Numerical Comparison of Periodic MOM (Method of Moments) and BMIA (Banded Matrix Iteration Method)

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The most popular numerical technique in rough surface scattering is the MOM (Method of Moments). Since the scattering patch size is finite, the edge current must be suppressed to obtain accurate scattering cross sections. Two standard ways to minimize the edge current are periodic boundary conditions and incident wave tapering. Both techniques require similar scattering patch size and their results agree reasonably well when the incidence angle is modest. However, at near grazing incidence, it is difficult to do numerical comparison of two techniques since the tapered incident wave requires a large patch size. This computational problem can be overcome by a recent] y developed method, known as BMIA (Banded Matrix Iteration Method). The details of this technique can be found in the original paper by L. Tsang et al. [L. Tsang, C. H. Chan, K, Pak, H. Sangani, A. Ishimaru, and P. Phu, J. Opt. Sot. Am A, 691-696, 1994]. Even though the use of periodic boundary condition does not require larger scattering patch size at near grazing, it is critical to evaluate the periodic Green's function accurately and examine the requirements of angular resolution. We present several ways of calculating the periodic Green's function. The purpose of the present work is to compare the accuracy and computational requirements of the two methods in order to access their relative strengths for a variety of surface spectra,

In order to compare two methods, at near grazing incidence, we generate large rough surfaces to use in the Monte Carlo simulations. Both Gaussian and power-law (multi-scale) spectra are used to produce two types of surfaces. Using the BMIA, the bistatic cross section from each large surface is calculated, Since the impedance matrix of the periodic MOM cannot be decomposed into the stu ong and weak interaction parts, the BMIA is not applied to the periodic MOM, For the periodic MOM, a single large surface is divided into many patches. We study the statistical convergence of the bistatic cross section as the patch length increases. A patch length of 100 wavelength was large enough to obtain good statistical convergence at the incidence angle of 85 degrees. In this talk, the bistatic cross sections obtained by using the BMIA and the periodic MOM will be compared and contrasted.