

## ABSTRACT

Predicting electromagnetic (EM) scattering from and propagation over rough surfaces is important in studying propagation effects for communication systems, and designing remote sensing systems. For example, time evolving sea surfaces cause EM backscattered returns to be spread into a Doppler spectrum; this affects maritime imaging radars. In this thesis, the West *et al.* non-linear hydrodynamic model is used in a Monte Carlo simulation to compute averaged Doppler spectra for wind speeds up to 5.0 m/s. EM scattering is computed with a pulse-based method of moments (MoM) formulation with acceleration techniques in place. This model is then compared to results obtained using MoM with a phasor basis (MoMPB) for site-specific terrain. Finally, a technique is introduced to improve the efficiency of the MoMPB algorithm, and the code is applied to propagation problems over Pierson-Moskowitz realized ocean surfaces.