

# Tongtong Xu

Research Scientist

CIRES, University of Colorado Boulder

NOAA Physical Sciences Laboratory

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## A. EDUCATION

Georgia Institute of Technology		Atlanta, USA
Ph.D.	Civil Engineering	2021
M.S.	Computational Science and Engineering	2021
M.S.	Civil Engineering	2015
Sun Yat-sen University		Guangzhou, China
B.E.	Hydrology Engineering	2013

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## B. ACADEMIC POSITION

Research Scientist	CIRES/NOAA Physical Sciences Laboratory	2022-present
Postdoc Fellow	NRC Research Associateship Programs	2021-2022

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## C. RESEARCH INTEREST

Ocean extremes (marine heatwaves, coastal inundation)

Ocean predictability (decadal to near-real time scale, global to coastal scale)

Renewable energy (tidal energy assessment and uncertainty)

Statistical modeling (Linear Inverse Model, deep learning)

Physical modeling (Regional Ocean Modeling System, Simulating WAves Nearshore)

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## D. PUBLICATIONS

### Journal Articles

1. Albers, J. R., M. Newman, M. A. Balmaseda, W. Sweet, Y. Wang & **T. Xu** (2025). Assessing subseasonal forecast skill for use in predicting US coastal inundation risk. *EGU Ocean Science*, 21, 1761–1785.
2. Hovenga, P. A., M. Newman, J. R. Albers, W. Sweet, G. Dusek, **T. Xu**, J. A. Callahan, S.-I. Shin & G. P. Compo (2025). Using stochastically generated skewed distributions to represent hourly nontidal residual water levels at United States tide gauges. *Frontiers in Marine Science*, 12:1618367.
3. Capotondi, A., R. R. Rodrigues, A. S. Gupta, J. A. Benthuysen, C. Deser, T. L. Frölicher, N. S. Loven-duski, D. J. Amaya, N. L. Grixti, **T. Xu**, J. Hermes, N. J. Holbrook, M. K. Roxy, C. Martinez-Villalobos, S. Masina, A. Schaeffer, R. W. Schlegel, K. E. Smith & C. Wang (2024). A global overview of marine heatwaves in a changing climate. *Communications Earth & Environment*, 5, 701.
4. **Xu, T.**, M. Newman, M. A. Alexander & A. Capotondi (2024). Seasonal predictability of bottom temperatures along the North American West Coast. *Journal of Geophysical Research: Oceans*, 129(9): e2023JC020504.

5. Gregory, C. H., C. Artana, S. Lama, D. León-FonFay, J. Sala, F. Xiao, **T. Xu**, A. Capotondi, C. Martinez-Villalobos & N. J. Holbrook (2024). Global marine heatwaves under different flavors of ENSO. *Geophysical Research Letters*, 51(20), e2024GL110399.
6. **Xu, T.**, M. Newman, M. A. Alexander & A. Capotondi (2024). A forecast test for reducing dynamical dimensionality of model emulators. *Journal of Advances in Modeling Earth Systems*, 16(1): e2022MS003599.
7. Saenger, C., C. Jimenez-Diaz, A. Gagnon, A. Mix, A. Ross & **T. Xu** (2024). A framework for reconstructing marine heatwaves from individual foraminifera in low-resolution sedimentary archives. *Frontiers in Marine Science*, 11, 1321254.
8. **Xu, T.**, K. Haas & B. Gunawan (2023). Estimating annual energy production from short tidal current records. *Renewable Energy*, 207: 105-115.
9. Capotondi, A., S. McGregor, M. J. McPhaden, S. Cravatte, N. J. Holbrook, Y. Imada, S. C. Sanchez, J. Sprintall, M. F. Stuecker, C. C. Ummenhofer, M. Zeller, R. Farneti, G. Graffino, S. Hu, K. B. Karnauskas, Y. Kosaka, F. Kucharski, M. Mayer, B. Qiu, A. Santoso, A. S. Taschetto, F. Wang, X. Zhang, R. M. Holmes, J. Luo, N. Maher, C. Martinez-Villalobos, R. Naha, S. Stevenson, A. Sullivan, P. van Renssch, **T. Xu** (2023). Mechanisms of Tropical Pacific decadal variability. *Nature Reviews Earth & Environment*, 4, 754–769.
10. Stevenson, S., X. Huang, Y. Zhao, E. Di Lorenzo, M. Newman, L. van Roekel, **T. Xu** & A. Capotondi (2023). Ensemble spread behavior in coupled climate models: insights from the Energy Exascale Earth System Model version 1 Large Ensemble. *Journal of Advances in Modeling Earth Systems*, 15, e2023MS003653.
11. Di Lorenzo, E., **T. Xu**, Y. Zhao, M. Newman, A. Capotondi, S. Stevenson, D. J. Amaya, B. T. Anderson, R. Ding, J. C. Furtado, Y. Joh, G. Liguori, J. Lou, A. J. Miller, G. Navarra, N. Schneider, D. J. Vimont, S. Wu & H. Zhang (2023). Modes and mechanisms of Pacific decadal-scale variability. *Annual Review of Marine Science*, 15:1.
12. **Xu, T.**, M. Newman, A. Capotondi, S. Stevenson, E. Di Lorenzo & M. A. Alexander (2022). An increase in marine heatwaves without significant changes in surface ocean temperature variability. *Nature Communications*, 13, 7396.
13. Capotondi, A., M. Newman, **T. Xu** & E. Di Lorenzo (2022). An optimal precursor of Northeast Pacific marine heatwaves and central Pacific El Niño events. *Geophysical Research Letters* 49, e2021GL097350.
14. **Xu, T.**, M. Newman, A. Capotondi & E. Di Lorenzo (2021). The continuum of Northeast Pacific marine heatwaves and their relationship to the Tropical Pacific. *Geophysical Research Letters* 48, e2020GL090661.
15. Kumar, N., J. A. Lerczak, **T. Xu**, A. F. Waterhouse, J. Thomson, E. J. Terrill, C. Swann, S. H. Suanda, M. S. Spydell, P. B. Smit, A. Simpson, R. Romeiser, S. D. Pierce, T. de Paolo, A. Palóczy, A. O'Dea, L. Nyman, J. N. Moum, M. Moulton, A. M. Moore, A. J. Miller, R. S. Mieras, S. T. Merrifield, K. Melville, J. M. McSweeney, J. MacMahan, J. A. MacKinnon, B. Lund, E. Di Lorenzo, L. Lenain, M. Kovatch, T. T. Janssen, S. R. Haney, M. C. Haller, K. Haas, D. J. Grimes, H. C. Gruber, M. K. Gough, D. A. Fertitta, F. Feddersen, C. A. Edwards, W. Crawford, J. Colosi, C. C. Chickadel, S. Celona, J.

- Calantoni, E. F. Braithwaite III, J. Becherer, J. A. Barth & S. Ahn (2020) The inner-shelf dynamics experiment. *Bulletin of the American Meteorological Society*, 1-77.
16. Lerczak, J., J. A. Barth, S. Celona, C. Chickadel, J. Colosi, F. Feddersen, M. Haller, S. Haney, L. Lenain, J. MacKinnon, J. MacMahan, K. Melviller, A. O'Dea, P. Smit, A. Waterhouse & **T. Xu** (2019). Untangling a web of interactions where surf meets coastal ocean. *EOS*, 100.
  17. Haas K. & **T. Xu** (2018). The effect of oblique shoreface-connected ridges on alongshore transport and shoreline change. *Coastal Engineering Proceedings*, 65-65.
  18. **Xu T.** & K. Haas (pp. 66-79) in Robichaud, R. & Ingram, M. R (2018). Marine hydrokinetic resource assessment for domestic army, air force, and coast guard facilities. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-70519.

### Conference Presentations

1. Hovenga, P., M. Newman, J. Albers, G. Dusek, W. Sweet, **T. Xu**, J. Callahan & S.-I. Shin (2025, April). Assessing the characteristics of nontidal residual water level distributions for high tide flooding predictions and projections. In *EGU General Assembly Conference*.
2. **Xu, T.**, S.-I. Shin, A. Capotondi, M. Newman, E. Di Lorenzo, D. Vimont & M. A. Alexander (2024, December). The impact of seasonality in the evolution of Northeast Pacific marine heatwaves. In *American Geophysical Union Fall*.
3. **Xu, T.**, M. Newman & J. Albers (2024, December). An empirical approach for assessing subseasonal-to-annual predictability of U.S. coastal inundation. In *American Geophysical Union Fall*.
4. **Xu, T.**, M. Newman, A. Capotondi, S. Stevenson, E. Di Lorenzo & M. A. Alexander (2024, September). An increase in marine heatwaves despite no significant changes in surface ocean temperature variability. In *Society of Environmental Toxicology and Chemistry*.
5. **Xu, T.** (2024, May). Linear inverse model as a diagnostic and prediction tool. In *Chinese-American Oceanic and Atmospheric Association Colorado Chapter*.
6. Capotondi, A., M. Newman, T. Xu & E. Di Lorenzo (2024, April). Large-scale drivers of Northeast Pacific marine heatwaves in a changing climate. In *EGU General Assembly Conference*.
7. **Xu, T.**, M. Newman, M. A. Alexander & A. Capotondi (2024, January). Seasonal predictability of bottom temperatures along the North American West Coast. In *American Meteorology Society*.
8. **Xu, T.**, M. Newman, A. Capotondi, S. Stevenson, E. Di Lorenzo & M. A. Alexander (2022, December). An increase in marine heatwaves despite no significant changes in surface ocean temperature variability. In *American Geophysical Union Fall*.
9. **Xu, T.**, M. Newman, M. A. Alexander & A. Capotondi (2022, December). Reduced dimension of linear empirical dynamical model to forecast Pacific sea surface temperatures. In *American Geophysical Union Fall*.
10. Haas, K., **T. Xu** & B. Gunawan (2022, March). Evaluating measurement based tidal energy resource assessment methods. In *Ocean Sciences*.
11. Capotondi, A., M. Newman, **T. Xu** & E. Di Lorenzo (2022, March). An empirical approach for understanding the origin of Northeast Pacific marine heatwaves. In *Ocean Sciences*.
12. Haas, K., **T. Xu** & B. Gunawan (2021, December). Tidal energy resource assessments using moving vessel measurements. In *American Geophysical Union Fall*.

13. Stevenson, S., X. Huang, Y. Zhao, E. Di Lorenzo, M. Newman, L. Roekel, A. Capotondi & **T. Xu** (2021, December). How much does ocean initial state contribute to ensemble spread? Insights from the Energy Exascale Earth System Model Version 1 Large Ensemble. In *American Geophysical Union Fall*.
14. **Xu, T.**, M. Newman, A. Capotondi & E. Di Lorenzo (2020, December). The continuum of Northeast Pacific marine heatwaves and their relationship to the Tropical Pacific. In *American Geophysical Union Fall*.
15. **Xu, T.**, Y. Zhao, E. Di Lorenzo & K. Haas (2020, February). Predictability in California Current System: the role of the North Pacific forcing and the asymmetric response to La Niña vs El Niño. In *Ocean Sciences*.
16. **Xu, T.** & E. Di Lorenzo (2019, October). Assessing predictability along the Eastern and Western North Pacific Coastlines. In *North Pacific Marine Science Organization*.
17. Di Lorenzo, E., **T. Xu** & D. J. Amaya (2019, October). Alaska marine heatwave 2019. In *North Pacific Marine Science Organization*.
18. Haas, K. & **T. Xu** (2018, August). The effect of oblique shoreface-connected ridges on alongshore transport and shoreline change. In *36<sup>th</sup> International Conference on Coastal Engineering*.
19. Haas, K., **T. Xu**, J. Colby & V. Neary (2018, April). Application of the IEC tidal energy resource assessment and characterization technical specification to the Roosevelt Island Tidal Energy (RITE) Site. In *Marine Energy Technology Symposium Paper*.
20. **Xu, T.**, D. Cai, E. Di Lorenzo, K. Haas, A. Miller, C. Edwards, A. Moore & P. Drake (2018, February). Experimental forecasts and predictability dynamics of inner shelf circulations: a case study for Pt. Sal, California. In *Ocean Sciences*.
21. Haas, K., D. Cai, **T. Xu**, E. Di Lorenzo, C. Edwards & A. Miller (2018, February). Modeling along-shore variability of the flow exchange between the surf zone and inner shelf. In *Ocean Sciences*.
22. **Xu, T.** & K. Haas (2017, August). Exploring the influence of obliquely oriented shoreface-connected ridges on alongshore sediment transport and shoreline change. In *Young Coastal Scientists and Engineers Conference-Americas*.
23. **Xu, T.** & K. Haas (2016, December). Improving the assessment of tidal stream energy resource for Anchorage, Alaska. In *American Geophysical Union Fall*.
24. **Xu, T.**, K. Haas, J. H. List & I. Safak (2016, February). Wave transformation and alongshore sediment transport due to obliquely oriented shoreface-connected ridges. In *Ocean Sciences*.

## **E. FUNDING**

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NOAA Bipartisan Infrastructure Law Award (Lead PI)	\$809,182	2025-26
<i>Assessing subseasonal-to-annual predictability of North American coastal conditions by leveraging model resolution and observational capabilities</i>		

## **F. PROFESSIONAL EXPERIENCE**

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<b>Associate Member</b>	2025-present
SCOR working group on <i>subsurface marine heatwaves</i> (Scientific Committee on Oceanic Research)	
<b>Guest Editor</b> , MDPI <i>Climate</i>	2025-present

*Special Issue: Coastal climate variability and predictability: challenges and emerging solutions*

### **Review Activity**

Nature Communications, Science Advances, Bulletin of the American Meteorological Society, npj Climate and Atmospheric Science, Communications Earth & Environment, Geophysical Research Letter, Journal of Climate, Climate Dynamics, Journal of Geophysical Research, Frontiers in Marine Science, Geo-spatial Information Science

### **Project Activity**

U.S. Bipartisan Law Infrastructure Award: Subseasonal to Annual Coast Inundation, U.S. Department of Energy: Modes of Pacific Variability and Extremes in a Changing Climate, U.S. Office of Naval Research: Inner-Shelf Dynamics Experiment.

## **G. TEACHING EXPERIENCE**

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### **Teaching Assistant**

	<b>Georgia Institute of Technology</b>
CS7641: School of Computer Science, Machine Learning	Fall 2019, Spring 2020
COE2001: College of Engineering, Statics	Fall 2016, Fall 2018
MATH3770: School of Mathematics, Statistics & Applications	Fall 2017
CEE4225: Civil and Environmental Engineering, Coastal Engineering	Spring 2016, Spring 2017