# Haiqi Fang

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## Education

**Sichuan University (Project 985 and 211)** **Sep. 2016 – May 2020**
*Bachelor of Engineering - Agricultural Water Conservancy Engineering* *Chengdu, China*

- Average Point (86.69/100.00), Integrated Ranking (2/52).
- Awarded first prize in Chinese Mathematics Competitions (national-level).
- Awarded a test waiver for admittance to the master's program.

**Sichuan University (Project 985 and 211)** **Sep. 2020 – May 2023**
*Master of Engineering - Hydraulics and River Dynamics* *Chengdu, China*

- Supervisor– Prof. Pengzhi Lin.
- Average Point (85.58/100.00).

## Experience

**Sichuan University** **May 2023 – Present**
*Research Assistant* *Chengdu, China*

- Assist Prof. Pengzhi Lin with theoretical and experimental research on Bragg resonance.
- Supervized by Prof. Philip L.-F. Liu studying wavemaker theory for high-order Stokes wave.

## Completed Research Projects

**Wave Transformation and Porous Structures** **Sep. 2020 – Dec. 2021**
*Homotopy analysis of wave transformation over permeable seabeds and porous structures* *First author*

- Published in 'Ocean Engineering', Feb. 2023.
- Introduced the Homotopy Analysis Method to solve the Modified Mild Slope equations.
- Developed a new methodology to study wave transformation over 2-D and 3-D axisymmetric topographies.

**Bragg Resonance** **May 2022 – Feb. 2023**
*Bragg scattering of nonlinear surface waves by sinusoidal sandbars* *First author*

- Under review (submitted to 'Journal of Fluid Mechanics').
- Derived new Nonlinear Schrödinger Equations for Class-I type Bragg scattering.
- Proposed a more precise analytical solution for reflection and a new theory that quantifies downshift magnitude.
- Discovered both upshift and downshift behaviors of the Bragg resonance induced by wave nonlinearity.

**Sheared Current and Stokes Wave** **Sep. 2021 – July 2023**
*The theory of fifth-order Stokes waves in a linear shear current* *First author*

- Under review (submitted to 'Proceedings of the Royal Society A').
- Derived a new fifth-order Stokes wave solution that incorporated current effects.
- Demonstrated superior capacities to simulate strongly nonlinear waves under intensely sheared currents.

**Wave-Current-Vegetation Interaction** **Jan. 2022 – Aug. 2022**
*A theoretical model for wave attenuation by vegetation considering current effects* *Second author*

- Under review (submitted to 'Coastal Engineering').
- Responsible for the formulation of the theoretical solutions.
- Established solutions for wave attenuation by emerged vegetation applicable for both strong and weak currents.

**Class-II Bragg Resonance** **Jan. 2023 – Present**
*On the downshift of Class-II Bragg resonance* *First author*

- Under revision.
- Formulated an analytical solution that can capture the downshift behavior for the first time.
- Presented a theoretical formula to quantify the downshift magnitude.

## Ongoing Research Projects

**Class-III Bragg Resonance** **Feb. 2023 – Present**

*Nonlinear equations for Class-III Bragg resonance*

- Derived a new set of nonlinear equations with wave-wave-bottom and wave-wave-wave interactions.
- Validated the present model by existing experimental data and numerical solutions.
- To be done: need further supporting data and plan to conduct experiments.

**Wavemaker theory** **June 2023 – Present**

*High-order wavemaker theory for Stokes waves*

- Proposed a third-order wavemaker theory for Stokes wave.
- To be done: need further experiments to validate the theory.
- To be done: extend the present theory to fifth-order.

## Research Aptitude

**Research Topics**: Wave Transformation, Wave-Current Interaction, Bragg Resonance, Nonlinear Waves.

**Mathematical Abilities**: PDE Theory, Complex/Real Analysis, Lie Algebra, Integrable System, Homotopy Analysis, Regular Perturbation, Multiple-Scale Expansion, Soliton Solutions.

**Numerical Methods**: FEM, Spectral Method

## Relevant Skills

**Programming**: Mathematica, Matlab, C, Fortran, LaTex.

**English**: IELTS **7.5** – Listening 7.5, Reading 8.5, Writing 7, Speaking 6.5.

## Honors and Awards

First-class Scholarship of Sichuan University for master's students. **2022**

First-class Scholarship of Sichuan University for master's students. **2021**

Sichuan University 'Bright Future' Graduate Scholarship **(Top 1‰)**. **2020**

First prize in Chinese Mathematics Competitions **(national-level)**. **2019**

First prize in the 11th Mathematics Competition of Chinese College Students. **2019**

First-class Scholarship from the society. **2019**

Outstanding Student of Sichuan University. **2019**

First-class Scholarship of Sichuan University. **2018**

Outstanding Student of Sichuan University. **2018**

First prize in the 10th Mathematics Competition of Chinese College Students. **2018**

Third prize in 'Internet +' Innovation Competition of Sichuan University. **2018**

First Prize of Mathematics Competition in Sichuan University. **2018**

Second-class Scholarship of Sichuan University. **2017**

Outstanding Student of Sichuan University. **2017**

## Publication

**Haiqi Fang**, Lian Tang and Pengzhi Lin, 2023. Homotopy analysis of wave transformation over permeable seabeds and porous structures. Ocean Engineering, 274: 114087. https://doi.org/10.1016/j.oceaneng.2023.114087.

**Haiqi Fang**, Philip L.-F. Liu, Lian Tang and Pengzhi Lin, 2023. The theory of fifth-order Stokes waves in a linear shear current. Submitted to Proceedings of the Royal Society A. https://arxiv.org/abs/2308.03023v1