Tongtong Xu

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I. EDUCATION

Georgia Institute of Technology   Atlanta, GA

Ph.D.	Civil and Environmental Engineering	08/2021
	(Advisors: Dr. Kevin Haas, Dr. Emanuele Di Lorenzo)	
M.S.	Computational Science and Engineering	08/2021
M.S.	Civil and Environmental Engineering	2015

Sun Yat-sen University   Guangzhou, China

B.E.	Hydrology Engineering	2013

II. RESEARCH INTEREST

- Ocean extremes: statistics and mechanisms of marine heatwaves
- Ocean predictability: decadal to near-real time scale, global to coastal scale
- Coastal circulation: coastal upwelling, tidal energy assessment, sediment transport
- Statistical modeling: Linear Inverse Model, Gaussian Process Model, deep learning
- Physical modeling: Regional Ocean Modeling System, Simulating WAves Nearshore

III. RESEARCH EXPERIENCE

1. Examining Model Reduction Techniques for Approximating Dynamical System   2021 – Present
   - Analyzing the dynamical system and forecast of Hankel vs. EOF reduced models.
   - Assessing the forecast uncertainty induced by sampling error effect.
2. Understanding Marine Heatwaves (MHWs) from Observation and Simulation   2020 – Present
   - Analyzing the Northeast Pacific MHWs linked to the tropical/extratropical teleconnection.
   - Studying the influence of climate change on global-LIM simulated marine heatwaves.
3. Estimating Annual Energy Production (AEP) from Short-record Tidal Currents   2020 – 2021
   - Quantify the AEP estimated from 14-days to 1-year tidal currents.
   - Understand the range and astronomical source of uncertainty.
4. Empirical Dynamical Models for Assessing Coastal Predictability   2019
   - Analyzing predictability of North Pacific Sea Surface Temperature (SST) through LIM.
   - Quantifying the role of initial extratropical/tropical anomalies on coastal SST predictability.
5. Multi-scale Nesting Forecast System to Study the Inner Shelf Circulations   2017 – 2018
   - Configuring a multi-scale (3km-1km-600m-200m) Regional Ocean Modeling System (ROMS) to perform a near-real time forecast of coastal circulation around Pt. Sal, California.
   - Performing ensemble simulations with various initial, boundary and surface forcing to diagnose the dynamics underlying the forecast skill.
6. Improving Tidal Energy Resource Assessment with Multiple Numerical Techniques   2016
   - Simulating tidal currents near multiple US Coast Guards locations using ROMS.
   - Improving simulation by grid-refinement techniques, wetting and drying schemes.
7. Investigating the Influence of Obliquely Oriented Ridges on Sediment Transport   2014 – 2015

- Configuring a Simulating WAves Nearshore (SWAN) model to simulate wave transformation and sediment transport on a synthetic bathymetry with shoreface-connected ridges.

IV. TEACHING EXPERIENCE

Teaching Assistant,   **Georgia Institute of Technology**

Computer Science, Machine Learning	Fall 2019, Spring 2020
College of Engineering, Statics	Fall 2016, Fall 2018
Civil and Environmental Engineering, Statistics & Applications	Fall 2017
Civil and Environmental Engineering, Coastal Engineering	Spring 2016, Spring 2017

V. PUBLICATIONS

Submitted

1. **Xu, T.,** Newman, M., Alexander, M. A. & Capotondi, A. A Forecast Test for Reducing Dynamical Dimensionality of Model Emulators. *Journal of Advances in Modeling Earth Systems*, submitted.

2. Stevenson, S., Huang, X., Zhao, Y., Di Lorenzo, E., Newman, M., van Roekel, L., **Xu, T.** & Capotondi, A. 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*, submitted.

3. **Xu, T.,** Haas, K. & Gunawan, B. Estimating annual energy production from short tidal current records. *Renewable Energy*, submitted.

Journal Paper

1. Di Lorenzo, E., **Xu, T.,** Zhao, Y., Newman, M., Capotondi, A., Stevenson, S., Amaya, D. J., Anderson, B. T., Ding, R., Furtado, J. C., Joh, Y., Liguori, G., Lou, J., Miller, A. J., Navarra, G., Schneider, N., Vimont, D. J., Wu, S. & Zhang, H. Modes and Mechanisms of Pacific Decadal-Scale Variability (2023). *Annual Review of Marine Science*, 15:1, https://doi.org/10.1146/annurev-marine-040422-084555.

4. **Xu, T.,** Newman, M., Capotondi, A., Stevenson, S., Di Lorenzo, E. & Alexander, M. A. An increase in marine heatwaves without significant changes in surface ocean temperature variability (2022). *Nature Communications*, 13, 7396, https://doi.org/10.1038/s41467-022-34934-x.

5. Capotondi, A., Newman, M., **Xu, T.** & Di Lorenzo, E. An Optimal Precursor of Northeast Pacific Marine Heatwaves and Central Pacific El Niño Events (2022*). Geophysical Research Letters* 49, e2021GL097350, https://doi.org/10.1029/2021GL097350.

6. **Xu, T.**, Newman, M., Capotondi, A. & Di Lorenzo, E. The Continuum of Northeast Pacific Marine Heatwaves and Their Relationship to the Tropical Pacific (2021*). Geophysical Research Letters* 48, e2020GL090661, https://doi.org/10.1029/2020GL090661.

7. Kumar, N., Lerczak, J. A., **Xu, T.**, Waterhouse, A. F., Thomson, J., Terrill, E. J., Swann, C., Suanda, S. H., Spydell, M. S., Smit, P. B., Simpson, A., Romeiser, R., Pierce, S. D., de Paolo, T., Palóczy, A., O'Dea, A., Nyman, L., Moum, J. N., Moulton, M., Moore, A. M., Miller, A. J., Mieras, R. S., Merrifield, S. T., Melville, K., McSweeney, J. M., MacMahan, J., MacKinnon, J. A., Lund, B., Di Lorenzo, E., Lenain, L., Kovatch, M., Janssen, T. T., Haney, S., Haller, M. C., Haas, K., Grimes, D. J., Graber, H. C., Gough, M. K., Fertitta, D. A., Feddersen, F., Edwards, C. A., Crawford, W., Colosi, J., Chickadel, C. C., Celona, S., Calantoni, J., Braithwaite, E. F., III, Becherer, J., Barth, J. A., & Ahn, S. (2020). The Inner-Shelf Dynamics Experiment. *Bulletin of the American Meteorological Society*, 1-77, https://doi.org/10.1175/BAMS-D-19-0281.1.

8. Lerczak, J., Barth, J. A., Celona, S., Chickadel, C., Colosi, J., Feddersen, F., Haller, M., Haney, S., Lenain, L., MacKinnon, J., MacMahan, J., Melviller, K., O'Dea, A., Smit, P., Waterhouse, A., **Xu, T.**, (2019). Untangling a web of interactions where surf meets coastal ocean. *EOS*, *100*, https://doi.org/10.1029/2019EO122141.

Report

1. **Xu, T.** & Haas, K. (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

1. **Xu, T.**, Newman, M., Capotondi, A., Stevenson, S., Di Lorenzo, E. & Alexander, M. A. (2022, December). An increase in marine heatwaves despite no significant changes in surface ocean temperature variability. In *American Geophysical Union Fall.*

2. **Xu, T.,** Newman, M., Alexander, M. A. & Capotondi, A. (2022, December). Reduced Dimension of Linear Empirical Dynamical Model to Forecast Pacific Sea Surface Temperatures. In *American Geophysical Union Fall.*

3. Haas, K., **Xu, T.** & Gunawan, B., (2022, March). Evaluating measurement based tidal energy resource assessment methods. In *Ocean Sciences*.

4. Capotondi, A., Newman, M., **Xu, T.** & Di Lorenzo, E., (2022, March). An empirical approach for understanding the origin of Northeast Pacific marine heatwaves. In *Ocean Sciences*.

5. Haas, K., **Xu, T.** & Gunawan, B., (2021, December). Tidal energy resource assessments using moving vessel measurements. In *American Geophysical Union Fall*.

6. Stevenson, S., Huang, X., Zhao, Y., Di Lorenzo, E., Newman, M., Roekel, L., Capotondi, A. & **Xu, T.,** (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*.

7. **Xu, T.**, Newman, M., Capotondi, A., & Di Lorenzo, E., (2020, December). The Continuum of Northeast Pacific Marine Heatwaves and Their Relationship to the Tropical Pacific. In *American Geophysical Union Fall*.

8. **Xu, T.**, Zhao, Y., Di Lorenzo, E., & Haas, K. (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*.

9. **Xu, T.** & Di Lorenzo, E., (2019, October). Assessing Predictability along the Eastern and Western North Pacific Coastlines. In *North Pacific Marine Science Organization*.

10. Di Lorenzo, E., **Xu, T.**, & Amaya, D. (2019, October). Alaska Marine Heatwave 2019. In *North Pacific Marine Science Organization*.

11. Haas, K. & **Xu, T.** (2018, August). The Effect of Oblique Shoreface-connected Ridges on Alongshore Transport and Shoreline Change. In *36th International Conference on Coastal Engineering*.

12. Haas, K., **Xu, T.**, Colby, J., & Neary, V. (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*.

13. **Xu, T.**, Cai, D., Di Lorenzo, E., Haas, K., Miller, A., Edwards, C., Moore, A., & Drake, P. (2018, February). Experimental Forecasts and Predictability Dynamics of Inner Shelf Circulations: A Case Study for Pt. Sal, California. In *Ocean Sciences*.

14. Haas, K., Cai, D., **Xu, T.**, Di Lorenzo, E., Edwards, C., & Miller, A. (2018, February). Modeling Alongshore Variability of the Flow Exchange between the Surf Zone and Inner Shelf. In *Ocean Sciences*.

15. **Xu, T.**, & Haas, K., (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*.

16. **Xu, T.**, Haas, K. (2016, December). Improving an Assessment of Tidal Stream Energy Resource for Anchorage, Alaska. In *American Geophysical Union Fall*.

17. **Xu, T.**, Haas, K., List, J. H., & Safak, I. (2016, February). Wave Transformation and Alongshore Sediment Transport due to Obliquely Oriented Shoreface-connected Ridges. In *Ocean Sciences*.