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EDUCATION

1994/09-2000/12	Ph.D.	Marine Sciences Research Center, State University of New York at Stony Brook, USA
1992/09-1994/06	M.S.	Institute of Oceanography, National Taiwan University, Taiwan
1985/09-1989/06	B.S.	Department of Marine Resources, National Sun Yat-sen University, Taiwan

EMPLOYMENT

2017/01-present	Research Fellow, RCEC, Academia Sinica, Taiwan
2017/08-present	Professor (joint appointment), Institute of Oceanography, National Taiwan University, Taiwan
2017-present	Professor, Taiwan International Graduate Program, Earth System Science, (Collaborated with National Central University & National Taiwan University).
2012/01-2017/01	Associate Research Fellow, RCEC, Academia Sinica, Taiwan
2006/09-2012/01	Assistant Research Fellow, RCEC, Academia Sinica, Taiwan
2006/02-2006/08	Assistant Professor, Institute of Marine Environment and Ecology, National Taiwan Ocean University, Taiwan
2004/08-2006/01	Assistant Professor, Department of Earth and Environmental Sciences, National Chung Cheng University, Taiwan
2003/08-2004/07	Distinguished Postdoctoral Fellow, Institute of Earth Sciences, Academia Sinica
2000/11-2003/07	Postdoctoral Fellow, Department of Geosciences, Princeton University, USA

HONORS & AWARDS

2024	Outstanding Research Award, National Science and Technology Council, Taiwan
2023	Annual Contribution Award, Future Earth Taipei, Taiwan
2022	Oceanochemistry Award, Research Institute for Oceanochemistry Foundation, Japan
2021-2025	Investigator Award, Academia Sinica, Taiwan
2015-2019	Career Development Award, Academia Sinica, Taiwan
2019-2024	Visiting Scholarship, International Joint Usage/Research Center, Institute for Chemical

Research, Kyoto University, Japan

2011-2015 Annual Significant Publications (2010, 2011, & 2014), Academia Sinica, Taiwan

2008-2012 Science Vanguard Research Program, National Science Counsel, Taiwan (with C.-F. You, H.-J. Yang, and D.-C. Lee)

2003-2005 Distinguished Postdoctoral Fellowship, Academia Sinica

2000 Invited to *Dissertations Symposium in Chemical Oceanography* (DISCO), NSF, USA

1994-1997 Full Scholarship to study Ph.D. abroad, Ministry of Education, Taiwan

PROFESSIONAL EXPERIENCE & ACADEMIC SERVICE

- Coordinator, Taiwan International Graduate Program, Earth System Science, 2024-present
- International Implementation Committee member, BioGeoSCAPES, 2024-present
- Associate Editor, *Geochimica et Cosmochimica Acta*, 2024-present
- Convener, Ocean Working Group, Future Earth Taipei, 2020-present
- Full Member, SCOR WG167 International project RUSTED (Reducing Uncertainty in Soluble aerosol Trace Element Deposition), 2022-2026
- Guest Editor, Special issue: "Biogeochemical Studies on Atmosphere, Ocean, and their Interaction in the western North Pacific region" on *Progress in Earth and Planetary Science*, 2024-2025
- Steering Committee Member, Ocean KAN, Future Earth, 2022-2025
- Editorial Board Member, *Scientific Reports*, 2015-2021
- Scientific Steering Committee Member, GEOTRACES, 2013-2018
- Planning Committee Member, Ocean Sciences Meeting, USA, 2015-2016
- Reviewing Committee Member, Oceanography Division, Department of Natural Sciences and Sustainable Development, Ministry of Science and Technology, Taiwan, 2015-2017

REPRESENTATIVE PUBLICATIONS (*corresponding author)

1. Hsieh, C.-C, and **T.-Y. Ho*** (2024) Contribution of anthropogenic and lithogenic aerosol Fe in the East China Sea. *Journal of Geophysical Research: Oceans* doi: 10.1029/2024JC021113.
2. Hsieh, C.-C., C.-F. You, and **T.-Y. Ho*** (2023) The solubility and deposition flux of East Asian aerosol metals in the East China Sea: The effects of aeolian transport processes. *Marine Chemistry* doi: 10.1016/j.marchem.2022.104268.
3. Wu, H.-Y., C.-C. Hsieh, and **T.-Y. Ho*** (2023) Trace metal dissolution kinetics of East Asian size-fractionated aerosols in seawater: The effect of a model siderophore. *Marine Chemistry* doi: 10.1016/j.marchem.2023.104277.
4. Hsieh, C.-C., H.-Y. Chen, and **T.-Y. Ho*** (2022) The effect of aerosol size on Fe solubility and deposition flux: A case study in the East China Sea *Marine Chemistry* doi: 10.1016/j.marchem.2022.104106.

5. Chen, C.-C., I. B. Rodriguez, Y.-l. L. Chen, J. P. Zehr, Y.-R. Chen, S.-T. D. Hsu, S.-C. Yang, and **T.-Y. Ho*** (2022) Nickel superoxide dismutase protects nitrogen fixation in *Trichodesmium*. *Limnology and Oceanography Letters* doi: 10.1002/lol2.10263.
6. Li, H.-T., S. Tuo, M.-C. Lu, and **T.-Y. Ho*** (2022) The effects of Ni availability on H_2 production and N2 fixation in a model unicellular diazotroph: The expression of hydrogenase and nitrogenase. *Limnology and Oceanography* doi: 10.1002/lno.12151.
7. Liao, W.-H., S. Takano, H.-A. Tian, H.-Y. Chen, Y. Sohrin, and **T.-Y. Ho*** (2021) Zn elemental and isotopic features in the sinking particles of the South China Sea: the implications to its sources and sinks *Geochimica et Cosmochimica Acta* doi: 10.1016/j.gca.2021.09.013.
8. Reich*, H. G., W.-C. Tu, I. B. Rodriguez, Y. Chou, E. F. Keister, D. W. Temp, T. C. LaJeunesse, and **T.-Y. Ho*** (2021) Iron availability modulates the response of endosymbiotic dinoflagellates to heat stress. *Journal of Phycology* doi: 10.1111/jpy.13078.
9. Wang, B.-S. and **T.-Y. Ho*** (2020) Aerosol Fe cycling in the surface water of the Northwestern Pacific Ocean. *Progress in Oceanography* doi: 10.1016/j.pocean.2020.102291.
10. Reich*, H. G., I. B. Rodriguez, T. C. LaJeunesse, and **T.-Y. Ho*** (2020) Endosymbiotic dinoflagellates pump iron: differences in iron and other trace metal needs among the Symbiodiniaceae. *Coral Reefs* doi: 10.1007/s00338-020-01911-z.
11. Liao, W.-H., S. Takano, S.-C. Yang, K.-F. Huang, Y. Sohrin, and **T.-Y. Ho*** (2020) Zn isotopic composition in the water column of the Northwestern Pacific Ocean: the importance of external sources. *Global Biogeochemical Cycles* doi: 10.1029/2019GB006379.
12. Tuo, S., I. B. Rodriguez, and **T.-Y. Ho*** (2020) H_2 accumulation and N_2 fixation variation by Ni limitation in *Cyanothece*. *Limnology and Oceanography* doi: 10.1002/lno.11305.
13. Liao, W.-H. and **T.-Y. Ho*** (2018) Particulate trace metal composition and sources in the Kuroshio adjacent to the East China Sea: The importance of aerosol deposition. *Journal of Geophysical Research: Oceans* doi: 10.1029/2018JC014113.
14. Yang, S.-C., J. Zhang, Y. Sohrin, and **T.-Y. Ho*** (2018) Cadmium cycling in the water column of the Kuroshio-Oyashio Extension region: Insights from dissolved and particulate isotopic composition. *Geochimica et Cosmochimica Acta* doi: 10.1016/j.gca.2018.05.001.
15. Rodriguez, I. B. and **T.-Y. Ho*** (2018) Trace metal requirements and interactions in *Symbiodinium kawagutii*. *Frontiers in Microbiology* doi: 10.3389/fmicb.2018.00142.
16. Liao, W.-H., S.-C. Yang, and **T.-Y. Ho*** (2017) Trace metal composition of size-fractionated plankton in the Western Philippine Sea: The impact of anthropogenic aerosol deposition. *Limnology and Oceanography* 52: 2243–2259.
17. Rodriguez, I. B. and **T.-Y. Ho*** (2017) Interactive effects of spectral quality and trace metal availability on the growth of *Trichodesmium* and *Symbiodinium*. *PLoS ONE* doi: 10.1371/journal.pone.0188777.

18. Rodriguez I. B., S. Lin, J. Ho, and **T.-Y. Ho*** (2016) Effects of trace metal concentrations on the growth of the coral endosymbiont *Symbiodinium kawagutii*. *Frontiers in Microbiology* 7:82 doi: 10.3389/fmicb.2016.00082.
19. Yang, S.-C., D.-C. Lee, and **T.-Y. Ho*** (2015) Cd isotopic composition in the suspended and sinking particles of the surface water of the South China Sea: the effects of biotic activities. *Earth and Planetary Science Letters* doi:10.1016/j.epsl.2015.07.025.
20. Rodriguez, I. B. and **T.-Y. Ho*** (2015) Influence of Co and B_{12} on the growth and nitrogen fixation of *Trichodesmium*. *Frontiers in Microbiology* doi: 10.3389/fmicb.2015.00623.
21. **Ho*, T.-Y.**, H.-H. Yang, G. T. F. Wong, and F.-K. Shiah (2015) Controls on temporal and spatial variations of phytoplankton pigment distribution in the northern South China Sea. *Deep-Sea Research II* doi:10.1016/j.dsr2.2015.05.015.
22. Rodriguez, I. B. and **T.-Y. Ho*** (2014) Diel nitrogen fixation pattern of *Trichodesmium*: the interactive control of light and Ni, *Scientific Reports* doi:10.1038/srep04445.
23. Wang, B.-S. C.-P. Lee, and **T.-Y. Ho*** (2014) Trace metal determination in natural waters by automated solid phase extraction system and ICP-MS: the influence of low level Mg and Ca, *Talanta* doi:10.1016/j.talanta.2014.04.077.
24. **Ho*, T.-Y.**, T.-H. Chu, and C.-L. Hu (2013) Interrelated influence of light and Ni on *Trichodesmium* growth. *Frontiers in Microbiology* doi: 10.3389/ fmicb.2013.00139.
25. **Ho*, T.-Y.** (2013) Nickel limitation of nitrogen fixation by *Trichodesmium*. *Limnology and Oceanography* 58:112-120.
26. **Ho*, T.-Y.**, W.-C. Chou, H.-L. Lin, and D. D. Sheu (2011) Trace metal cycling in the deep water of the South China Sea: The composition, sources, and fluxes of sinking particles. *Limnology and Oceanography* doi:10.4319/lo.2011.56.4.
27. **Ho*, T.-Y.**, W.-C. Chou, C.-L. Wei, F.-J. Lin, G. T. F. Wong, and H.-L. Lin (2010) Trace metal cycling in the surface water of the South China Sea: Vertical fluxes, composition, and sources. *Limnology and Oceanography* 55:1807-1820.
28. **Ho*, T.-Y.**, C.-T. Chien, B.-N. Wang, A. Siriraks. (2010) Determination of trace metals in seawater by an automated flow injection ion chromatograph pretreatment system with ICPMS. *Talanta*. doi:10.1016/j.talanta.2010.07.022.
29. **Ho*, T.-Y.**, C.-F. You, W.-C. Chou, S.-C. Pai, L.-S. Wen, and D. D. Sheu (2009) Cadmium and phosphorus cycling in the water column of the South China Sea: the roles of biotic and abiotic particles. *Marine Chemistry* 115:125-133.
30. **Ho*, T.-Y.**, L.-S. Wen, C.-F. You, and D.-C. Lee (2007) The trace metal composition of size-fractionated plankton in the South China Sea: biogenic versus abiogenic sources. *Limnology and Oceanography* 52: 1776-1788.

31. **Ho*, T.-Y.** (2006) The trace metal composition of marine microalgae in cultures and natural assemblages. pp 271-299. In *Algal Cultures, Analogues of blooms and Applications*. Edited by DV Subba Rao, Science Publishers, New Hampshire, USA.
32. **Ho*, T.-Y.**, Y. Astor, R. Varela, G. T. Taylor, F. Muller-Karger, and M. I. Scranton (2004) Vertical and temporal variability of redox zonation in the water column of the Cariaco Basin: implications for organic carbon oxidation pathways. *Marine Chemistry* 86: 89-104.
33. **Ho*, T.-Y.**, A. Quigg, Z. V. Finkel, A. J. Milligan, K. Wyman, P. G. Falkowski, and F. M. M. Morel (2003) Elemental composition of some eukaryotic marine phytoplankton. *Journal of Phycology*, 39: 1145-1159.
34. **Ho*, T.-Y.**, M. I. Scranton, G. T. Taylor, R. C. Thunell, R. Varela, and F. Muller-Karger (2002) Acetate cycling in the water column of the Cariaco Basin: seasonal and vertical variability, and implication for carbon cycling. *Limnology and Oceanography* 47: 1119-1128.

The complete publication and citation information of my papers may be found through the Google Scholar link. TYHO Google Scholar

INVITED PRESENTATION

2024/06 Invited talk, AOGS Meeting, PyeongChang, Korea

2022/04 Award acceptance speech, Research Institute for Oceanochemistry Foundation, Japan

2019/06 Invited speaker, Kanazawa University, Japan

2018/09 Invited speaker, Atmosphere and Ocean Research Institute, The University of Tokyo University, Japan

2018/09 Invited talk, Japan BioGEOTRACES Workshop, Nagasaki University, Japan

2017/11 Keynote speech, Research Institute for Oceanochemistry, Japan

2016/08 Plenary talk, *Biogeochemical cycling of trace elements within the ocean: a synthesis workshop*, Lamont-Doherty Earth Observatory, USA

2016/04 Invited speaker, Department of Marine Sciences, University of California at Santa Cruz, USA

RESEARCH INTEREST

Marine Biogeochemistry, Chemical Oceanography, & Marine Environmental Changes

My major research interest, marine trace metal biogeochemistry, focuses on studying the cycling mechanisms of biologically active trace metals, exploring their interaction with phytoplankton, and using them as tracers and proxies to investigate material cycling in the ocean. We have conducted a series of laboratory culture studies and field studies in the NWPO and its marginal seas to investigate trace metals cycling mechanisms and their interaction with phytoplankton and particles. We have mainly focused on the following four research topics: the mechanism of **Ni availability** on controlling N_2 fixation and H_2 production in marine diazotrophic cyanobacteria, the importance of

anthropogenic aerosol deposition on trace metal cycling in the surface water of the Northwestern Pacific Ocean, using trace metal **isotopic composition** as proxies to study trace metal and material cycling in the ocean, and investigating **trace metal requirement** in **Symbiodiniaceae**.

RESEARCH HIGHLIGHTS

1. **Studying the mechanism of Ni availability on controlling N_2 fixation and H_2 production in marine diazotrophic cyanobacteria** Ni is an essential cofactor in Ni superoxide dismutase (SOD) & Ni-Fe uptake hydrogenase, two enzymes responsible for removing superoxides and regulating H_2 cycling in some marine diazotrophic cyanobacteria, respectively. Applying trace metal defined culture techniques (Ho et al. 2003), my group has demonstrated the essential role of Ni on N_2 fixation and H_2 production (Ho 2013; Rodriguez and Ho 2014; Rodriguez and Ho 2017; Tuo et al. 2019). Our most recent study found that Ni limitation results in one order of magnitude higher H_2 accumulation rates in the low Ni than high Ni treatments (Tuo et al. 2019). We propose that Ni deficiency decreases hydrogenase expression and leads to H_2 accumulation and N_2 fixation reduction in marine diazotrophic cyanobacteria. We are currently evaluating our custom-made antibodies for Ni-SOD and Ni-Fe hydrogenase and shall apply them to investigate how Ni availability influences cyanobacterial N_2 fixation and H_2 production in the ocean.

2. **Demonstrating the importance of anthropogenic aerosol deposition on trace metal cycling in the surface water of the Northwestern Pacific Ocean (NWPO).** We have pioneered studies for the impacts of anthropogenic aerosol deposition on trace metal cycling in the oceanic regions. Illustrated by the distribution patterns of trace metal composition and their ratios in seawater, plankton, suspended and sinking particles, and aerosols, our series field studies have demonstrated that anthropogenic aerosols are the major trace metal source in the surface water of the South China Sea, Western Philippine Sea, the Kuroshio, and the NWPO (e.g., Ho et al. 2007; Liao et al. 2017; Liao and Ho 2018). The impact shall not only be on trace metal cycling but also on phytoplankton community structure and material cycling in the ocean.

3. **Applying trace metal isotopic composition as proxies to study trace metal and material cycling in the ocean.** Trace metal isotopic composition are powerful tracers and proxies to study physical and biogeochemical processes in the ocean. For example, Yang et al. (2018) found that Cd isotope fractionation can match either a closed or open system Rayleigh fractionation model, depending on the relative contribution of physical and biogeochemical processes on its cycling. Liao et al. (2020) found that anthropogenic aerosol deposition may play an important role in causing the variations of $\delta^{66}Zn$ and [Zn] in oceanic surface water globally. A series of trace metal isotopic studies on Fe and Ni are currently ongoing in our laboratory.

4. **Investigating trace metal requirement in Symbiodiniaceae.** Our systematic and seminal studies have obtained fundamental understanding for trace metal requirement in Symbiodiniaceae (Rodriguez et al. 2016; Rodriguez and Ho 2017, 2018; Reich et al. 2020). We found that Symbiodiniaceae possesses high Fe and Zn requirement. Our most recent studies have indicated

that Fe requirement in Symbiodiniaceae may be significantly elevated to sustain their growth at relatively high ambient seawater temperature (Reich et al. 2021). We are carrying out experiments to demonstrate whether Fe availability is an important factor affecting coral bleaching in coral reef ecosystem.