

Oil Slick Detection on the Ocean Surface

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Oil spill is the main source of the pollution in the oceans. It reduces ocean interaction with the atmosphere and contributing to the carbon and water cycles and therefore causing harm for the ocean lives. So detection and quantification of oil spills on water is one of the most important issues of environmental protection. As the oil layer above the ocean surface is very thin, the difference in effective permittivity due to it is not significant. However adding a thin layer of oil reduces the surface roughness and consequently the electromagnetic backscattering. There are many algorithms for oil slick detection that has been used such as pattern recognition techniques, frequency spectrum attenuation measurements, neural networks recognition techniques and SAR images detection and characterization (P. Trivero *et al.*, *Int. Journal of Remote Sensing*, **19**, 543-548, 1998).

Most of the reported techniques are useful however complex. In this paper an easy method has been proposed to find oil slicks on the ocean surface by calculating backscattering coefficient. Different types of ocean surfaces (Gaussian surface with band-limited ocean spectrum and Band-limited fractal surface based on the Weierstrass-Mandelbrot function) have been considered for this study. The oil effect on the ocean surface has been modeled as decrease in upper wave-number cutoff. The surface integral equation is solved numerically using the method of moments. Figure 1 shows a random generation of these surfaces and effect of oil on them. The simulation results for back scattering coefficient are shown in Figure 2. As it can be seen for incident angles more than **35** degrees the reduction in back scattering coefficient in both cases is more than **3** dB and easily detectable.

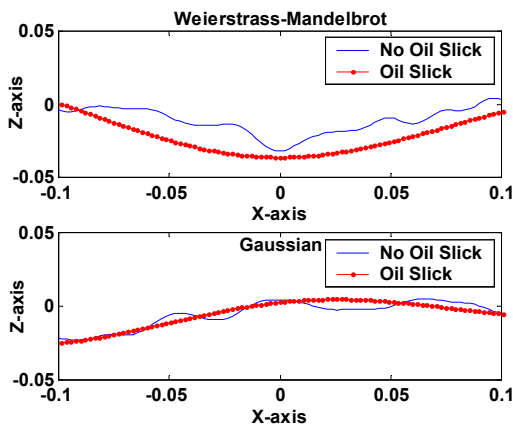


Figure 1. Surface Profiles

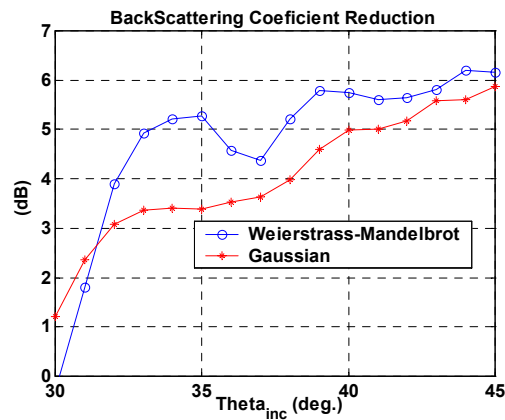


Figure 2. Back-Scattering Reduction