



Sensing and Multiscale Structure

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We introduce a method of estimating parameters associated with a fractal random scattering medium, which utilizes the multiscale properties of the scattered field. The example of ray-density fluctuations beyond a phase screen with fractal slope is considered. An exact solution to the forward problem, in the case of the Brownian fractal, leads to an expression for the volatility of the slope. This expression is invariant under a change of probability measure, a fact which gives rise to the corresponding result for a (stationary) Ornstein-Uhlenbeck slope. We demonstrate that our analytical results are consistent with numerical simulations. Finally, an application to the determination of sea ice thickness via sonar is discussed.

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