

Turbulent Imaging Simulation at DRDC

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Abstract: We present the work done at *Defense Research & Development Canada* (DRDC) on simulating turbulence effects on imaging in the atmospheric surface layer. We begin by reviewing the passive imaging simulator dubbed the *Optical Turbulence for Imaging Systems Simulator* (OTISS). We show the physical principles underlying OTISS along with its various stages of development and its validation using imaging data. We then review our work on extending OTISS for active imaging. This entails formulating the *Bidirectional Reflectivity Distribution Function* (BRDF) of a surface in terms of incident and reflected Wigner functions which propagate through atmospheric turbulence both towards the target surface and back. We explain the physics behind this approach and demonstrate some outputs from the preliminary active imaging simulator. We discuss some of the limits of this approach and directions for future work.