MICROSCALE OCEAN DYNAMICS

by

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The main goal of this task is to study the detailed dynamics of the micro-scale ocean surface phenomena, and to establish relationships among the surface signatures with the underlying dynamical processes. Our approach to advance our understanding in this area is as follows: 1) Conduct rigorous theoretical studies of the ocean surface wave dynamics and statistical properties. 2) Conduct process-oriented laboratory experiments to verify the theoretical results, and to provide guidance for further studies. 3) Prepare testable hypotheses for field verifications and comparisons during the ONR/NASA sponsored Surface Wave Dynamics Experiment (SWADE).

In the past year, we have established an analytic model for wave breaking probability to study the influence of wave breaking on the spectrum shape in both deep and finite-depth waters. We have also processed the laboratory data on the wave number spectrum and the structures of the water surface under the influence of wind and existing waves. A paper is currently under revision for publication in the Journal of Fluid Mechanics.

Based on our plan for the next three-years, we should be able to produce the following results at the end of the study period: 1) A quantitative assessment on the importance of the Kelvin-Helmholtz instability in wind-wave generation. 2) A quantitative

parameterization of the influence of background waves on the development of centimeter-range waves. 3) A definition of the threshold for wind-wave breaking, and assess the influence on the dynamics of the upper ocean layer. 4) A verification of the influence of the concurrent motions on the weakly nonlinear wave-wave interactions.