

## 2008 Summary of Research Reports

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**Project:** Acoustic Field Uncertainty in Ocean Waveguides

**Sponsor:** NRL

### **Statement of Work:**

The project will be exploring the application of polynomial chaos basis expansions to describe environmental uncertainty in the sound speed distribution, and its subsequent effect on acoustic field uncertainty in ocean waveguides. These expansions treat the sound speed distribution as a random process, and allow for a description of acoustic wave propagation in terms of a stochastic differential equation. A solution then describes acoustic propagation in conjunction with a measure of uncertainty in the amplitude and phase of the pressure field. Such information is important in simulating real-world environments for the purpose of predicting sonar array performance in a robust manner. The specific work will involve a generalization of a random, single layer waveguide to multiple layers, with more than one source of environmental uncertainty. Moments of the acoustic field will be computed using the polynomial chaos basis expansion approach and results compared to ground truth using an independent Monte Carlo estimate of the moments.