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研究方向 中小尺度动力学, 海洋混合, 基于数据同化与 AI 的海洋参数反演

海洋所个人网页:

http://qdio.cas.cn/2019Ver/Teams/researcher/201707/t20170720_5479492.html

研究部招生个人主页:

http://www.qdio.ac.cn/yjs/tutor/bstutor/bswlhyx/202003/t20200311_546368.html

个人简介

刘传玉, 中国科学院海洋研究所研究员, 博士生导师, 主要研究方向为海洋中小尺度动力学、海洋混合、海洋数值模拟及海洋数据同化, 当前, 开展部分人工智能海洋学应用研究。

2015、2016、2017、2025 年, 分别获中国科学院、国家、崂山实验室(海洋国家实验室)、山东省等相关高层次人才项目资助; 2024 年 5 月作为副总设计师承担中国科学院战略先导性科技专项(A 类)任务; 2024 年 8 月获国家自然科学基金委重点项目资助。

取得了若干研究成果:

a) 中尺度/动力学: 首次给出全球中尺度涡致混合系数和小尺度湍流扩散系数优化值分布特征; 揭示了海洋斜压不稳定性不同结构全球分布规律、变异规律及控制机理, 给出了不同结构中尺度涡全球分布规律及与不同斜压不稳定性分布规律之间的机制联系; 发现了海洋中尺度涡致混合各向异性结构全球分布规律与机理; 发现了北赤道潜流区次表层(温跃层之下)中尺度不稳定波。

b) 小尺度动力学: 系统揭示热带不稳定波对温跃层混合规律的机制影响; 发现了次表层热带不稳定波, 揭示其对温跃层深层混合的影响; 揭示了不同动力模态和时空尺度赤道波动(赤道陷波)对混合的影响机制; 发现了热带障碍层混合并揭示其对海表温度影响规律; 进而确立了赤道温跃层(次表层)混合的普遍存在性, 给出了热量从表层向更深层传输的新机制。

c) 海洋内部参数“最优”估计及人工智能反演预报: 采用国际先进的伴随敏感性分析及四维变分方法, 构建国内首个基于 ECCO 框架的“两洋一海”高分辨率四维变分(伴随)大洋状态估算和参数优化系统 TOOSSE, 反演优化全球中尺度涡致混合系数和小尺度湍流扩散系数并描述其基本规律。

在 Nature Communications (3 篇), Journal of Physical Oceanography, Journal of Geophysical Research-Oceans, Geophysical Research Letters 等本领域高水平期刊发表论文 60 余篇。

教育背景

2000.09 - 2004.07	中国海洋大学	海洋科学	理学学士
2004.09 - 2009.07	中国科学院海洋研究所	物理海洋学	理学博士

工作经历

2016.10 - 至今	中国科学院海洋研究所	博士生导师
2016.04 - 至今	中国科学院海洋研究所	研究员
2015.12 - 2016.03	中国科学院海洋研究所	特聘研究员
2009.09 - 2015.10	德国汉堡大学海洋研究所	博士后助理研究员

招生专业及方向

物理海洋学（物理海洋/数学/物理/计算机等相关专业背景）：

博士招生：大洋环流动力学，中小尺度动力学，海洋混合，海洋数值模拟数据同化，人工智能海洋学

硕士招生：大洋环流动力学，中小尺度动力学，海洋混合，海洋数值模拟数据同化，人工智能海洋学

论文著作

- 1 Xuerong Cui, Guiqing Zhang, **Chuanyu Liu*** (2026): Lead-conditioned direct forecasting of daily air-sea interface variables over the tropical Pacific Ocean with soft physical regularization. *Ocean Modelling*. <https://doi.org/10.1016/j.ocemod.2026.102803> 【AI 海洋学论文】
- 2 Tian, F., Zhang, RH., Wang, X. **Chuanyu Liu** (2026). Phytoplankton-induced radiation effects reshape the evolution of multi-year La Niña. *Communications Earth and Environment*. <https://doi.org/10.1038/s43247-026-03680-z>
- 3 Gang Zheng, Xuanwei Wan, Lizhang Zhou, Yuanyuan Zhu, **Chuanyu Liu**, Jungang Yang, Peng Chen (2026). Can a Single Profile Reveal the Three-Dimensional Ocean Temperature Field in Its Surrounding Region? A Lightweight Deep Learning Proof of Concept. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*. 10.1109/JSTARS.2026.3717933 【AI 海洋学论文】
- 4 Xu An, **Chuanyu Liu***, Ling Feng, Zhuoyue Wang (2026) : Types of Mesoscale Eddies in the Kuroshio extension region and South China Sea, *Deep Sea Research Part II: Topical Studies in Oceanography*, <https://doi.org/10.1016/j.dsr2.2026.105646>

- Kai Ma, Manfredi Manizza, Yonglin Liu, Dimitris Menemenlis, Hanqin Tian, Kate Zhang, Qinghua Yang, **Chuanyu Liu**, Yang Feng*. (2026). Recent changes in global ocean N2O fluxes and their relationship to ocean climate variability. *Global Biogeochemical Cycles*, 40, e2025GB008942.
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- Wang, Zhuoyue and **Chuanyu Liu*** (2026), Subsurface Eddies Transited from Surface Eddies over Non-parallel Background Isopycnals, *Journal of Physical Oceanography*, DOI: 10.1175/JPO-D-25-0232.1
- Qianwen Hu, **Chuanyu Liu***, Yanli Jia, Fan Wang, Chuan Gao, Rong-Hua Zhang, Subsurface Mixing Promotes Central Pacific-like ENSO in an Intermediate Coupled model (2026), *Journal of Climate*, <https://doi.org/10.1175/JCLI-D-25-0360.1>
- 9 **刘传玉**, 王凡 (2026). 海洋数据再分析现状及展望. <中国科学院院刊> 41(1): 120-129
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- 12 **Liu, C***, Wang, F., Köhl, A. et al. Subsurface ocean turbulent mixing enhances central Pacific ENSO. *Nature Communications* 16, 2315 (2025). <https://doi.org/10.1038/s41467-025-57058-4>
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- 14 Feng, L., **Liu, C***, McWilliams, J. C., & Wang, F. (2025). Global distribution and seasonal variations of Charney-type submesoscale baroclinic instabilities (C-SBCIs). *Journal of Geophysical Research: Oceans*, 130, e2024JC022103. <https://doi.org/10.1029/2024JC022103>
- Lv, Guokun, **C. Liu**, et al. (2025), Adjoint-Based Simultaneous State and Parameter Estimation in an Arctic Sea Ice- Ocean Model using MITgcm (c63m), *Geoscientific Model Development*, <https://doi.org/10.5194/gmd-18-9451-2025>
- 16 刘丹丹, 朱善良, **刘传玉*** (2024) : 南太平洋热带-副热带区斜压不稳定的多年代际趋势及其机制分析, <海洋与湖沼>, 6.

- 17 Jing T, Chen R, **Liu C**, Qiu C, Zhang C and Hong M (2024) Global surface eddy mixing ellipses: spatio-temporal variability and machine learning prediction. *Front. Mar. Sci.* 11:1506419. doi: 10.3389/fmars.2024.1506419
- 18 Yingjie Liu, Xiaofeng Li, **Chuanyu Liu**, Qian Liu (2024) Transitions in surface thermal signatures during the evolution of long-lived eddies in the global ocean, *Deep Sea Research Part I: Oceanographic Research Papers*, 206, <https://doi.org/10.1016/j.dsr.2024.104279>.
- 19 Wang X, **Liu C*** and Wang F (2024) Influence of tidal mixing on bottom circulation in the Caroline Sea. *Front. Mar. Sci.* 11:1301541. doi: 10.3389/fmars.2024.1301541
- 20 Fang L, Ma K, **Liu C***, Wang X and Wang F (2023) Ocean mixing induced by three-dimensional structure of equatorial mode tropical instability waves in the Pacific Ocean. *Front. Mar. Sci.* 10:1228897. doi: 10.3389/fmars.2023.1228897
- 21 方丽媛, 霍丹, **刘传玉***, 线性稳定性分析方法及其在海洋小尺度不稳定过程研究中的应用, 《海洋科学》, 2023,49(9):1-9.
- 22 Weisheng Yang; **Chuanyu Liu***; Armin Köhl; Jin Wang; Xin Wang; Fan Wang; The Adjoint-based Favorable Winds for the Generation of the Central Pacific El Niño, *Journal of Climate*, 2023. <https://doi.org/10.1175/JCLI-D-22-0548.1>
- 23 Kai Ma; **Chuanyu Liu***; Junli Xu; Fan Wang (2023); Contrasts of Bimodal Tropical Instability Waves (TIWs)-Induced Wind Stress Perturbations in the Pacific Ocean among Observations, Ocean Models and Coupled Climate Models, *Journal of Oceanology and Limnology*, 2023. <https://doi.org/10.1007/s00343-023-2326-z>
- 24 Jingjing Zhang; **Chuanyu Liu ***; Xiang Gong; FanWang; Persistent Mixing Bursts in the Equatorial Pacific Thermocline Induced by Persistent Equatorial Waves, *Journal of Oceanology and Limnology*. 2023. <https://doi.org/10.1007/s00343-023-2350-z>
- 25 Rongjie Zhao; Feng Zhao; Ling Feng; James Kar-Hei Fang; **Chuanyu Liu**; Kuidong Xu; A Deep Seamount Effect Enhanced the Vertical Connectivity of the Planktonic Community Across 1000 m Above Summit, *Journal of Geophysical Research: Oceans*, 2023, 128(3)
- 26 Junli Xu; Kai Ma; Yuling Nie; **Chuanyu Liu**; Xin Bi; Wenqi Shi; Xianqing Lv; Numerical Study on Storm Surge Level Including Astronomical Tide Effect Using Data Assimilation Method, *Atmosphere*, 2023, 14(1)
- 27 **Chuanyu Liu ***; Dan Huo; Zhiyu Liu; Xiaowei Wang; Cong Guan; Jifeng Qi; Fan Wang; Turbulent mixing in the barrier layer of the equatorial Pacific Ocean, *Geophysical Research Letters*, 2022, 49(5)
- 28 **Chuanyu Liu ***; Ling Feng; Armin Köhl; Zhiyu Liu; Wave, vortex and wave-vortex dipole (instability wave): three flavors of the intra-seasonal variability of the North Equatorial Undercurrent, *Geophysical Research Letters*, 2022, 49(11)

- 29 Jin Wang; **Chuanyu Liu ***; Xiaowei Wang; Armin Köh; Yilong Lyu; Yuanlong Li; Fan Wang;
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on Adjoint Sensitivity Analysis, *Frontiers in marine science*, 2022, 9
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instability in the global oceans, *Journal of Geophysical Research: Oceans*, 2022, 127(5)
- 31 Jifeng Qi; **Chuanyu Liu**; Jianwei Chi; Delei Li; Le Gao; Baoshu Yin; An Ensemble-Based
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Sea, *Remote Sensing*, 2022; 14(13)
- 32 Xiaowei Wang; **Chuanyu Liu***; Armin Köhl; Geng Wu; Fan Wang; Detlef Stammer; The
adjoint-based Two Oceans One Sea State Estimate (TOOSSE), *Journal of Oceanology and
Limnology*, 2022, 40 (1): 1-21
- 33 Hao Wang; Huijie Liu; Xiaowei Wang; Junlong Zhang; Boris I. Sirenko; **Chuanyu Liu**; Dong
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Species of Thermochiton (Mollusca: Polyplacophora) From Haima Cold Seeps, *Frontiers in
Marine Science*, 2022, 9
- 34 Ling Feng; **Chuanyu Liu***; Armin Köhl; Detlef Stammer; Fan Wang*; Four types of baroclinic
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mesoscale eddies, *Journal of Geophysical Research:Oceans*, 2021, 126(3)
- 35 **Chuanyu Liu***; Xiaowei Wang; Zhiyu Liu; Armin Köhl; William Smyth; Fan Wang ; On the
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sheared turbulent layer in the eastern equatorial Pacific: interplays of multiple time scale
equatorial waves, *Journal of Physical Oceanography*, 2020, 50(10): 2907-2930
- 36 Xiaohua Li; Xiaowei Wang; **Chuanyu Liu**; Yi Liu; Kefu Yu; Weidong Sun; Traces of the 1997
Indonesian Wildfires in the Marine Environment From a Network of Coral $\delta C-13$ Records,
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- 37 Yilong Lyu; Yuanlong Li; Jianing Wang; Jing Duan; Xiaohui Tang; **Chuanyu Liu**; Linlin Zhang;
Qiang Ma; Fan Wang; Anomalous Upper-Ocean Circulation of the Western Equatorial
Pacific following El Niño Events, *Journal of Physical Oceanography*, 2020, 50(11) : 3353-
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- 38 Mengrong Ding; Pengfei Lin; Hailong Liu; Aixue Hu; **Chuanyu Liu**; Lagrangian Eddy Kinetic
Energy of Ocean Mesoscale Eddies and its Application to the Northwestern Pacific,
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- 39 Bowen Sun; **Chuanyu Liu***; Fan Wang*; Eddy Induced SST Variation and Heat Transport in
the Western North Pacific Ocean, *Journal of Oceanology and Limnology*, 2019, 38(1): 1-15

- 40 **Chuanyu Liu***; Liyuan Fang; Armin Köhl; Zhiyu Liu; William D. Smyth; Fan Wang; The Subsurface Mode Tropical Instability Waves in the Equatorial Pacific Ocean and Their Impacts on Shear and Mixing, *Geophysical Research Letters*, 2019, 46(21): 12270-12278
- 41 **Chuanyu Liu***; Xiaowei Wang*; Armin Köhl; Fan Wang; Zhiyu Liu; The northeast-southwest oscillating equatorial mode of the tropical instability wave and its impact on equatorial mixing, *Geophysical Research Letters*, 2019, 46(1): 218-225
- 42 Bowen Sun; **Chuanyu Liu***; Fan Wang*; Global meridional eddy heat transport inferred from Argo and altimetry observations, *Scientific Reports*, 2019, 9
- 43 Lina Song; Yuanlong Li; **Chuanyu Liu**; Fan Wang*; Jianing Wang; Observed Deep-Reaching Signatures of the Madden-Julian Oscillation in the Ocean Circulation of the Western Tropical Pacific, *Geophysical Research Letters*, 2019, 46(24): 14634-14643
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- 45 Qiuping Ren; Yuanlong Li; Fan Wang; Lina Song; **Chuanyu Liu**; Fangguo Zhai; Seasonality of the Mindanao Current/Undercurrent System, *Journal of Geophysical Research: Oceans*, 2018, 123(2): 1105-1122
- 46 Lina Song; Yuanlong Li; Jianing Wang; Fan Wang*; Shijian Hu; **Chuanyu Liu**; Xinyuan Diao; Cong Guan; Tropical Meridional Overturning Circulation Observed by Subsurface Moorings in the Western Pacific, *Scientific Reports*, 2018, 8
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- 48 Fan Wang*; Lina Song; Yuanlong Li; **Chuanyu Liu**; Jianing Wang; Pengfei Lin; Guang Yang; Jun Zhao; Xinyuan Diao; Dongxiao Zhang; Dunxin Hu; Semiannually alternating exchange of intermediate waters east of the Philippines, *Geophysical Research Letters*, 2016, 43(13): 7059-7065
- 49 **Chuanyu Liu***; Armin Köhl; Zhiyu Liu; Fan Wang; Detlef Stammer; Deep-reaching thermocline mixing in the equatorial Pacific cold tongue, *Nature Communications*, 2016, 7
- 50 Ryo Furue; Yanli Jia; Julian P. McCreary; Niklas Schneider; Kelvin J. Richards; Peter Müller; Bruce D. Cornuelle; Nidia Martínez Avellaneda; Detlef Stammer; **Chuanyu Liu**; Armin Köhl; Impacts of regional mixing on the temperature structure of the equatorial Pacific Ocean. Part 1: Vertically uniform vertical diffusion, *Ocean Modelling*, 2015, 91:91-111
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- 52 **Chuanyu Liu**; Fan Wang*; Xinping Chen; Jinsong von Storch; Interannual variability of the Kuroshio onshore intrusion along the East China Sea shelf break: Effect of the Kuroshio volume transport, *Journal of Geophysical Research: Oceans*, 2014, 119(9): 6190-6209
- 53 **Chuanyu Liu**; Armin Köhl; Detlef Stammer; Interpreting layer thickness advection in terms of eddy-topography interaction, *Ocean Modeling*, 2014, 81: 65-77
- 54 Xinping Chen; **Chuanyu Liu**; Kieran O'Driscoll; Bernhard Mayer; Jian Su; Thomas Pohlmann; On the nudging terms at open boundaries in regional ocean models, *Ocean Modelling*, 2013, 66: 14-25
- 55 **Chuanyu Liu**; Armin Köhl*; Detlef Stammer; Adjoint-Based Estimation of Eddy-Induced Tracer Mixing Parameters in the Global Ocean, *Journal of Physical Oceanography*, 2012, 42(7): 1186-1206
- 56 Fan Wang; **Chuanyu Liu***; Qingjia Meng; Effect of the Yellow Sea warm current fronts on the westward shift of the Yellow Sea warm tongue in winter, *Continental Shelf Research*, 2012, 45: 98-107

项目课题

- 1 国家自然科学基金委重点项目：内部强化型海洋中尺度涡形成与变异机制及其对太平洋热带辐合带（ITCZ）上层海洋温度的影响（2025 年 1 月-2029 年 12 月，经费：230 万），**主持**
- 2 中国科学院战略先导性科技专项（A 类）项目：关键海洋过程预报技术研究（2023 年 10 月-2026 年 9 月，经费：700 万），**主持**
- 3 崂山实验室崂山实验室科技创新项目“海洋中小尺度动力过程对气候变化的响应和反馈”课题“气候变化背景下海洋内波和赤道中小尺度波动变异机理及其对湍流混合的影响”（课题编号：LSKJ202202502），2022.10-2025.09，325.50 万，**主持**
- 4 中国科学院国家重大科技基础设施项目“基于‘科学’号的半潜无人船海洋动力环境智能观测系统研制”（项目编号：DSS-WXGZ-2022），2022.01-2024.12，814.15 万，**参与**
- 5 中国科学院 B 类战略性先导科技专项子课题“‘两洋一海’高分辨率大洋状态估算系统发展”（子课题编号：XDB42040102），2020.01-2024.12，88 万，**主持**
- 6 国家自然科学基金委面上项目“太平洋热带不稳定波双模态、跨赤道、倾斜流态结构变异机制及跨尺度效应研究”（项目编号：41976012），2020.01-2023.12，62 万，**主持**
- 7 国家自然科学基金委青年基金项目“全球大洋中尺度涡致侧向混合系数各向异性分布规律及大尺度效应研究”（项目编号：41606026），2016.10-2020.12，20 万，**主持**
- 8 中国科学院前沿科学重点研究项目“赤道中太平洋温跃层混合研究”（项目编号：QYZDB-SSW-DQC030），2016.10-2020.10，250 万，**主持**

学术兼职

2016.11 - 至今	中国海洋湖沼学会海洋与气候分会理事、秘书长
2022.10 - 至今	中国海洋学会人工智能海洋学专业委员会委员
2022.11 - 2023.11	<i>Deep Sea Research II</i> 客座编辑
2025.09 - 至今	
2024.07 - 至今	《海洋学报》《Acta Oceanologica Sinica》两刊青年编委
2025.01 - 至今	国际 SOLAS 计划中国青年工作组委员