

## [NICOLE] XUN CAI

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Github: [https://github.com/nicolecx122/schism/tree/icm\\_Balg](https://github.com/nicolecx122/schism/tree/icm_Balg)

### Education

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| Ph.D. in Marine Science, 2022 | Virginia Institute of Marine Science, William & Mary, VA |
| M.S. in Marine Science, 2018  | Virginia Institute of Marine Science, William & Mary, VA |
| B.S. in Oceanography, 2015    | Nanjing University, Nanjing, China                       |

### Professional Experience

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| 2022 – present | <b>ORISE Postdoctoral Fellow</b> , Chesapeake Bay Program Office, EPA, MD   |
| 2021 – 2022    | <b>ORISE Fellow</b> , Chesapeake Bay Program Office, EPA, MD  |
| 2017           | <b>International Visiting Fellow</b> , University of Oldenburg, Germany<br>Advisor: Dr. Jörg-Olaf Wolff                       |
| 2015 – 2021    | <b>Graduate Research Assistant</b> , Virginia Institute of Marine Science, VA<br>Advisors: Drs. Y. Joseph Zhang and Jian Shen |

### Peer-Reviewed Publications

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[8]. Cai, X., Shen, J., Zhang, Y., J., Qin, Q., and Linker, L., 2023. Sea-level Rise Impacts on The Tidal Marshes and Estuarine Biogeochemical Processes. Journal of Geophysical Research: Biogeosciences. doi: 10.1029/2023JG007450.

[7]. Cai, X., Shen, J., Zhang, Y., J., Qin, Q., and Linker, L., 2023. The Roles of Tidal Marshes in the Estuarine Biochemical Processes: A Numerical Modeling Study. Journal of Geophysical Research: Biogeosciences. doi: 10.1029/2022JG007066.

[6]. Xiong, J., Shen, J., Qin, Q., Tomlinson, M., Zhang, Y., Cai, X., Ye, F., Cui, L., and Mulholland, M., 2023. Biophysical Interactions Control the Progression of Harmful Algal Blooms in Chesapeake Bay: A Novel Lagrangian Particle Tracking Model with Mixotrophic Growth and Vertical Migration. Limnology and Oceanography Letters. doi: 10.1002/lol2.10308.

[5]. Cai, X., Qin, Q., Shen, J. and Zhang, Y., J., 2022. Bifurcate Responses of Tidal Range to Sea-level Rise in Estuaries with Marsh Evolution. Limnology and Oceanography Letters. doi: 10.1002/lol2.10256.

[4]. Tian, R., Cai, X., Testa, J., Brady, D.C., Cerco, C. and Linker, L., 2022. Simulation of High-Frequency Dissolved Oxygen Dynamics in A Shallow Estuary, the Corsica River, Chesapeake Bay. Frontiers in Marine Science. doi: 10.3389/fmars.2022.1058839.

- [3]. Qin, Q., Shen, J., Tuckey, T.D., **Cai, X.** and Xiong, J., 2022. Using Forward and Backward Particle Tracking Approaches to Analyze Impacts of a Water Intake on Ichthyoplankton Mortality in the Appomattox River. Journal of Marine Science and Engineering. doi: 10.3390/jmse10091299.
- [2]. **Cai, X.**, Shen, J., Zhang, Y., J., Qin, Q., Wang, Z. and Wang H., 2021. Impacts of Sea Level Rise on Hypoxia and Phytoplankton Production in Chesapeake Bay: Model Prediction and Assessment. Journal of American Water Resources Association. doi: 10.1111/1752-1688.12921.
- [1]. **Cai, X.**, Zhang, Y., J., Shen, J., Wang, H., Wang, Z., Qin, Q., and Ye, F., 2020. A Numerical Study of Hypoxia in Chesapeake Bay Using an Unstructured Grid Model: Validation and Sensitivity to Bathymetry Representation. Journal of American Water Resources Association. doi: 10.1111/1752-1688.12887.

### Grants

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| Mar. 2023 | <b>ECO-DAS XV Fellow</b> , Association for the Sciences of Limnology & Oceanography (ASLO) and National Science Foundation (NSF), Honolulu, HI – “Enhanced Sulfide Flux by Resuspension: An Underestimated Piece to Estuarine Hypoxia” (\$3,337)                               |
| Apr. 2022 | <b>W&amp;M Open Access Financial Assistance</b> , for publication in L&O Letter – “Bifurcate Responses of Tidal Range to Sea-level Rise in Estuaries with Marsh Evolution” (\$2,400)   |
| Aug. 2020 | <b>Commonwealth Coastal Research Fellowship</b> , VIMS, VA – for dissertation research focus which strategically advances VIMS’ advisory service to the Commonwealth of Virginia in areas such as water quality research, and management and resilience approaches. (\$31,245) |
| May. 2019 | <b>CSDMS Integration Scholarship</b> at <i>Community Surface Dynamics Modeling System meeting 2019</i> , Boulder, CO – “Impact of Submerged Aquatic Vegetation on Water Quality in Cache Slough Complex, Sacramento-San Joaquin Delta: A Numerical Study”                      |

### Proposals and Collaborations (devoid of costs for the eligibility of the ORISE program)

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- “Developing cyanobacteria Harmful Algal Bloom model using a lower trophic level ecosystem model in the freshwater system of Rio Grande Valley.” proposal submitted to the US Army Corps of Engineers (USACE) Engineer Research and Development Center (ERDC). PI: Dr. Jongsun Kim (University of Texas Rio Grande Valley), Co-PI: Myung Hwangbo (University of Texas Rio Grande Valley), Collaborators: Drs. **Xun Cai** (ORISE fellow at EPA CBP) and Qubin Qin (VIMS).

### Teaching and Mentoring

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| Aug. 2023 – present | Co-mentor of master student <u>Julia Abrao Teixeira</u> , VIMS, VA – thesis “Distribution and Fate of Floating Marine Debris from Major Estuaries along the US East Coast to the Mid-Atlantic Bight: A Lagrangian Particle Tracking Approach” |
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| Nov. 2023       | Guest lecture at class ENVR 1401 at the University of Texas Rio Grande Valley – "Water Quality Modeling, Climate Change, and Sea-level Rise" (UTRGV is a Hispanic Serving Institution)   |
| May – Jul. 2023 | Mentor of undergraduate summer intern <u>Philip Ignatoff</u> , William & Mary, VA – design of an 8-week research project "Revisit sediment diagenesis, bioturbation, and nutrient cycling" as a case study in Gadeken et al., in prep for <i>L&amp;O Letters</i> |
| Apr. 2019       | Teaching lecture at SCHISM Summit workshop, Sacramento, CA – "Introduction of SCHISM-ICM water quality model"  |

### Awards

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| Mar. 2022 | <b>Top Cited Article 2020-2021</b> , Journal of American Water Resources Association, Wiley – "A Numerical Study of Hypoxia in Chesapeake Bay Using an Unstructured Grid Model: Validation and Sensitivity to Bathymetry Representation."   |
| Oct. 2021 | <b>Juliette B. &amp; Carroll W. Owens, Sr. Fellowship</b> , VIMS, VA – for academic performance and progress in the Ph.D. Degree Program  |
| May. 2019 | <b>Best Poster Award</b> at <i>Southeastern Virginia Postdoctoral Symposium</i> , Gloucester Point, VA – "Numerical Study of Impact of Submerged Aquatic Vegetation on Water Quality in Cache Slough Complex, Sacramento-San Joaquin Delta" |

### Invited Talks and First-author Conference Presentations

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| May 2023  | Oral presentation at <i>International Society for Ecological Modelling Global Conference</i> , Toronto, Canada – "Impacts of sea-level rise on the tidal marshes and estuarine biochemical processes" |
| Mar. 2023 | Invited talk at the first annual meeting of NSF project CHALK – "Development of biogeochemical modeling of tidal wetlands estuarine waters of the York River"   |
| Jun. 2022 | Oral presentation at <i>Chesapeake Bay Symposium</i> , Annapolis, MD – "Impacts of sea-level rise on the material exchange between tidal marshes and the estuary"                                     |
| Jun. 2022 | Oral presentation at <i>Chesapeake Bay Symposium</i> , Annapolis, MD – "Development of a Next-Generation Tributary Model in the tidal James River"  |
| Jun. 2020 | Oral presentation at <i>Chesapeake Bay Symposium</i> , virtual – "Impacts of Sea-level Rise on Hypoxia and Phytoplankton Production in Chesapeake Bay: Model Validation and Assessment"               |

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| Nov. 2019 | Oral presentation at <i>Cerf</i> , Mobile, AL – “Numerical Simulation of Impacts from Sea-level Rise on Hypoxia in Chesapeake Bay Using an Unstructured Grid Model: Validation and Assessment” |
| Jun. 2016 | Poster presentation at <i>Chesapeake Bay Symposium, 2016</i> , Williamsburg, VA – “Effect of pH on nutrients release and algal bloom in the Back River, Upper Chesapeake Bay”                  |

### Service and Outreach

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| 2021 - present | Reviewer for <i>Geology</i> , <i>Journal of Geophysical Research: Biogeosciences</i> , <i>Ocean Modeling</i> , <i>Marine Pollution Bulletin</i> , <i>Journal of American Water Resources Association</i> , and <i>USGS Colleague Review</i> |
| Jun. 2024      | Session lead at <i>Chesapeake Community Research Symposium 2024</i> – “Exploring the Linkage Between the Tidal Marsh Dynamics and the Key Processes in the Chesapeake Bay” (session proposal accepted)                                      |
| 2019 - 2022    | VIMS Ombudsperson – Peer mentor and confidential resource for graduate students to promote conflict resolution for problems that arise in the university setting.   |
| Aug. 2019      | Oral presentation at <i>A Scientist Walks into A Bar – Grad Student Edition</i> – “To Save the Fish by Removing Seagrass?”  |

### Professional Skills

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| Numerical modeling                 | Semi-implicit Cross-scale Hydrosceince Integrated System Model (SCHISM); Integrated Compartment Model (ICM) multi-dimensional water quality model; Sediment Flux Model; Tidal Marsh Model; Submerged Aquatic Vegetation Model; Benthic Algae Model; Benthic Feeder Model; Bioturbation Model; Sediment Transport Model; Wind Wave Model; Watershed and Airshed Coupling |
| Data analysis and machine learning | Harmonic Analysis, Regressions, Decision Tree, Classification and Regression Trees (CART), Random Forest, Neural Network, Empirical Mode Decomposition (EMD), Empirical Orthogonal Function (EOF)   |
| Programing skills                  | Fortran, Matlab, Python, HTML, Perl, and C  |
| Software                           | SMS, ArcGIS, CorelDRAW, STELLA  |
| Operating system                   | Unix for high-performance computing (HPC)   |

### Field Experience and Research Cruise

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| Oct. 2017 | RV HEINCKE HE498, CTD profiling at North Sea, 7 days.       |
| Sep. 2017 | Fish tagging cruise at Sacramento-San Joaquin delta, 1 day. |