RPI

CIVIL AND ENVIRONMENTAL ENGINEERING

Funded PhD Position

Turbulence · Building Aerodynamics · Wind-Load Design

STIPEND PAID · TUITION COVERED | NSF-FUNDED RESEARCH ASSISTANTSHIP | PHD · START SPRING 2027 | ROLLING REVIEW

THE PROJECT

NSF Award 2529208. *Advancing Partial Turbulence Simulation for Wind-Resilient Envelope Systems, Exterior Attachments, and Small Structures. September 2026 to August 2029.*

Wind damage in residential communities often begins with building envelopes, exterior attachments and other small, largely non-engineered systems, whose collective and cascading failures drive much of the loss a community sustains and much of the delay in its recovery. Traditional wind tunnel scaling serves large engineered structures well; small building systems demand large, detailed models that break kinematic similarity of the flow, so practice falls back on simplified product tests.

Partial Turbulence Simulation (PTS) reconciles these divergent scaling requirements, opening a route to more sophisticated testing of small building systems in existing facilities. It splits the turbulence spectrum, reconstructing the loading effects of the large, slow motions analytically while physically reproducing the smaller motions that drive interactions with the body-generated separated flow. **ASCE 49-21 now licenses its broad application**, without the validation or guidance to constrain it.

This project will validate and constrain PTS to support its appropriate adoption. At the University of Florida NHERI facility, surface-pressure measurements and time-resolved stereo PIV will resolve the basic aerodynamics controlling loading across a broad set of PTS-scaled flows. Outputs include an open benchmark dataset, recommendations to the wind tunnel testing and wind load standards, and project-based wind hazard education.

WHAT WE ARE LOOKING FOR

The doctoral work will be informed primarily through an **applied fluid mechanics approach**, interpreting pressure and velocity data acquired in PTS-scaled flows from fundamental principles. Prior wind engineering experience is not required.

ESSENTIAL

- **A strong foundation in fluid mechanics**, with an interest in turbulence and separated flow. This is the most important qualification.
- Scientific computing in Python or MATLAB, applied to large datasets.

VALUABLE, NOT REQUIRED

- Experimental methods, instrumentation and **time-resolved PIV**.
- Advanced data-driven diagnostic methods (**DMD**, **SPOD** and similar).
- Signal processing and spectral analysis.

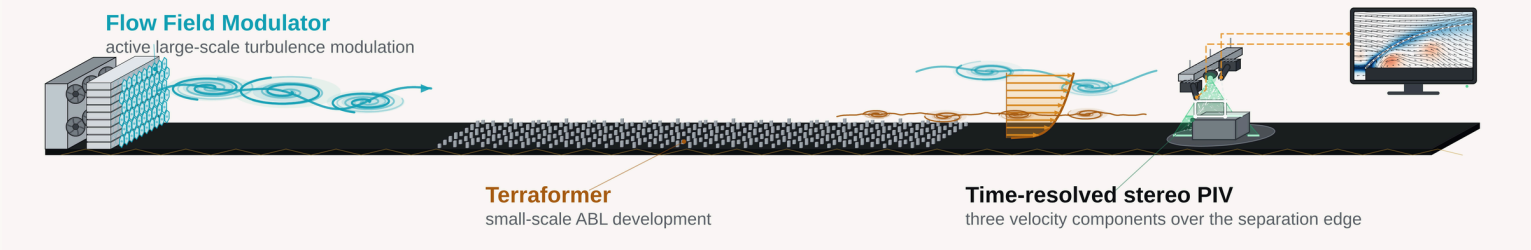
Applicants from civil, mechanical, aerospace or environmental engineering, engineering mechanics, or applied physics are all appropriate.

This is a paid position: the student **receives a stipend and does not pay tuition**, which is covered through the assistantship. This applies equally to international applicants. A substantial share of the appointment is supported by the research assistantship on this award, including summer support, with additional semesters supported through teaching assistantships.

EDUCATION AND OUTREACH

The award includes project-based wind hazard education through **RPI STEP** (grades 7 to 12) and **PREFACE**, in which students design, build and test structures in the RPI CEE educational wind tunnel. The doctoral student helps lead these activities.

The facility. UF NHERI Boundary Layer Wind Tunnel. A 319-cell Flow Field Modulator sets the large scales, an automated roughness field develops the small-scale boundary layer, and a gantry-mounted laser with a stereo camera pair resolves the separated flow over the model roof.



How to apply — two steps, both needed.

1. Complete the short application form: **forms.cloud.microsoft/r/Pz2yhjnZc0**

2. Email **both of us**, subject line "PTS PhD application - Lastname Firstname", attaching your CV and an unofficial transcript.

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Co-chair, ASCE 49-21 wind tunnel testing standard committee

Spring 2027 start prioritized; Fall 2027 considered for exceptional candidates. Applications reviewed as received, open until filled; decision expected January or February 2027.