



**PennState**  
College of Engineering

**ENGINEERING SCIENCE  
AND MECHANICS**

## Funded Ph.D. Position in Acoustics

---

### *Multiscale Elastodynamic Modeling of Particle Reinforced Ice*

Applications are sought for a research assistantship in the field of wave propagation modeling. The position is supported by a monthly stipend and tuition and fees towards a PhD degree for up to four years (subject to satisfactory progress). The start date is flexible (January 2021 preferred). The student will be based in the Department of Engineering Science and Mechanics ([www.esm.psu.edu](http://www.esm.psu.edu)) at Penn State University in Pennsylvania, USA ([www.psu.edu](http://www.psu.edu)). To qualify for this position, you must satisfy the PhD admission requirements set by the department and university.

The work will be to study the effects of microstructural modifications in ice composites on wave propagation and scattering through multiscale modeling, as part of a project funded by the National Science Foundation (NSF). The long-term goal of the project is to introduce a new material specifically designed to couple ultrasonic signals with the bulk of geometrically complex components. The material will be a new form of ice loaded with solid particles to yield tunable rigidity and mass density which are critical for the effectiveness of ultrasonic testing. The proposed work will create a new mathematical framework to model wave propagation in particle reinforced composites that lies at the convergence of physics-based analytical approaches and numerical unit cell methods. By merging analytical and data-driven strategies, this work uncovers innovative multiscale approaches to the study of wave propagation in media with complex microstructures. You will focus on the analytical framework of the problem, which is based on homogenization methods that seek to establish the macroscopic wave displacement by ensemble averaging the microscale behavior. Throughout the project, you will work in close collaboration with a PhD student developing the numerical framework (position filled).

If you are interested in this position, please send your full CV and a cover letter describing your expertise, goals and why you are interested in pursuing this PhD position to the project principal investigator, Prof. Andrea P. Arguelles at [arguelles@psu.edu](mailto:arguelles@psu.edu). Please include CRYOULTRASOUND as the first word in the subject of your email. Qualifying applicants will be contacted for a follow-up videoconference interview over Zoom.