Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

**Using machine learning to predict low-altitude atmospheric optical turbulence.**[1] CHRIS JELLEN, JOHN BURKHARDT, CHARLES NELSON, CODY BROWNELL, U.S. Naval Academy — Laser-based systems employed within the atmospheric surface layer are subject to degradation due to index of refraction fluctuations within the beam path, known as optical turbulence. Laser propagation through optical turbulence results in beam spread, loss of coherence, and reduced irradiance on target. The root causes of optical turbulence are temperature and humidity fluctuations within the atmosphere. Prediction of these parameters from basic meteorological data is required for effective implementation of any long-range laser system. A field measurement site at the U.S. Naval Academy in Annapolis, Maryland, is used to gather data related to atmospheric effects on optical propagation. A scintillometer measures the refractive index structure constant along a 1-km path over the Severn River adjacent to the Chesapeake Bay. At each end of the scintillometer link, weather data including wind velocity, air and sea surface temperatures, etc. is captured. Using this data, machine learning techniques are used to predict the refractive index structure parameter of the atmosphere and the scintillation on target of the laser.

[1]Gratefully acknowledge support from ONR and DE-JTO.

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Date submitted: 17 Jul 2019 Electronic form version 1.4