Direct numerical simulations of breaking waves

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Breaking waves at the water surface is a striking example of turbulent mixing across a fluid interface. The impact of the jet generates turbulence, entrains air into the water and ejects droplets into the air. A fundamental understanding of the general multi-scale properties of the resulting multiphase turbulent flow is necessary to develop more accurate gas transfer or spray generation parameterizations.

In this talk, we will present direct numerical simulations of breaking waves at various scales, using the open source solver Gerris including capillary effects. We will discuss the effects of surface tension on the wave shape, the dissipation due to breaking and parasitic capillaries as well as air entrainment and bubble statistics in breaking waves. The numerical results are carefully validated against laboratory experiments and scaling models are proposed (Deike et al 2015, 2016).

References

L. Deike, W. K. Melville and S. Popinet. Journal of Fluid Mechanics. (2016). Air entrainment and bubble statistics in breaking waves. vol 801, pp 91- 129.

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