Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Wave - fluid particle interaction in the Faraday waves[1] NICOLAS FRANCOIS, HUA XIA, HORST PUNZMANN, MICHAEL SHATS, Australian Natl Univ — Faraday waves are parametrically excited perturbations that appear on a liquid surface when the latter is vertically vibrated. Recently it has been discovered that: 1) such wave field can be described as a disordered lattice made of localised oscillating excitations, termed oscillons, 2) the horizontal motion of fluid particles on the water surface reproduces in detail the motion of fluid in two-dimensional turbulence.
Here we report experimental measurements of the motion of both entities using Particle Image Velocimetry and Particle Tracking Velocimetry techniques. Those techniques allow to measure Lagrangian and Eulerian features of the oscillon motion and compare them with those of the fluid motion. A strong coupling is uncovered between the erratic motion of the waves and the turbulent agitation of the fluid particles. Both motions show Brownian-type dispersion and the r.m.s velocity of oscillons is directly related to the r.m.s. velocity of the fluid particles in a broad range of vertical accelerations. These results offer new perspectives for predicting surface fluid transport from the knowledge of the wave fields and vice versa. In particular, the broadening of the wave spectra at high wave amplitude can be predicted if the 2D turbulence energy is known.

[1]This work was supported by the Australian Research Council's Discovery Projects funding scheme (DP150103468 and DP160100863). NF acknowledges support by the Australian Research Council's DECRA Award (DE160100742).

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Date submitted: 29 Jul 2016 Electronic form version 1.4