### GENERAL INFORMATION

**Program sponsor:** Princeton Environmental Institute  
**Position number:** U1DEI2  
**Project title:** Wave Breaking on Coastal Structures  
**Organization/research group:** Deike Lab  
**Primary location(s) of internship:** Princeton University, EQUAD D309  
**Additional cities and/or countries to be visited (if applicable):** n/a  

**Note:** If this internship is located in a country with an International SOS risk rating of High or Extreme, final candidates must participate in a travel review process overseen by the Travel Oversight Group (TOG), and obtain safety guidance prior to departure. The University reserves the right to revoke support and funding for travel at any time there has been a significant deterioration in the safety and security conditions surrounding travel arrangements, or in the sector of the country, or countries, where travel is to occur.

### FACULTY SPONSOR(s)/HOST INFORMATION

**Name(s):** Luc Deike  
**University Department(s):** Mechanical and Aerospace Engineering and Princeton Environmental Institute  
**E-mail:** ldeike@princeton.edu  
**Website:** ldeike.princeton.edu  
**Phone:** 8582638128

### INTERNSHIP/RESEARCH PROJECT INFORMATION

**Internship/project description:**

The interactions between oceans and human welfare are increasing, due to the rising population living near coastlines. Coastal urban areas are especially vulnerable to storm surge induced flooding due to the dense population while rapid urbanization along coastline is expected to continue in the near future. Moreover, climate change has significant negative effects on coastal cities through the general sea-level rise, the possible increase in storm surge, making the potential damages to coastal infrastructures by extreme breaking waves more severe. The present internship will focus in increasing our fundamental understanding of breaking waves in shallow water and impacting vertical structures by performing high resolution and high fidelity direct numerical simulations and by developing simple physical models based on the numerical data to relate the following three processes to the incoming wave parameters: (i) dynamical loads during wave breaking impact on walls and storm surge barriers, (ii) run-up due to extreme storm surge waves and tsunamis, and (iii) spray generation and impact on health.

**Student’s role and responsibilities:**

The intern will work on the development of fundamental knowledge on wave impact in coastal structures, and will investigate the dynamics of two-phase turbulence associated with the impact of breaking waves on vertical structures, such as storm surge barrier. The intern will work on run and analyze numerical simulations of wave breaking impacting a vertical structure and describe the associated pressure fields. This project is part of the Urban Grand Challenge supported by the Princeton Environmental Institute, on Extreme wave breaking in coastal urban areas: impacts on structures, run-ups and spray generation.
Internship/project learning objectives:
The student will learn to perform and analyze numerical simulations of complex two-phase flows.

**PROGRAM REQUIREMENTS**

**Academic background and any course pre-requisites:**
none required.

**Technical skills:**
n/a

**Additional training(s):**
n/a

**Equipment:**
one

**Physical demands:**
one

**Language abilities/competencies (if applicable):** n/a

**Additional information about the internship/project:**
none

**INTERNATIONAL TRAVEL REQUIREMENTS (if applicable)**

<table>
<thead>
<tr>
<th>Visa(s) required?</th>
<th>Research permit/pass required?</th>
<th>Immunizations required?</th>
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</thead>
<tbody>
<tr>
<td>Yes □ No □</td>
<td>Yes □ No □</td>
<td>Yes □ No □</td>
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</table>

**INTERNSHIP/PROJECT SUPERVISOR(S)**

**Name and title of primary supervisor:** Luc Deike

**Email:** ldeike@princeton.edu  
**Phone:**

**Name and title of additional supervisor:**

**E-mail:**  
**Phone:**

**PROGRAM DATES AND FUNDING INFORMATION**

<table>
<thead>
<tr>
<th>Weekly Stipend: $500</th>
<th>Number of Positions Available: 2</th>
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<tbody>
<tr>
<td>Tentative Start Date (mm/dd/yyyy): 06/01/2019</td>
<td>Number of Weeks: 8</td>
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<tr>
<td>Tentative End Date (mm/dd/yyyy): 07/30/2019</td>
<td>Note: PEI funding is for full-time work, 35 hours per week minimum, and for a period of at least 8 continuous weeks.</td>
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**Application Deadline:** January 11, 2019