Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Direct numerical simulations of gravity-capillary wave turbulence
LUC DEIKE, Univ Paris Diderot, Sorbonne Paris Cité, MSC, UMR 7057 CNRS, F-75 013 Paris, France, EU, DANIEL FUSTER, CNRS, UMR 7190, Institut Jean Le Rond d'Alembert, F-75005 Paris, France, EU, MICHAEL BERHANU, ERIC FALCON, Univ Paris Diderot, Sorbonne Paris Cité, MSC, UMR 7057 CNRS, F-75 013 Paris, France, EU — Direct numerical simulation of the full two phase Navier-Stokes equations, including surface tension are performed, using the code Gerris (Popinet, 2009), in order to investigate gravity-capillary wave turbulence. Wave turbulence concerns the study of the statistical and dynamical properties of a set of nonlinear interacting waves (Zakharov, 1992). Waves at the air-water interface, initially at rest, are excited at low wave-numbers and a stationary wave turbulence state is obtained after a time long enough (typically 30 periods of the wave forcing period). The space-time wave height power spectrum is calculated for both capillary and gravity waves regimes. The observed dispersion relation is in agreement with the theoretical one for linear gravity-capillary wave. The wave height power spectrum in the wave-number-space or in the frequency-space exhibit a power law and will be discussed with respects of weak turbulence theory (Zakharov, 2012). Finally the scaling of the spectrum with the injected power will be compared with theoretical and experimental works.

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Date submitted: 24 Jul 2012 Electronic form version 1.4