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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
- 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**

- 2022 Oceanochemistry Award (海洋化学學術賞), Research Institute for Oceanochemistry Foundation (公益財団法人海洋化学研究所), Japan
- 2021-2025 Investigator Award, Academia Sinica, Taiwan
- 2015-2019 Career Development Award, Academia Sinica, Taiwan
- 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)

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- 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**

- Steering Committee Member, Ocean KAN, Future Earth, 2022-2025
- Convener, Ocean Working Group, Future Earth Taipei, 2020-present
- 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

## **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<sub>2</sub> fixation and H<sub>2</sub> 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<sub>2</sub> fixation and H<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> fixation and H<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> accumulation and N<sub>2</sub> fixation reduction in marine diazotrophic cyanobacteria. We are currently evaluating our

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custom-made antibodies for Ni-SOD and Ni-Fe hydrogenase and shall apply them to investigate how Ni availability influences cyanobacterial N<sub>2</sub> fixation and H<sub>2</sub> 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  $\delta^{66}\text{Zn}$  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. in prep.). We are carrying out experiments to demonstrate whether Fe availability is an important factor affecting coral bleaching in coral reef ecosystem.

#### **REPRESENTATIVE PUBLICATIONS** (\*corresponding author)

- Hsieh, C.-C., H.-Y. Chen, and **T.-Y. Ho**\* (2021) 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
- 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.

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3. 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.
4. 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.
5. 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.
6. 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.
7. Tuo, S., I. B. Rodriguez, and **T.-Y. Ho\*** (2019) H<sub>2</sub> accumulation and N<sub>2</sub> fixation variation by Ni limitation in *Cyanothece*. *Limnology and Oceanography* doi: 10.1002/lno.11305.
8. 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.
9. 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.
10. 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.
11. 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.
12. 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.
13. 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.
14. **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.
15. 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.

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16. 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.
17. **Ho\*, T.-Y.** (2013) Nickel limitation of nitrogen fixation by *Trichodesmium*. *Limnology and Oceanography* 58:112-120.
18. **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.
19. **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.
20. **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.
21. **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.
22. **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.
23. **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.

#### **INVITED PRESENTATION (2015 - Present)**

- |         |   |
|---------|---|
| 2018/09 | Special seminar, 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 Oceanography, Japan  |
| 2016/08 | Plenary talk, <i>Biogeochemical cycling of trace elements within the ocean: a synthesis workshop</i> , Lamont-Doherty Earth Observatory, USA<br><a href="http://web.whoi.edu/geotraces-synthesis/plenary-speakers/">http://web.whoi.edu/geotraces-synthesis/plenary-speakers/</a> |
| 2016/04 | Departmental seminar, Department of Marine Sciences, University of California at Santa Cruz, USA  |

#### **VISITING EXPERIENCE (2015 - Present)**

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| 2019/12 | Visiting Research Fellow, Institute for Chemical Research, Kyoto University, Japan |
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(Host: Yoshiki Sohrin)

- 2019/7-8 Guest Investigator, Department of Marine Chemistry and Geochemistry, Woods Hole Oceanographic Institution, USA (Host: Daniel Repeta)
- 2018/8-9 Visiting Research Fellow, Department of Chemical Oceanography, Atmosphere and Ocean Research Institute, The University of Tokyo, Japan (Host: Hajime Obata)
- 2015-2016 Visiting Associate Research Fellow, Institute of Ocean Sciences, University of California at Santa Cruz, USA (Host: Jonathan Zehr)