TAN Zhetao

Doctor of Philosophy

École Normale Supérieure (ENS), Université Paris Sciences et Lettres (PSL)

Personal information

Date of birth: June 1997 Gender: Male Nationality: Chinese

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Professional Experiences

[1] Feb 2025 – Current, École Normale Supérieure (ENS), Université Paris Sciences et Lettres (PSL)

- **Research Fellow (Enseignant-chercheur)**, Department of Geosciences (Laboratoire de Météorologie Dynamique), Paris, France
- Advisors: Prof. Sabrina Speich, Dr. Elaine McDonagh (NORCE, Norway)
- Research Project: Assessing the salinity and freshwater redistribution in the South Atlantic Ocean (OCEAN:ICE; Horizon Europe project)

[2] September 2025 – October 2025, Visiting Scholar, Bjerknes Centre for Climate Research (BCCR)

- **Visiting researcher**, NORCE Research, Ocean Observations team
- Research Project: How does the Antarctic Intermediate Water (AAIW) from the Indian Ocean change with time? (under the OCEAN:ICE Horizon Europe project)

[3] Sept 2022 – Sept 2023, Visiting Scholar, Department of Geosciences, École Normale Supérieure (ENS), Université Paris Sciences et Lettres (PSL), Paris, France

- Research Interests: Ocean compound climate change, climate risk assessment (collaborate with Mercator Ocean internationals, Toulouse, France)
- Advisors: Prof. Karina von Schuckmann, Prof. Sabrina Speich

Education

[1] Sept 2019 – July 2024, Ph.D., Institute of Atmospheric Physics, Chinese Academy of Sciences (IAP/CAS)

- Research Interests: physical oceanography, operational oceanography, ocean climate change
- Thesis title: *The construction of ocean in-situ observational database and the investigation of ocean compound climatic impact-drivers*
- Advisors: Prof. CHENG Lijing; Prof. ZHU Jiang

[2] Sept 2015 – July 2019, B.Sc., Chengdu University of Information Technology, Chengdu, China

- Major: Atmospheric Science Cumulative GPA: 3.97/5 (top 5%)

Research Interests

- Compound climate change (climatic impact-drivers; indicators monitor; detection & attribution)
- Physical Oceanography (freshwater, water mass, circulation)
- Ocean warming and ocean heat content (OHC)
- Ocean observations and climate data quality improvement (e.g., instrument bias correction; quality control; duplicate checking; XBT science)
- Climate change impact and climate risk assessment (hazards, vulnerability, exposure)

Languages

English (IELST: 6.5); Mandarin and Cantonese (native speaker); French (A2)

International Services

[1] November 2025 – Current. **Member** of United Nations Integrated Research on Disaster Risk (IRDR) Young Scientists Programme (YSP)

[As a member to contribute my knowledge of the compound climate risk from the ocean (e.g., warming, marine heatwaves, salinity changes, deoxygenation, acidification, tropical cyclones etc.), specifically focus on the climate risk in the exclusive economic zone (EEZs).]

[2] Oct 2021 – Current. **Member** of International Quality Controlled Ocean Database (IQuOD)

[As a task team leader of (1) 'duplicate checking' to develop an automatic duplicate checking algorithm for ocean profiles with robustness examination (Feb 2022 – Sept 2024); (2) best-practice salinity quality control system activity (Nov 2024 – current). The duplicate checking results have been incorporated into the World Ocean Database (WOD). Participated in the IQuOD steering team meeting (July 2023, Potsdam, Germany). Supervised a master's student for her academic training. A paper was published in Frontier in Marine Sciences]

[3] Oct 2024 – Current. **Ocean Expert** of IOC/IODE – Intergovernmental Oceanographic Commission, UNESCO

[4] March 2025 – Current. **Member** of XBT Data Management Team (XBT-DM) under the framework of the Ship Of Opportunity Programme (SOOP)

[5] Jan 2024 – Oct 2024. **Young scholar** of Climind (https://home.climind.co/)

[As a young scholar at Climind, involved in a project utilizing AI large language models (LLMs) to accelerate the communication and dissemination of climate knowledge. The role encompassed integrating various climate databases, including textual tokens from IPCC historical reports, to build and evaluate the Climind LLM's robustness and accuracy in handling climate-related queries. Participated in the 9th Youth Geosciences Forum of China (June 2024, Xiamen, China). This initiative aimed to facilitate the dissemination of climate science and support the systematic literature review process for the IPCC report]

[6] Journals Reviewer of Journal of Geophysical Research: Oceans (JGR-oceans), *Frontiers in Marine Sciences* (FMS), *Atmospheric and Oceanic Science Letters* (AOSL), *International Journal of Climatology (IJC)*, *Journal of Operational Oceanography*

[7] Session Convener of 2026 AGU Ocean Science Meeting (Glasgow, Scotland): Changing Ocean Physical Conditions in a Warming Climate (session primary chair).

[8] Expert Reviewer on Special Report on Climate Change and Cities of IPCC Seventh Assessment Cycle (AR7)

Co-supervision

Xinyi Song (M.S., October 2022 – September 2024): Development and evaluation of the duplicate checking algorithm of global ocean databases.

Yingfan Sun (M.S. October 2023 – September 2024): Investigation the systematic bias of Argo salinity data.

Publications

Total citations: 570+, H-index: 10, i-10 index: 10 (Google Scholar, 01/2026)

2026

[1] Liu Xu, Licheng Feng, Lijing Cheng, **Zhetao Tan**, Cuijuan Sui, Chunyang Song (2026): Spatiotemporal Changes of Ocean Heat Content in the Seas around China. *Advances in Atmospheric Sciences.* 1-19

[2] Yuying Pan, Lijing Cheng, John Abraham, Kevin Trenberth…., **Zhetao Tan**,…. Miao Zhang, Lin Chen (2026): The Ocean Heat Content Sets New Records in 2025 Signals Accelerated Climate

Warming. *Advances in Atmospheric Sciences.* 1-23

2025

[1] **Tan, Z.,** K. v. Schuckmann, S. Speich, L. Bopp, J. Zhu, and L. Cheng. (2025): Observed large-scale and deep-reaching compound ocean state changes over the past 60 years. *Nature Climate Change*. 1-11. https://doi.org/10.1038/s41558-025-02484-x [Altmetric scores: 180+]

[2] **Tan Z,** Zhu Y, Cheng L, Gouretski V, Pan Y, Yuan H, Wang Z, Li G, Song X, Zhang B, Bao S, Li Y, Zhu J. 2025. CODC-S: A quality-controlled global ocean salinity profiles dataset. *Scientific Data*, 12: 917.

[3] Cheng L. J. Abraham, K. E. Trenberth, J. Reagan, H.-M. Zhang, A. Storto, K. Von Schuckmann, Y. Pan, Y. Zhu, M. E. Mann, J. Zhu, F. Wang, F. Yu, R. Locarnini, J. Fasullo, B. Huang, G. Graham, X. Yin, V. Gouretski, F. Zheng, Y. Li, B. Zhang, L. Wan, X. Chen, D. Wang, L. Feng, X. Song, Y. Liu, F. Reseghetti, S. Simoncelli, G. Chen, R. Zhang, A. Mishonov, **Z. Tan**, W. Wei, H. Yuan, G. Li, Q. Ren, L. Cao, Y. Lu, J. Du, K. Lyu, A. Sulaiman, M. Mayer, H. Wang, Z. Ma, S. Bao, H. Yan, Z. Liu, C. Yang, X. Liu, Z. Hausfather, T. Szekely, F. Gues: 2025: Record High Temperatures in the Ocean in 2024. *Advances in Atmospheric Sciences*.

2024:

[1] X. Song†, **Z. Tan**†, R. Locarnini, S. Simoncelli, R. Cowley, S.i Kizu, T. Boyer, F. Reseghetti, G. Castelao, V. Gouretski, L. Cheng, 2024: DC_OCEAN: An open-source algorithm for identification of duplicates in ocean database. *Frontier in Marine Science*. 11. [†: co-first author]

[2] Cheng, L., Pan, Y., **Tan, Z.**, Zheng, H., Zhu, Y., Wei, W., Du, J., Yuan, H., Li, G., Ye, H., Gouretski, V., Li, Y., Trenberth, K., Abraham, J., Jin, Y., Reseghetti, F., Lin, X., Zhang, B., Chen, G., Mann, M., and Zhu, J., 2024: IAPv4 ocean temperature and ocean heat content gridded dataset. *Earth Syst. Sci. Data.* [JCR Q1]

[3] Zhang B., L. Cheng, **Z. Tan**, V. Gouretski, F. Li, Y. Pan, H. Yuan, H. Ren, F. Reseghetti, J. Zhu, and F. Wang, 2024: CODC-v1: a quality-controlled and bias-corrected ocean temperature profile dataset from 1940-2023. *Scientific Data,* 11(1), 666

[4] Yuan H., L. Cheng*, Y. Pan, **Z. Tan**, Q. Liu, Z. Jin, 2024: A multi-level parallel approach to increase the computation efficiency of a global ocean temperature dataset reconstruction. *Journal of Parallel and Distributed Computing*, 104938.

[5] Viktor Gourteski, Lijing Cheng, Juan Du, Xiaogang Xing, Fei Chai, **Zhetao Tan**. 2024: A consistent ocean oxygen profile dataset with new quality control and bias assessment. *Earth Syst. Sci. Data.* 2024, 1-27.

[6] Cheng L… **Z. Tan**, … Y. Lu, 2024: New record ocean temperatures and related climate indicators in 2023, *Advances in Atmospheric Sciences*. [Altmetric scores: 5000+]

[7] Yuan H., T. Li, Z. Jin., L. Cheng, **Z. Tan**, B. Zhang, Y. Wang., 2024: CODC-pyParaQC: A design and implementation of parallel quality control for ocean observation big data. 2024 *IEEE International Symposium on Parallel and Distributed Processing with Applications*, 2024, pp. 1863-1870.

[8] Simoncelli, S., Cowley, R., **Tan, Z.**, Killick, R., Castelão, G., Cheng, L., Good, S., Boyer, T., Mills, B., Bhaskar, U., & Locarnini, R. (2024). The International Quality-controlled Ocean Database (IQuOD). Miscellanea INGV, 80, 139–140. https://doi.org/10.13127/MISC/80/50

2023:

[1] **Tan Z.**, Cheng L., Gouretski V., Zhang B., Wang Y., Li F., Liu Z., Zhu J., 2023: A new automatic

quality control system for ocean *in-situ* temperature observations and impact on ocean warming estimate. *Deep-Sea Research Part I*, 194, 103961

2022:

[1] **Tan, Z.**, B. Zhang, X. Wu, M. Dong, L. Cheng*, 2022: Quality control for ocean observations: From present to future. *Science China-Earth Sciences*, 65(2):215-233 [JCR Q1]

[2] Cheng, L., J. Abraham, K. E. Trenberth, J. Fasullo, T. Boyer, M. E. Mann, J. Zhu, F. Wang, R. Locarnini, Y. Li, B. Zhang, **Z. Tan**, F. Yu, L. Wan, X. Chen, X. Song, Y. Liu, F. Reseghetti, S. Simoncelli, V. Gouretski, G. Chen, A. Mishonov, J. Reagan, 2022: Another record: Ocean warming continues through 2021 Despite La Niña Conditions. *Advances in Atmospheric Sciences*. [Altmetric scores: 4451]

[3] Liu, Y, L. Cheng, Y. Pan, **Z. Tan**, J. Abraham, B. Zhang, J. Zhu, and J. Song, 2022: How well do CMIP6 and CMIP5 models simulate the climatological seasonal variations of ocean salinity? *Advances in Atmospheric Sciences*

2021:

[1] **Tan Z.**, Reseghetti F, Abraham J, Cowley R, Chen K, Zhu J, Zhang B, Cheng L, 2021: Examining the Influence of Recording System on the Pure Temperature Error in XBT Data. *Journal of Atmospheric and Oceanic Technology*, 38, 759-776.

[2] Zhang B., F. Li, G. Zheng, Y. Wang, **Z. Tan,** X. Li, 2021: Developing big ocean system in support of Sustainable Development Goals: challenges and countermeasures. *Big Earth Data*, 5(4), 557-575.

Patents

[1] Cheng L., **Z. Tan**, B. Zhang, J. Zhu., 2023. A method and system for quality control ocean profile observations. CN202310234743.4

Programming Skills

MATLAB, Python, CDO, SQL, Shell, Fortran, C

Projects

[1] Feb 2025 – Current Ice sheet impacts on global ocean circulation (WP5), Ocean-Cryosphere Exchanges in ANtarctica: Impacts on Climate and the Earth System (OCEAN:ICE), Horizon Europe project. **Lead Investigator**

[Severed in the Working Package 5 (WP5) to investigate long-term historical changes in the salinity and freshwater budget of the South Atlantic Ocean, focusing on the roles of AMOC variability and regional salinity redistribution processes under climate change. Analyzing critical regions of freshwater accumulation, identifying climate-driven salinity changes across distinct water layers and water mass, and evaluating implications for ocean stratification and future climate stability]

[2] November 2025 – November 2027. Integrated Research on Disaster Risk (IRDR), International Science Council, International Young Scientists Program Project. **Principal Investigator**

[Developing an integrated ocean compound climate risk assessment framework within Exclusive Economic Zones. Quantifying the compound climatic impact-drivers and evaluating coastal socio-economic systems in terms of compound climate risk exposure and vulnerability. Proposal selected as a Top 10 awardee from 41 global applications]

[3] 01/2020 – 12/2024 Strategic Priority Research Program of the Chinese Academy of Sciences (XDB42040402). 1,500,000 RMB. **Lead Investigator**

[Developed an ocean data quality control system (CODC-QC), and improved XBT bias correction methods for reconstructing climate grid products. **Developed standardized methods and procedures for the IAP ocean temperature, salinity, and ocean heat content annual update**, including the raw data acquisition and formatting, the removal of duplicates, the data quality control, instrumental bias corrections, data mapping, and the data release. **Contributed to the annual release of the IAP global ocean temperature and OHC time series.** Constructed a monthly update and maintained global ocean *in-situ* science database (CODCv1), in which variables include temperature, salinity, and dissolved oxygen]

[4] 01/2022 – 12/2024 National Natural Science Foundation of China: "Ocean and Climate Change" (42122046). 2,000,000 RMB. Primary Contributors

[Understood the spatial-temporal pattern and the long-term exposure of the ocean compound climate change represented by different climatic drivers; Improved the CODC-QC performance, and quantified the uncertainty in OHC estimate induced by QC]

[5] 07/2019 – 06/2022 National Key Technology R&D Program: "Reconstruction of key ocean variables" (2017YFA0603200). 4,770,000 RMB. **Primary Contributors**

[Developed an updated XBT bias correction scheme to reduce the global XBT bias for IAP temperature gridded product development]

[6] 01/2025 – now. International Quality-controlled Ocean Database (IQuOD) Initiative: Ocean Salinity Automatic Quality Control Benchmarking & Best Practice Development. **Principal Investigators.**

[Led cross-border evaluation of salinity AutoQC methodologies; Coordinated multiple international labs to deliver best-practice salinity quality control protocols]

Ongoing studies

[1] Investigate long-term historical changes in the salinity and freshwater budget of the South Atlantic Ocean, analyzing critical regions of freshwater accumulation, identifying climate-driven salinity changes across distinct water layers and water mass. Post-doc investigator of WP5 for OCEAN:ICE project founded by Horizon Europe.

[2] Compound climate risk assessment of global EEZs and marine aquaculture to the ocean compound climatic impact-drivers (multi-hazards) by proposing and evaluating a comprehensive climate risk assessment framework for mariculture using hazards (disasters), exposure, and vulnerability components.

[3] IAP Ocean *in-situ* observation database (CODC) development and maintenance. Developed and maintained the bias-corrected, quality-controlled, format unified Chinese Academy of Sciences Ocean Data Center (CODC) database. Ongoing research includes developing Argo salinity bias correction algorithm, developing quality control methods for dissolved oxygen data, and updating data release policy from seasonal release to monthly release.

Awards/Scholarships/Certifications/Grants

[1] Travel Grants from UNESCO participants to the Joint Meeting IQuOD/GTSPP/SOOP/XBT (award by IOC/UNESCO; 2024; 1600€)

[2] Certificate in CFA-ESG investing (awarded by the CFA institute, 2023)

[3] National Scholarship (honored by the China Ministry of Education; 2021)

[4] Excellent Graduates Student of Sichuan Province (honored by Sichuan Ministry of Education, only for top 0.2% students every year; 2019)

[5] Top One Scholarship of the University (only for top 1% students every year; 2019)

Data products

[1] Constructed and maintained a quality-controlled and bias-corrected global ocean temperature profile data (refers as CAS-Ocean Data Center, Global Ocean Science Database or CODC-v1). See product at http://www.ocean.iap.ac.cn/

[2] Constructed and maintained a quality-controlled global ocean salinity profile data (refers as CODC-S). See product at https://doi.org/10.1038/s41597-025-05172-9

[3] Constructed a benchmark dataset for ocean profiles duplicate checking. See product at http://dx.doi.org/10.12157/IOCAS.20230821.001

Science Policies

[1] Global Ocean Temperature and Ocean Heat Content Monitoring funded by the National Marine Environmental Monitoring Center (NMEMC), Technical Contributor (2021-2023)

[Synthesized current data-processing techniques (bias corrections, data quality control, format unify, mapping etc.) to create lists of comprehensive figures of supporting monthly release reports]

[2] UNFCCC-COP27 (Egypt), Outflow delegation and coordinator (November 2022)

[Communicated, collaborated, and coordinated the team and delegated outflows for a side event (Climate Extremes: Prediction and Early Warning) hosted by the Institute of Atmospheric Physics, Chinese Academy of Science at China Pavilion]

Presentations/Conferences/Trainings/Summits

[1] 02/2026 Glasgow, UK. Ocean Science Meeting 2026 (Oral)

[Presentation tile: Changing Properties of South Atlantic Upper-Ocean Water Masses During the Past 45 Years]

[2] 12/2025 Nanjing, China. Nanjing University (Oral)

[Presentation tile: The ocean is changing faster than we initially thought in a warming climate]

[3] 10/2025 OCEAN:ICE WP5 webinar (Ice sheet Meltwater & Global Ocean Circulation), European Polar Board, *online webinar* (Invited talk)

[Presentation title: New observations on water mass properties changes in the South Atlantic]

[4] 09/2025 Bergen, Norway, Bjerknes Centre for Climate Research (BCCR) seminar (Invited speaker)

[Presentation title: Data-driven science: From Global Compound Ocean State Change to South Atlantic Water Masses Responses]

[5] 09/2025 Bergen, Norway, Bjerknes 2025 Annual Meeting (poster)

[Poster title: Observed large-scale and deep-reaching compound ocean state changes in a warming climate]

[6] 09/2025 Copenhagen, Denmark, OCEAN:ICE Annual Meeting (Oral)

[Presentation title: Water properties changes over the past 40 years in the South Atlantic]

[7] 03/2025 Paris, France, COP@CITE simulation, Cité Internationale Universitaire de Paris (Invited speaker)

[presentation title: Ocean warming and its impacts on marine ecosystems]

[8] 11/2024 Bologna, Italy, Joint IQuOD/GTSPP/SOOP/XBT meeting (Invited talk)

[Presentation title: Quality control for historical salinity data and an investigation of potential Argo salinity bias]

[9] 11/2024 Paris, France, visited the Department of Geosciences, École Normale Supérieure (ENS),

Université Paris Sciences et Lettres (PSL)

[10] 10/2024 Haikou, China, The 3rd Impact Climate Innovation Conference (Invited talk)

[11] 06/2024 Xiamen, China, The 9th Youth Geosciences Forum of China (Oral)

[12] 02/2024 New Orleans, USA, Ocean Science Meeting 2024 (Poster)

[Poster title: Global emergence of ocean compound climatic impact-drivers]

[13] 07/2023 Berlin, Germany, IUGG 2023 (Oral)

[Presentation title: A new ocean data quality control system reveals a stronger ocean warming rate]

[14] 07/2023 Potsdam, Germany, International Quality-Controlled Ocean Database (IQuOD) steering team meeting (Task team leader)

[Presentation title: Duplicate checking task team: progress and future work]

[15] 04/2023 Vienna, Austria, EGU 2023 (Oral)

[Presentation title: Global emergence of compound climatic impact-drivers]

[16] 03/2023 Paris, France. École Normale Supérieure (Invited talk)

[Presentation title: Global emergence of compound climatic impact-drivers reveals a high exposure of marine environment]

[17] 11/2022 Sharm El Sheikh, Egypt, UNFCCC-COP27 (Outflow delegation)

[18] 10/2022 Darmstadt, Germany, 2nd Global Climate Observation System (GCOS) meeting (Participant)

[19] 02/2022 Hawaii, USA, Ocean Sciences Meeting 2022, *online conference* (Oral)

[Presentation title: Toward a practical quantification of uncertainty in ocean heat content (OHC) due to data quality control (QC) procedures]

[20] 11/2021 Guangzhou, China, The 13th Physical Oceanography Training on "Oceans, Climate and Environmental Change" hosted by the State Key Laboratory of Tropical Marine Environment.

[21] 09/2021 Beijing, China, 1st International Forum on Big Data for Sustainable Development Goals (Volunteer).

[22] 08/2021 Hohhot, China, The 7th China Science Data (Oral)

[Presentation title: Progress in developing Chinese Academy of Sciences Ocean Data Center (CODC) database (in Chinese)]

[23] 08/2021 Singapore, 18th annual meeting of Asia Oceania Geosciences Society, *online conference* (Poster)

[24] 07/2021 Guiyang, China, The 7th Youth Geosciences Forum (Oral)

[Presentation title: Time of emergence: Have the regional long-term ocean warming in the upper 2000m exceeded from the local climate variability? (in Chinese)]

[25] 02/2021-05/2021 Jinan, China, Training on Climate Change Economics host by Shandong University of Finance and Economics

[26] 04/2021 Netherland, 2021 International conference on Marine Data and Information Systems (IMDIS), *online conference* (Participant)

[27] 10/2019 Xining, China, The 6th Youth Geosciences Forum (Participant)

[28] 09/2019 Beijing, China, 2019 Committee on Data (CODATA) Conference: Towards Next-Generation Data-driven Science **(Oral)**

[Presentation title: Examining the influence of recording system on the pure temperature bias in XBT data]

[29] 06/2019 Chengdu, China, 2019 Community Satellite Processing Package Users' Group Meeting (Volunteer)

[30] 01/2019 Xiamen China, The 4th Xiamen Symposium on Marine Environmental Sciences (Participant)

[31] 08/2018 Beijing, China, 2018 Third Pole Environment Science & Technology Training: Geology, Geophysics, Ecology and Environmental Change (Participant)

Field Works

[1] **01/2025 Scientific Crew Member** of the South China Sea **Scientific Experimental Mission & Citizen Science Program**. *Vessel: "Shen Kuo (沈括号)" (Affiliated with China Ocean Mineral Resources Research and Development Association, COMRA)*, *Cruise No. SLSK-00392502*

[Deployments of several instruments, mainly CTD casts around the South China Sea; Delivered the scientific outreach classes]

Outreach

[1] Chapter Contributor (e.g., literature reviews, figure creations) of the Ocean, Cryosphere, and Sea Level to the higher education textbook 'Climate Change Science Series' (in Chinese)

[2] Science popularization article "Conducting a 'Health Check' for the Ocean (给海洋做"体检")" in Chinese social media. (07/2022)

[3] Science popularization article 'Global Ocean Warming Breaks Record in 2023: how do we understanding this phenomenon? (2023 年 :全球海洋变暖"破纪录", 我们该如何理解这一现象)' in the official social media of Chinese Academy of Science (in Chinese) (01/2024)

[4] Science popularization article "Beyond warming: the ocean is under compound stress. Is a mass extinction scenario unfolding? (海洋不仅在"发烧"，还得了"三高"！生物大灭绝的剧本正在上演？" in Chinese social media. (12/2025)