TAN Zhetao

Doctor of Philosophy
Institute of Atmospheric Physics, Chinese Academy of Sciences

Personal information

Date of birth: June 1997 Gender: Male Nationality: China
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Education

2019 – 2024, Ph.D., Institute of Atmospheric Physics, Chinese Academy of Sciences (IAP/CAS)

Research Focus: physical oceanography, operational oceanography, ocean climate change

Title of Ph.D. Thesis: *The construction of ocean in-situ observational database and the investigation of ocean compound climatic impact-drivers*

Supervisor: Prof. CHENG Lijing; Prof. ZHU Jiang

2022 – 2023, Visiting Ph.D., Mercator Ocean international, Toulouse, France

Research Focus: Ocean compound climate change, climate risk assessment (collaborate with École Normale Supérieure du Paris, France)

Supervisor: Karina von Schuckmann, Sabrina Speich

2015 - 2019, B.S., Chengdu University of Information Technology, Chengdu, China

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

Languages

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

Research Focus

Compound climate change (climatic impact-drivers; indicators monitor; detection & attribution)
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)
Mariculture disasters risk reduction

International Services

[1] Member of International Quality Controlled Ocean Database (IQuOD)
[As a task team leader of 'duplicate checking' to develop an automatic duplicate checking algorithm for ocean profiles with robustness examination. 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]
[2] 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]

[3] Journals Reviewer of Atmospheric and Oceanic Science Letters (AOSL), International Journal of Climatology, Journal of Operational Oceanography

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: 193, H-index: 7, i-10 index: 6 (Google Scholar, 10/2024)

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; advised M.S. student]

[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.*

[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*

[7] 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

[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] Strategic Priority Research Program of the Chinese Academy of Sciences (XDB42040402). 1,500,000 RMB. **Primary Contributors** (PI: Lijing Cheng, Jiang Zhu)

[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]

[2] National Natural Science Foundation of China: “Ocean and Climate Change” (42122046). 2,000,000 RMB. **Primary Contributors** (PI: Lijing Cheng)

[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]

[3] National Key Technology R&D Program: “Reconstruction of key ocean variables” (2017YFA0603200). 4,770,000 RMB. **Contributors** (PI: Lijing Cheng)

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

Ongoing studies

[1] A new automated quality control system for ocean salinity profile data. Led the team with

NOAA/NECI to co-develop a quality control system for salinity data, with robust evaluation.
[2] Compound climate risk assessment of global 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] Ocean *in-situ* observation database (CODCv1) development. 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

[1] Certificate in CFA-ESG investing (awarded by the CFA institute, 2023)
[2] National Scholarship (honored by the China Ministry of Education; 2021**)**
[3] Excellent Graduates Student of Sichuan Province (honored by Sichuan Ministry of Education, only for top 0.2% students every year; 2019**)**
[4] 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 ocean 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 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

[1] 06/2024 Xiamen, China, The 9th Youth Geosciences Forum of China (Oral)
[2] 02/2024 New Orleans, USA, Ocean Science Meeting 2024 (Poster)
[Poster title: Global emergence of ocean compound climatic impact-drivers]
[3] 07/2023 Berlin, Germany, IUGG 2023 (Oral)
[Presentation title: A new ocean data quality control system reveals a stronger ocean warming rate]
[4] 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]
[5] 04/2023 Vienna, Austria, EGU 2023 (Oral)

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

[6] 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]

[7] 11/2022 Sharm El Sheikh, Egypt, UNFCCC-COP27 (Outflow delegation)

[8] 10/2022 Darmstadt, Germany, 2nd Global Climate Observation System (GCOS) meeting (Participant)

[9] 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]

[10] 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.

[11] 09/2021 Beijing, China, 1st International Forum on Big Data for Sustainable Development Goals (Volunteer).

[12] 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)]

[13] 08/2021 Singapore, 18th annual meeting of Asia Oceania Geosciences Society, *online conference* (Poster)

[14] 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)]

[15] 02/2021-05/2021 Jinan, China, Training on Climate Change Economics host by Shandong University of Finance and Economics

[16] 04/2021 Netherland, 2021 International conference on Marine Data and Information Systems (IMDIS), *online conference* (Participant)

[17] 10/2019 Xining, China, The 6th Youth Geosciences Forum (Participant)

[18] 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]

[19] 06/2019 Chengdu, China, 2019 Community Satellite Processing Package Users' Group Meeting (Volunteer)

[20] 01/2019 Xiamen China, The 4th Xiamen Symposium on Marine Environmental Sciences (Participant)

[21] 08/2018 Beijing, China, 2018 Third Pole Environment Science & Technology Training: Geology, Geophysics, Ecology and Environmental Change (Participant)

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)