Ice Area: Strong Link to Strengthening and Weak Link to Shift. <i>Journal of Climate</i> , 2018, 31, 195-211.	3.2	44
61	Relationship between Ocean Carbon and Heat Multidecadal Variability. <i>Journal of Climate</i> , 2018, 31, 1467-1482.	3.2	9
62	Southern Ocean Warming. <i>Oceanography</i> , 2018, 31, .	1.0	78
63	Surface Macronutrient Dynamics of the Drake Passage and the Argentine Sea. , 2018, , 71-86.		2
64	Polar Climate Change as Manifest in Atmospheric Circulation. <i>Current Climate Change Reports</i> , 2018, 4, 383-395.	8.6	123
65	Evolving Relative Importance of the Southern Ocean and North Atlantic in Anthropogenic Ocean Heat Uptake. <i>Journal of Climate</i> , 2018, 31, 7459-7479.	3.2	72
66	The global influence of localized dynamics in the Southern Ocean. <i>Nature</i> , 2018, 558, 209-218.	27.8	181
67	Ventilation of the Subtropical North Atlantic: Locations and Times of Last Ventilation Estimated Using Tracer Constraints From GEOTRACES Section GA03. <i>Journal of Geophysical Research: Oceans</i> , 2018, 123, 2332-2352.	2.6	9
68	Delivering Sustained, Coordinated, and Integrated Observations of the Southern Ocean for Global Impact. <i>Frontiers in Marine Science</i> , 2019, 6, .	2.5	67
69	The Global Ocean Ship-Based Hydrographic Investigations Program (GO-SHIP): A Platform for Integrated Multidisciplinary Ocean Science. <i>Frontiers in Marine Science</i> , 2019, 6, .	2.5	60
70	Adequacy of the Ocean Observation System for Quantifying Regional Heat and Freshwater Storage and Change. <i>Frontiers in Marine Science</i> , 2019, 6, .	2.5	19
71	Remotely Sensed Winds and Wind Stresses for Marine Forecasting and Ocean Modeling. <i>Frontiers in Marine Science</i> , 2019, 6, .	2.5	71
72	Trends in anthropogenic carbon in the Arctic Ocean. <i>Progress in Oceanography</i> , 2019, 178, 102177.	3.2	10
73	Response of Southern Ocean Ventilation to Changes in Midlatitude Westerly Winds. <i>Journal of Climate</i> , 2019, 32, 5345-5361.	3.2	23
74	The Weddell Gyre, Southern Ocean: Present Knowledge and Future Challenges. <i>Reviews of Geophysics</i> , 2019, 57, 623-708.	23.0	105

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75	The oceanic sink for anthropogenic CO <sub>2</sub> from 1994 to 2007. <i>Science</i> , 2019, 363, 1193-1199.	12.6	505
76	Revisiting Antarctic ice loss due to marine ice-cliff instability. <i>Nature</i> , 2019, 566, 58-64.	27.8	215
77	Variability of marine 14C reservoir ages in the Southern Ocean highlighting circulation changes between 1910 and 1950. <i>Earth and Planetary Science Letters</i> , 2019, 511, 99-104.	4.4	8
78	The Variable Southern Ocean Carbon Sink. <i>Annual Review of Marine Science</i> , 2019, 11, 159-186.	11.6	165
79	Decadal-scale Increases of Anthropogenic CO <sub>2</sub> in Antarctic Bottom Water in the Indian and Western Pacific Sectors of the Southern Ocean. <i>Geophysical Research Letters</i> , 2019, 46, 833-841.	4.0	6
80	The Influence of Warming Patterns on Passive Ocean Heat Uptake. <i>Geophysical Research Letters</i> , 2020, 47, e2020GL088429.	4.0	15
81	Dynamics of Southern Hemisphere Atmospheric Circulation Response to Anthropogenic Aerosol Forcing. <i>Geophysical Research Letters</i> , 2020, 47, e2020GL089919.	4.0	8
82	The Oceans. , 2020, , 361-429.		0
83	Contrasting Recent Trends in Southern Hemisphere Westerlies Across Different Ocean Basins. <i>Geophysical Research Letters</i> , 2020, 47, e2020GL088890.	4.0	13
84	Global Drivers on Southern Ocean Ecosystems: Changing Physical Environments and Anthropogenic Pressures in an Earth System. <i>Frontiers in Marine Science</i> , 2020, 7, .	2.5	79
85	How Rapidly Do the Southern Subtropical Oceans Respond to Wind Stress Changes?. <i>Journal of Geophysical Research: Oceans</i> , 2020, 125, e2020JC016236.	2.6	4
86	A pause in Southern Hemisphere circulation trends due to the Montreal Protocol. <i>Nature</i> , 2020, 579, 544-548.	27.8	106
87	Comparison Between Early and Late 21stC Phytoplankton Biomass and Dimethylsulfide Flux in the Subantarctic Southern Ocean. <i>Journal of Ocean University of China</i> , 2020, 19, 151-160.	1.2	4
88	Internal Variability Dominates Over Externally Forced Ocean Circulation Changes Seen Through $\langle \text{sc} \rangle \text{CFCs} \langle / \text{sc} \rangle$ . <i>Geophysical Research Letters</i> , 2020, 47, e2020GL087585.	4.0	3
89	GISS Model E2.2: A Climate Model Optimized for the Middle Atmosphere—Model Structure, Climatology, Variability, and Climate Sensitivity. <i>Journal of Geophysical Research D: Atmospheres</i> , 2020, 125, e2019JD032204.	3.3	32
90	Multidecadal Changes in Southern Ocean Ventilation since the 1960s Driven by Wind and Buoyancy Forcing. <i>Journal of Climate</i> , 2021, 34, 1485-1502.	3.2	5
91	Historical and Projected Changes in the Southern Hemisphere Surface Westerlies. <i>Geophysical Research Letters</i> , 2021, 48, e2020GL090849.	4.0	57
92	CYCLOCIM: A 4-D variational assimilation system for the climatological mean seasonal cycle of the ocean circulation. <i>Ocean Modelling</i> , 2021, 159, 101762.	2.4	3

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93	Interbasin Differences in Ocean Ventilation in Response to Variations in the Southern Annular Mode. <i>Journal of Geophysical Research: Oceans</i> , 2021, 126, e2020JC016540.	2.6	2
94	The effects of historical ozone changes on Southern Ocean heat uptake and storage. <i>Climate Dynamics</i> , 2021, 57, 2269-2285.	3.8	10
95	Ventilation of the Southern Ocean Pycnocline. <i>Annual Review of Marine Science</i> , 2022, 14, 405-430.	11.6	21
96	Southern Ocean Phytoplankton Community Structure as a Gatekeeper for Global Nutrient Biogeochemistry. <i>Global Biogeochemical Cycles</i> , 2021, 35, e2021GB006991.	4.9	10
99	Effects of Buoyancy and Wind Forcing on Southern Ocean Climate Change. <i>Journal of Climate</i> , 2020, 33, 10003-10020.	3.2	26
100	Perspectives of transient tracer applications and limiting cases. <i>Ocean Science</i> , 2015, 11, 699-718.	3.4	28
102	Nitrogen isotopic constraints on nutrient transport to the upper ocean. <i>Nature Geoscience</i> , 2021, 14, 855-861.	12.9	17
104	Ocean warming and accelerating Southern Ocean zonal flow. <i>Nature Climate Change</i> , 2021, 11, 1090-1097.	18.8	39
105	Changes of Southern Hemisphere westerlies in the future warming climate. <i>Atmospheric Research</i> , 2022, 270, 106040.	4.1	19
106	Bio-GO-SHIP: The Time Is Right to Establish Global Repeat Sections of Ocean Biology. <i>Frontiers in Marine Science</i> , 2022, 8, .	2.5	9
107	Twenty-first-century Southern Hemisphere impacts of ozone recovery and climate change from the stratosphere to the ocean. <i>Weather and Climate Dynamics</i> , 2022, 3, 139-171.	3.5	12
108	Transit Time Distributions and ventilation pathways using CFCs and Lagrangian backtracking in the South Atlantic of an eddying ocean model. <i>Journal of Physical Oceanography</i> , 2022, , .	1.7	0
109	The redistribution of anthropogenic excess heat is a key driver of warming in the North Atlantic. <i>Communications Earth &amp; Environment</i> , 2022, 3, .	6.8	10
110	A deep-learning estimate of the decadal trends in the Southern Ocean carbon storage. <i>Nature Communications</i> , 2022, 13, .	12.8	9
111	The Deep Ocean's Carbon Exhaust. <i>Global Biogeochemical Cycles</i> , 2022, 36, .	4.9	12
112	Projected Changes of Surface Winds Over the Antarctic Continental Margin. <i>Geophysical Research Letters</i> , 2022, 49, .	4.0	9
113	Synoptic <sup>129</sup> I and CFC <sup>6</sup> Transit Time Distribution (TTD) Sections Across the Central Arctic Ocean From the 2015 GEOTRACES Cruises. <i>Journal of Geophysical Research: Oceans</i> , 2022, 127, .	2.6	4
114	Ocean Acidification and Long-Term Changes in the Carbonate System Properties of the South Atlantic Ocean. <i>Global Biogeochemical Cycles</i> , 2022, 36, .	4.9	0

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116	Revisiting Interior Water Mass Responses to Surface Forcing Changes and the Subsequent Effects on Overturning in the Southern Ocean. <i>Journal of Geophysical Research: Oceans</i> , 2023, 128, .	2.6	3
117	Annually Resolved Propagation of CFCs and SF <sub>6</sub> in the Global Ocean Over Eight Decades. <i>Journal of Geophysical Research: Oceans</i> , 2023, 128, .	2.6	1
118	Contrasting trends in short-lived and long-lived mesoscale eddies in the Southern Ocean since the 1990s. <i>Environmental Research Letters</i> , 2023, 18, 034042.	5.2	2
119	Contemporary oceanic radiocarbon response to ocean circulation changes. <i>Climate Dynamics</i> , 2023, 61, 3223-3235.	3.8	2
120	Human-induced changes in the global meridional overturning circulation are emerging from the Southern Ocean. <i>Communications Earth &amp; Environment</i> , 2023, 4, .	6.8	4
121	Satellite Remote Sensing of Surface Winds, Waves, and Currents: Where are we Now?. <i>Surveys in Geophysics</i> , 2023, 44, 1357-1446.	4.6	3
122	On the Multiscale Oceanic Heat Transports Toward the Bases of the Antarctic Ice Shelves. , 2023, 2, .		0
123	Southern Ocean warming and its climatic impacts. <i>Science Bulletin</i> , 2023, 68, 946-960.	9.0	9
124	Magnitude, Trends, and Variability of the Global Ocean Carbon Sink From 1985 to 2018. <i>Global Biogeochemical Cycles</i> , 2023, 37, .	4.9	12
125	Complexities of regulating climate by promoting marine primary production with ocean iron fertilization. <i>Earth-Science Reviews</i> , 2024, 249, 104675.	9.1	0
127	How Does the Pinatubo Eruption Influence Our Understanding of Long-Term Changes in Ocean Biogeochemistry?. <i>Geophysical Research Letters</i> , 2024, 51, .	4.0	0
128	Spatial and Temporal Patterns of Southern Ocean Ventilation. <i>Geophysical Research Letters</i> , 2024, 51, .	4.0	0
129	Assessment of Global Ocean Biogeochemistry Models for Ocean Carbon Sink Estimates in RECCAP2 and Recommendations for Future Studies. <i>Journal of Advances in Modeling Earth Systems</i> , 2024, 16, .	3.8	0