Tian Tan

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Last edited date: Aug 6, 2025

I hold a PhD from the University of Edinburgh and currently work there as a Postdoctoral Research Associate in Hydro-Environment Modelling. With strong academic foundations in both ocean engineering and computer science, my expertise spans ***ocean or coastal numerical modelling (waves and tidal currents)***, ***wave-current interactions***, ***machine-learning based wave prediction***, and ***physical scale model testing*** of ocean structures. The multidisciplinary background gives me a well-rounded perspective on both physics-based and data-driven approaches.

EXPERIENCE

Postdoctoral Research Associate in Hydro-Environment Modelling **2025.08 - Now**

Institute for Infrastructure & Environment, The University of Edinburgh

CoTide project, *funded by EPSRC | Advisor: Dr. Athanasios Angeloudis*

- Investigating hydrodynamic mechanisms that influence tidal stream energy resources and tidal array design through high-resolution simulations using Thetis.

Research Assistant in Coastal Numerical Modelling **2025.01 - 2025.07**

Institute for Energy Systems, The University of Edinburgh

CES:UPSTREAM project, *funded by the Crown Estate Scotland and EPSRC | Advisor: Dr. Brian Sellar*

- Characterised 3D and 2D wake profiles for various tidal stream energy turbine rotors, including bed-mounted and floating configurations, using hydrodynamic simulations with TELEMAC.

Research Assistant in Physical Model Testing **2023.09 - 2024.10**

Institute for Energy Systems, The University of Edinburgh

WavE-Suite project, *funded by EPSRC Supergen ORE Hub | Advisor: Prof. Vengatesan (Venki) Venugopal*

- Conducted physical scale model testing and performed experimental data analysis on a point-absorber wave energy converter (CorPower C4) under operational and extreme wave conditions, including single and dual wave directions, at the FloWave research facility.

Teaching Assistant **2021 - 2023**

School of Engineering, The University of Edinburgh

- Marine Energy 5, Fluid Mechanics 4, Structure Mechanics and Dynamics 3, Thermal Fluids 3

EDUCATION

PhD in Ocean Engineering - The University of Edinburgh **2020.12 - 2025.03**

Supervisor: Prof. Vengatesan (Venki) Venugopal

Thesis: Quantification of Wave-Current-Turbulence Interactions through Numerical Modelling and Data-Driven Methods for Ocean Energy Applications

1. Numerical modelling of ocean waves and tidal currents *(~TOMAWAC & TELEMAC)*

- *Simulated and analyzed 10 years (2014-2023) of ocean waves from both wave-only model (North Atlantic Scale) and wave-current coupled model (Pentland Firth & Orkney Waters Regional Scale).*
- *Provided insights into interannual, inter-seasonal, and inter-monthly wave resource variability, as well as the long-term effects of tidal currents on wave dynamics.*

2. Wave-current decomposition

- *Developed a novel wave-current decomposition method: side information assisted EMD method.*
- *Derived depth-wise turbulence profiles and quantified turbulence enhancement by waves.*

3. Machine learning based wave predictions

- *Wave predictions for open sea region (using public database for training): Integrated the XGBoost algorithm to the Informer model through attention-mechanism to enhance prediction accuracy*
- *Wave predictions for strait area (using numerical modelling results for training)*

MSc in Sustainable Energy Systems - The University of Edinburgh **2019 - 2020**

Grade: Distinction

BEng in Computer Science - Dalian University of Technology, China **2016 - 2019**

First Class (dual bachelor's degree) | Thesis in algorithm optimization awarded the highest scores (91/100)

BEng in Ocean Technology - Dalian University of Technology, China **2015 - 2019**

First Class | Awarded 'Outstanding Graduate, Dalian University of Technology, 2019'

AWARD

Best Paper Award, the 43rd OMAE conference, Singapore **2024**

My paper on machine learning based wave predictions (https://doi.org/10.1115/OMAE2024-127930) was selected as the sole Best Paper in the symposium on 'CFD, FIS, and AI'.

JOURNAL ARTICLES

1. **Tan T.**, Venugopal V. (2024): Characterisation of turbulence at sites with coexisting waves and currents: an analysis by Empirical Mode Decomposition, *Ocean Engineering.* https://doi.org/10.1016/j.oceaneng.2024.119616
2. **Tan T.**, Venugopal V. (2025): A decade long high-resolution wave resource map for Pentland Firth and Orkney Waters - hindcast by two-way coupling of wave-current models, *Applied Ocean Research.* https://doi.org/10.1016/j.apor.2025.104730

Under-review

3. **Tan T.**, Venugopal V. (2025): Enhancing wave resource assessment of high energy sites through wave-current interaction modelling, *Ocean Modelling.* https://dx.doi.org/10.2139/ssrn.5281396

Ready to submit:

4. **Tan T.**, Venugopal V. (2025): Prediction of Wave Parameters under Tidal Current Influence using Informer Deep Neural Network, *Environmental Modelling & Software.*

CONFERENCE PROCEEDINGS

1. **Tan T.**, Venugopal V.: Machine learning and deep learning for enhanced spatio-temporal wave parameters prediction, *Proceedings of the ASME 2024 43rd International Conference on Ocean, Offshore and Arctic Engineering* (OMAE 2024, Singapore). https://doi.org/10.1115/OMAE2024-127930
2. Venugopal V., **Tan T.**: Hydrodynamic assessment of the CorPower C4 point absorber wave energy converter in extreme wave conditions, *Proceedings of the ASME 2024 43rd International Conference on Ocean, Offshore and Arctic Engineering* (OMAE 2024, Singapore). https://doi.org/10.1115/OMAE2024-127861

3. **Tan T.**, Venugopal V.: Numerical modelling of wave and tidal current interactions and their impact on wave parameters, *Proceedings of the 15th European Wave and Tidal Energy Conference* (EWTEC 2023, Spain). https://doi.org/10.36688/ewtec-2023-279

4. **Tan T.**, Venugopal V., Sellar B.: Analysis of turbulence parameters for a tidal energy site in a wave-current environment, *Proceedings of the ASME 2023 42nd International Conference on Ocean, Offshore and Arctic Engineering* (OMAE 2023, Australia). https://doi.org/10.1115/OMAE2023-104347

SKILLS

Programming	MATLAB, Python, Fortran, JavaScript, C/C++
Software	TELEMAC 2D & 3D (hydrodynamic flow model), TOMAWAC (3rd general spectra wave model), SolidWorks, QGIS (or ArcGIS), WAMIT, ANSYS Mechanical